

ESSAYS :

SCIENTIFIC, POLITICAL, AND SPECULATIVE.

BY

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"SOCIAL STATICS" AND "THE PRINCIPLES OF PSYCHOLOGY."

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P R E F A C E.

THE Essays collected together in this volume, were severally written with a view to ultimate re-publication in a permanent form. Each contains, as I believe, ideas of more than ephemeral interest; and on each I have bestowed an amount of thought and labour much greater than is usually bestowed on Review articles.

Most of them now re-appear with additions. The Essay on "The Philosophy of Style" especially, has been considerably amplified; and that on "Transcendental Physiology" includes two sections (pp. 279 to 290, and pp. 302, 303) omitted from it when first published. Add to which, that all of them have undergone a careful verbal revision.

The places and dates of original publication are as follows:—

"Progress: its Law and Cause," in the *Westminster Review*, for April, 1857.

"Railway Morals and Railway Policy," in the *Edinburgh Review*, for October, 1854.

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“Over-Legislation,” in the *Westminster Review*, for July, 1853.

“The Origin and Function of Music,” in *Fraser’s Magazine*, for October, 1857.

“The Haythorne Papers,” in the “Portfolio” of the *Leader*, between January, 1852, and May, 1854.

At the time when the first of these Essays was sent to the printer’s, I had hoped to make up the series of ten, by including an article on “The Art of Education,” contributed to the *North British Review*, for May, 1854; but the proprietor of that journal refuses his consent to its re-publication. And though, except in cases where the copyright has been definitely made over to the proprietor, the implication of the amended Copyright Act is that it remains with the Author; yet legal decisions are so uncertain, that I prefer to omit the Essay rather than risk the chances of a law-suit.

To the proprietors of the other journals above named, I tender my thanks for the courtesy with which they have acceded to my wishes.

St. John’s Wood,
December, 1857.

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ESSAYS.

PROGRESS: ITS LAW AND CAUSE.

THE current conception of Progress is somewhat shifting and indefinite. Sometimes it comprehends little more than simple growth—as of a nation in the number of its members and the extent of territory over which it has spread. Sometimes it has reference to quantity of material products—as when the advance of agriculture and manufactures is the topic. Sometimes the superior quality of these products is contemplated: and sometimes the new or improved appliances by which they are produced. When, again, we speak of moral or intellectual progress, we refer to the state of the individual or people exhibiting it; while, when the progress of Knowledge, of Science, of Art, is commented upon, we have in view certain abstract results of human thought and action. Not only, however, is the current conception of Progress more or less vague, but it is in great measure erroneous. It takes in not so much the reality of Progress as its accompaniments—not so much the substance as the shadow. That progress in intelligence seen during the growth of the child into the man, or the savage into the philosopher, is commonly regarded as consisting in the greater number of facts known and laws understood: whereas the actual progress consists in those internal modifications of which this increased knowledge is the expression. Social progress is

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supposed to consist in the produce of a greater quantity and variety of the articles required for satisfying men's wants; in the increasing security of person and property; in widening freedom of action: whereas, rightly understood, social progress consists in those changes of structure in the social organism which have entailed these consequences. The current conception is a teleological one. The phenomena are contemplated solely as bearing on human happiness. Only those changes are held to constitute progress which directly or indirectly tend to heighten human happiness. And they are thought to constitute progress simply *because* they tend to heighten human happiness. But rightly to understand progress, we must inquire what is the nature of these changes, considered apart from our interests. Ceasing, for example, to regard the successive geological modifications that have taken place in the Earth, as modifications that have gradually fitted it for the habitation of Man, and as *therefore* a geological progress, we must seek to determine the character common to these modifications—the law to which they all conform. And similarly in every other case. Leaving out of sight concomitants and beneficial consequences, let us ask what Progress is in itself.

In respect to that progress which individual organisms display in the course of their evolution, this question has been answered by the Germans. The investigations of Wolff, Goethe, and Von Baer, have established the truth that the series of changes gone through during the development of a seed into a tree, or an ovum into an animal, constitute an advance from homogeneity of structure to heterogeneity of structure. In its primary stage, every germ consists of a substance that is uniform throughout, both in texture and chemical composition. The first step is the appearance of a difference between two parts of this substance; or, as the phenomenon is called in physiological language, a differentiation. Each of these differentiated divisions presently begins itself to exhibit some contrast of parts; and by and by these secondary differentiations become as definite as the original one. This process is continuously repeated—is simul-

taneously going on in all parts of the growing embryo ; and by endless such differentiations there is finally produced that complex combination of tissues and organs constituting the adult animal or plant. This is the history of all organisms whatever. It is settled beyond dispute that organic progress consists in a change from the homogeneous to the heterogeneous.

Now, we propose in the first place to show, that this law of organic progress is the law of all progress. Whether it be in the development of the Earth, in the development of Life upon its surface, in the development of Society, of Government, of Manufactures, of Commerce, of Language, Literature, Science, Art, this same evolution of the simple into the complex, through successive differentiations, holds throughout. From the earliest traceable cosmical changes down to the latest results of civilization, we shall find that the transformation of the homogeneous into the heterogeneous, is that in which Progress essentially consists.

With the view of showing that *if* the Nebular Hypothesis be true, the genesis of the solar system supplies one illustration of this law, let us assume that the matter of which the sun and planets consist was once in a diffused form ; and that from the gravitation of its atoms there resulted a gradual concentration. By the hypothesis, the solar system in its nascent state existed as an indefinitely extended and nearly homogeneous medium—a medium almost homogeneous in density, in temperature, and in other physical attributes. The first advance towards consolidation resulted in a differentiation between the occupied space which the nebulous mass still filled, and the unoccupied space which it previously filled. There simultaneously resulted a contrast in density and a contrast in temperature, between the interior and the exterior of this mass. And at the same time there arose throughout it rotatory movements, whose velocities varied according to their distances from its centre. These differentiations increased in number and degree until there was evolved the organized group of sun, planets, and satellites, which we now know—a group which presents nu-

merous contrasts of structure and action among its members. There are the immense contrasts between the sun and the planets, in bulk and in weight; as well as the subordinate contrasts between one planet and another, and between the planets and their satellites. There is the similarly marked contrast between the sun as almost stationary, and the planets as moving round him with great velocity; while there are the secondary contrasts between the velocities and periods of the several planets, and between their simple revolutions and the double ones of their satellites, which have to move round their primaries while moving round the sun. There is the yet further strong contrast between the sun and the planets in respect of temperature; and there is reason to suppose that the planets and satellites differ from each other in their proper heat, as well as in the heat they receive from the sun. When we bear in mind that, in addition to these various contrasts, the planets and satellites also differ in respect to their distances from each other and their primary; in respect to the inclinations of their orbits, the inclinations of their axes, their times of rotation on their axes, their specific gravities, and their physical constitutions; we see what a high degree of heterogeneity the solar system exhibits, when compared with the almost complete homogeneity of the nebulous mass out of which it is supposed to have originated.

Passing from this hypothetical illustration, which must be taken for what it is worth, without prejudice to the general argument, let us descend to a more certain order of evidence. It is now generally agreed among geologists that the Earth was at first a mass of molten matter; and that it is still fluid and incandescent at the distance of a few miles beneath its surface. Originally, then, it was homogeneous in consistence, and, in virtue of the circulation that takes place in heated fluids, must have been comparatively homogeneous in temperature; and it must have been surrounded by an atmosphere consisting partly of the elements of air and water, and partly of those various other elements which assume a gaseous form at high tempera-

tures. That slow cooling by radiation which is still going on at an inappreciable rate, and which, though originally far more rapid than now, necessarily required an immense time to produce any decided change, must ultimately have resulted in the solidification of the portion most able to part with its heat—namely, the surface. In the thin crust thus formed we have the first marked differentiation. A still further cooling, a consequent thickening of this crust, and an accompanying deposition of all solidifiable elements contained in the atmosphere, must finally have been followed by the condensation of the water previously existing as vapour. A second marked differentiation must thus have arisen: and as the condensation must have taken place on the coolest parts of the surface—namely, about the poles—there must thus have resulted the first geographical distinction of parts. To these illustrations of growing heterogeneity, which, though deduced from the known laws of matter, may be regarded as more or less hypothetical, Geology adds an extensive series that have been inductively established. Its investigations show that the Earth has been continually becoming more heterogeneous in virtue of the multiplication of the strata which form its crust; further, that it has been becoming more heterogeneous in respect of the composition of these strata, the latter of which, being made from the detritus of the older ones, are many of them rendered highly complex by the mixture of materials they contain; and that this heterogeneity has been vastly increased by the action of the Earth's still molten nucleus upon its envelope, whence have resulted not only a great variety of igneous rocks, but the tilting up of sedimentary strata at all angles, the formation of faults and metallic veins, the production of endless dislocations and irregularities. Yet again, geologists teach us that the Earth's surface has been growing more varied in elevation—that the most ancient mountain systems are the smallest, and the Andes and Himalayas the most modern; while in all probability there have been corresponding changes in the bed of the ocean. As a consequence of these ceaseless differentiations, we now find

that no considerable portion of the Earth's exposed surface is like any other portion, either in contour, in geologic structure, or in chemical composition; and that in most parts it changes from mile to mile in all these characteristics. Moreover, it must not be forgotten that there has been simultaneously going on a gradual differentiation of climates. As fast as the Earth cooled and its crust solidified, there arose appreciable differences in temperature between those parts of its surface most exposed to the sun and those less exposed. Gradually, as the cooling progressed, these differences became more pronounced; until there finally resulted those marked contrasts between regions of perpetual ice and snow, regions where winter and summer alternately reign for periods varying according to the latitude, and regions where summer follows summer with scarcely an appreciable variation. At the same time the successive elevations and subsidences of different portions of the Earth's crust, tending as they have done to the present irregular distribution of land and sea, have entailed various modifications of climate beyond those dependent on latitude; while a yet further series of such modifications have been produced by increasing differences of elevation in the land, which have in sundry places brought arctic, temperate, and tropical climates to within a few miles of each other. And the general result of these changes is, that not only has every extensive region its own meteorologic conditions, but that every locality in each region differs more or less from others in those conditions, as in its structure, its contour, its soil. Thus, between our existing Earth, the phenomena of whose varied crust neither geographers, geologists, mineralogists, nor meteorologists have yet enumerated, and the molten globe out of which it was evolved, the contrast in heterogeneity is sufficiently striking.

When from the Earth itself we turn to the plants and animals that have lived, or still live, upon its surface, we find ourselves in some difficulty from lack of facts. That every existing organism has been developed out of the simple into the complex, is indeed the first established truth of all; and

that every organism that has existed was similarly developed, is an inference which no physiologist will hesitate to draw. But when we pass from individual forms of life to Life in general, and inquire whether the same law is seen in the *ensemble* of its manifestations,—whether modern plants and animals are of more heterogeneous structure than ancient ones, and whether the Earth's present Flora and Fauna are more heterogeneous than the Flora and Fauna of the past,—we find the evidence so fragmentary, that every conclusion is open to dispute. Two-thirds of the Earth's surface being covered by water ; a great part of the exposed land being inaccessible to, or untravelled by, the geologist ; the greater part of the remainder having been scarcely more than glanced at ; and even the most familiar portions, as England, having been so imperfectly explored that a new series of strata has been added within these four years,—it is manifestly impossible for us to say with any certainty what creatures have, and what have not, existed at any particular period. Considering the perishable nature of many of the lower organic forms, the metamorphosis of many sedimentary strata, and the gaps that occur among the rest, we shall see further reason for distrusting our deductions. On the one hand, the repeated discovery of vertebrate remains in strata previously supposed to contain none,—of reptiles where only fish were thought to exist,—of mammals where it was believed there were no creatures higher than reptiles,—renders it daily more manifest how small is the value of negative evidence. On the other hand, the worthlessness of the assumption that we have discovered the earliest, or anything like the earliest, organic remains, is becoming equally clear. That the oldest known sedimentary rocks have been greatly changed by igneous action, and that still older ones have been totally transformed by it, is becoming undeniable. And the fact that sedimentary strata earlier than any we know, have been melted up, being admitted, it must also be admitted that we cannot say how far back in time this destruction of sedimentary strata has been going on. Thus it is manifest that the title *Palæozoic*, as

applied to the earliest known fossiliferous strata, involves a *petitio principii*; and that, for aught we know to the contrary, only the last few chapters of the Earth's biological history may have come down to us. On neither side, therefore, is the evidence conclusive. Nevertheless we cannot but think that, scanty as they are, the facts, taken altogether, tend to show both that the more heterogeneous organisms have been evolved in the later geologic periods, and that Life in general has been more heterogeneously manifested as time has advanced. Let us cite, in illustration, the one case of the *vertebrata*. The earliest known vertebrate remains are those of Fishes; and Fishes are the most homogeneous of the *vertebrata*. Later and more heterogeneous are Reptiles. Later still, and more heterogeneous still, are Mammals and Birds. If it be said, as it may fairly be said, that the Palæozoic deposits, not being estuary deposits, are not likely to contain the remains of terrestrial *vertebrata*, which may nevertheless have existed at that era, we reply that we are merely pointing to the leading facts, *such as they are*. But to avoid any such criticism, let us take the mammalian subdivision only. The earliest known remains of mammals are those of small marsupials, which are the lowest of the mammalian type; while, conversely, the highest of the mammalian type—Man—is the most recent. The evidence that the vertebrate fauna, as a whole, has become more heterogeneous, is considerably stronger. To the argument that the vertebrate fauna of the Palæozoic period, consisting, so far as we know, entirely of Fishes, was less heterogeneous than the modern vertebrate fauna, which includes Reptiles, Birds, and Mammals, of multitudinous genera, it may be replied, as before, that estuary deposits of the Palæozoic period, could we find them, might contain other orders of *vertebrata*. But no such reply can be made to the argument that whereas the marine *vertebrata* of the Palæozoic period consisted entirely of cartilaginous fishes, the marine *vertebrata* of later periods include numerous genera of osseous fishes; and that, therefore, the later marine vertebrate faunas are more heterogeneous than

the oldest known one. Nor, again, can any such reply be made to the fact that there are far more numerous orders and genera of mammalian remains in the tertiary formations than in the secondary formations. Did we wish merely to make out the best case, we might dwell upon the opinion of Dr. Carpenter, who says that "the general facts of Palæontology appear to sanction the belief, that *the same plan* may be traced out in what may be called *the general life of the globe*, as in *the individual life* of every one of the forms of organized being which now people it." Or we might quote, as decisive, the judgment of Professor Owen, who holds that the earlier examples of each group of creatures severally departed less widely from archetypal generality than the later ones—were severally less unlike the fundamental form common to the group as a whole; that is to say—constituted a less heterogeneous group of creatures; and who further upholds the doctrine of a biological progression. But in deference to an authority for whom we have the highest respect, who considers that the evidence at present obtained does not justify a verdict either way, we are content to leave the question open.

Whether an advance from the homogeneous to the heterogeneous is or is not displayed in the biological history of the globe, it is clearly enough displayed in the progress of the latest and most heterogeneous creature—Man. It is alike true that, during the period in which the Earth has been peopled, the human organism has grown more heterogeneous among the civilized divisions of the species; and that the species, as a whole, has been growing more heterogeneous in virtue of the multiplication of races and the differentiation of these races from each other. In proof of the first of these positions, we may cite the fact that, in the relative development of the limbs, the civilized man departs more widely from the general type of the placental mammalia than do the lower human races. While often possessing well-developed body and arms, the Papuan has extremely small legs: thus reminding us

of the *quadrumana*, in which there is no great contrast in size between the hind and fore limbs. But in the European, the greater length and massiveness of the legs has become very marked—the fore and hind limbs are relatively more heterogeneous. Again, the greater ratio which the cranial bones bear to the facial bones illustrates the same truth. Among the *vertebrata* in general, progress is marked by an increasing heterogeneity in the vertebral column, and more especially in the *vertebræ* constituting the skull: the higher forms being distinguished by the relatively larger size of the bones which cover the brain, and the relatively smaller size of those which form the jaws, &c. Now, this characteristic, which is stronger in Man than in any other creature, is stronger in the European than in the savage. Moreover, judging from the greater extent and variety of faculty he exhibits, we may infer that the civilized man has also a more complex or heterogeneous nervous system than the uncivilized man: and indeed the fact is in part visible in the increased ratio which his *cerebrum* bears to the subjacent *ganglia*. If further elucidation be needed, we may find it in every nursery. The infant European has sundry marked points of resemblance to the lower human races; as in the flatness of the *alæ* of the nose, the depression of its bridge, the divergence and forward opening of the nostrils, the form of the lips, the absence of a frontal sinus, the width between the eyes, the smallness of the legs. Now, as the developmental process by which these traits are turned into those of the adult European, is a continuation of that change from the homogeneous to the heterogeneous displayed during the previous evolution of the embryo, which every physiologist will admit; it follows that the parallel developmental process by which the like traits of the barbarous races have been turned into those of the civilized races, has also been a continuation of the change from the homogeneous to the heterogeneous. The truth of the second position—that Mankind, as a whole, have become more heterogeneous—is so obvious as scarcely to need illustration. Every work on *Ethnology*, by its

divisions and subdivisions of races, bears testimony to it. Even were we to admit the hypothesis that Mankind originated from several separate stocks, it would still remain true, that as, from each of these stocks, there have sprung many now widely different tribes, which are proved by philological evidence to have had a common origin, the race as a whole is far less homogeneous than it once was. Add to which, that we have, in the Anglo-Americans, an example of a new variety arising within these few generations; and that, if we may trust to the descriptions of observers, we are likely soon to have another such example in Australia.

On passing from Humanity under its individual form, to Humanity as socially embodied, we find the general law still more variously exemplified. The change from the homogeneous to the heterogeneous is displayed equally in the progress of civilization as a whole, and in the progress of every tribe or nation; and is still going on with increasing rapidity. As we see in existing barbarous tribes, society in its first and lowest form is a homogeneous aggregation of individuals having like powers and like functions: the only marked difference of function being that which accompanies difference of sex. Every man is warrior, hunter, fisherman, tool-maker, builder; every woman performs the same drudgeries; every family is self-sufficing, and save for purposes of aggression and defence, might as well live apart from the rest. Very early, however, in the process of social evolution, we find an incipient differentiation between the governing and the governed. Some kind of chieftainship seems coeval with the first advance from the state of separate wandering families to that of a nomadic tribe. The authority of the strongest makes itself felt among a body of savages as in a herd of animals, or a posse of schoolboys. At first, however, it is indefinite, uncertain; is shared by others of scarcely inferior power; and is unaccompanied by any difference in occupation or style of living: the first ruler kills his own game, makes his own weapons, builds his own hut, and, economically considered, does not differ from others of his

tribe. Gradually, as the tribe progresses, the contrast between the governing and the governed grows more decided. Supreme power becomes hereditary in one family; the head of that family, ceasing to provide for his own wants, is served by others; and he begins to assume the sole office of ruling. At the same time there has been arising a co-ordinate species of government—that of Religion. As all ancient records and traditions prove, the earliest rulers are regarded as divine personages. The maxims and commands they uttered during their lives are held sacred after their deaths, and are enforced by their divinely-descended successors; who in their turns are promoted to the pantheon of the race, there to be worshipped and propitiated along with their predecessors: the most ancient of whom is the supreme god, and the rest subordinate gods. For a long time these connate forms of government—civil and religious—continue closely associated. For many generations the king continues to be the chief priest, and the priesthood to be members of the royal race. For many ages religious law continues to contain more or less of civil regulation, and civil law to possess more or less of religious sanction; and even among the most advanced nations these two controlling agencies are by no means completely differentiated from each other. Having a common root with these, and gradually diverging from them, we find yet another controlling agency—that of Manners or ceremonial usages. All titles of honour are originally the names of the god-king; afterwards of God and the king; still later of persons of high rank; and finally come, some of them, to be used between man and man. All forms of complimentary address were at first the expressions of submission from prisoners to their conqueror, or from subjects to their ruler, either human or divine—expressions that were afterwards used to propitiate subordinate authorities, and slowly descended into ordinary intercourse. All modes of salutation were once obeisances made before the monarch and used in worship of him after his death. Presently others of the god-descended race were similarly saluted; and by degrees

some of the salutations have become the due of all.* Thus, no sooner does the originally homogeneous social mass differentiate into the governed and the governing parts, than this last exhibits an incipient differentiation into religious and secular—Church and State; while at the same time there begins to be differentiated from both, that less definite species of government which rules our daily intercourse—a species of government which, as we may see in heralds' colleges, in books of the peerage, in masters of ceremonies, is not without a certain embodiment of its own. Each of these is itself subject to successive differentiations. In the course of ages, there arises, as among ourselves, a highly complex political organization of monarch, ministers, lords and commons, with their subordinate administrative departments, courts of justice, revenue offices, &c., supplemented in the provinces by municipal governments, county governments, parish or union governments—all of them more or less elaborated. By its side there grows up a highly complex religious organization, with its various grades of officials, from archbishops down to sextons, its colleges, convocations, ecclesiastical courts, &c.; to all which must be added the ever-multiplying independent sects, each with its general and local authorities. And at the same time there is developed a highly complex aggregation of customs, manners, and temporary fashions, enforced by society at large, and serving to control those minor transactions between man and man which are not regulated by civil and religious law. Moreover it is to be observed that this ever-increasing heterogeneity in the governmental appliances of each nation, has been accompanied by an increasing heterogeneity in the governmental appliances of different nations: all of which are more or less unlike in their political systems and legislation, in their creeds and religious institutions, in their customs and ceremonial usages.

Simultaneously there has been going on a second differentiation of a more familiar kind; that, namely, by which the

* For detailed proof of these assertions see essay on *Manners and Fashion*.

mass of the community has been segregated into distinct classes and orders of workers. While the governing part has undergone the complex development above detailed, the governed part has undergone an equally complex development, which has resulted in that minute division of labour characterizing advanced nations. It is needless to trace out this progress from its first stages, up through the caste divisions of the East and the incorporated guilds of Europe, to the elaborate producing and distributing organization existing among ourselves. Political economists have long since described the evolution which, beginning with a tribe whose members severally perform the same actions each for himself, ends with a civilized community whose members severally perform different actions for each other; and they have further pointed out the changes through which the solitary producer of any one commodity is transformed into a combination of producers who, united under a master, take separate parts in the manufacture of such commodity. But there are yet other and higher phases of this advance from the homogeneous to the heterogeneous in the industrial organization of society. Long after considerable progress has been made in the division of labour among different classes of workers, there is still little or no division of labour among the widely separated parts of the community: the nation continues comparatively homogeneous in the respect that in each district the same occupations are pursued. But when roads and other means of transit become numerous and good, the different districts begin to assume different functions, and to become mutually dependent. The calico manufacture locates itself in this county, the woollen-cloth manufacture in that; silks are produced here, lace there; stockings in one place, shoes in another; pottery, hardware, cutlery, come to have their special towns; and ultimately every locality becomes more or less distinguished from the rest by the leading occupation carried on in it. Nay, more, this subdivision of functions shows itself not only among the different parts of the same nation, but among different nations. That exchange of commodities which

free-trade promises so greatly to increase, will ultimately have the effect of specializing, in a greater or less degree, the industry of each people. So that beginning with a barbarous tribe, almost if not quite homogeneous in the functions of its members, the progress has been, and still is, towards an economic aggregation of the whole human race; growing ever more heterogeneous in respect of the separate functions assumed by separate nations, the separate functions assumed by the local sections of each nation, the separate functions assumed by the many kinds of makers and traders in each town, and the separate functions assumed by the workers united in producing each commodity.

Not only is the law thus clearly exemplified in the evolution of the social organism, but it is exemplified with equal clearness in the evolution of all products of human thought and action; whether concrete or abstract, real or ideal. Let us take Language as our first illustration.

The lowest form of language is the exclamation, by which an entire idea is vaguely conveyed through a single sound; as among the lower animals. That human language ever consisted solely of exclamations, and so was strictly homogeneous in respect of its parts of speech, we have no evidence. But that language can be traced down to a form in which nouns and verbs are its only elements, is an established fact. In the gradual multiplication of parts of speech out of these primary ones—in the differentiation of verbs into active and passive, of nouns into abstract and concrete—in the rise of distinctions of mood, tense, person, of number and case—in the formation of auxiliary verbs, of adjectives, adverbs, pronouns, prepositions, articles—in the divergence of those orders, genera, species, and varieties of parts of speech by which civilized races express minute modifications of meaning—we see a change from the homogeneous to the heterogeneous. And it may be remarked, in passing, that it is more especially in virtue of having carried this subdivision of function to a greater extent and completeness, that the English language is superior to all others.

Another aspect under which we may trace the development of language is the differentiation of words of allied meanings. Philology early disclosed the truth that in all languages words may be grouped into families having a common ancestry. An aboriginal name applied indiscriminately to each of an extensive and ill-defined class of things or actions, presently undergoes modifications by which the chief divisions of the class are expressed. These several names springing from the primitive root, themselves become the parents of other names still further modified. And by the aid of those systematic modes which presently arise, of making derivatives and forming compound terms expressing still smaller distinctions, there is finally developed a tribe of words so heterogeneous in sound and meaning, that to the uninitiated it seems incredible they should have had a common origin. Meanwhile from other roots there are being evolved other such tribes, until there results a language of some sixty thousand or more unlike words, signifying as many unlike objects, qualities, acts. Yet another way in which language in general advances from the homogeneous to the heterogeneous, is in the multiplication of languages. Whether, as Max Müller and Bunsen think, all languages have grown from one stock, or whether, as some philologists say, they have grown from two or more stocks, it is clear that since large families of languages, as the Indo-European, are of one parentage, they have become distinct through a process of continuous divergence. The same diffusion over the Earth's surface which has led to the differentiation of the race, has simultaneously led to a differentiation of their speech: a truth which we see further illustrated in each nation by the peculiarities of dialect found in separate districts. Thus the progress of Language conforms to the general law, alike in the evolution of languages, in the evolution of families of words, and in the evolution of parts of speech.

On passing from spoken to written language, we come upon several classes of facts, all having similar implications. Written language is connate with Painting and Sculpture; and at

first all three are appendages of Architecture, and have a direct connection with the primary form of all Government—the theocratic. Merely noting by the way the fact that sundry wild races, as for example the Australians and the tribes of South Africa, are given to depicting personages and events upon the walls of caves, which are probably regarded as sacred places, let us pass to the case of the Egyptians. Among them, as also among the Assyrians, we find mural paintings used to decorate the temple of the god and the palace of the king (which were, indeed, originally identical); and as such they were governmental appliances in the same sense that state-pageants and religious feasts were. Further, they were governmental appliances in virtue of representing the worship of the god, the triumphs of the god-king, the submission of his subjects, and the punishment of the rebellious. And yet again they were governmental, as being the products of an art revered by the people as a sacred mystery. From the habitual use of this pictorial representation there naturally grew up the but slightly-modified practice of picture-writing—a practice which was found still extant among the Mexicans at the time they were discovered. By abbreviations analogous to those still going on in our own written and spoken language, the most familiar of these pictured figures were successively simplified; and ultimately there grew up a system of symbols, most of which had but a distant resemblance to the things for which they stood. The inference that the hieroglyphics of the Egyptians were thus produced, is confirmed by the fact that the picture-writing of the Mexicans was found to have given birth to a like family of ideographic forms; and among them, as among the Egyptians, these had been partially differentiated into the *kuriological* or imitative, and the *tropical* or symbolic: which were, however, used together in the same record. In Egypt, written language underwent a further differentiation; whence resulted the *hieratic* and the *epistolographic* or *enchorial*: both of which are derived from the original hieroglyphic. At the same time we find that for the expression of proper

names which could not be otherwise conveyed, phonetic symbols were employed; and though it is alleged that the Egyptians never actually achieved complete alphabetic writing, yet it can scarcely be doubted that these phonetic symbols occasionally used in aid of their ideographic ones, were the germs out of which alphabetic writing grew. Once having become separate from hieroglyphics, alphabetic writing itself underwent numerous differentiations—multiplied alphabets were produced; between most of which, however, more or less connection can still be traced. And in each civilized nation there has now grown up, for the representation of one set of sounds, several sets of written signs used for distinct purposes. Finally, through a yet more important differentiation came printing; which, uniform in kind as it was at first, has since become multiform.

While written language was passing through its earlier stages of development, the mural decoration which formed its root was being differentiated into Painting and Sculpture. The gods, kings, men, and animals represented, were originally marked by indented outlines and coloured. In most cases these outlines were of such depth, and the object they circumscribed so far rounded and marked out in its leading parts, as to form a species of work intermediate between intaglio and bas-relief. In other cases we see an advance upon this: the raised spaces between the figures being chiselled off, and the figures themselves appropriately tinted, a painted bas-relief was produced. The restored Assyrian architecture at Sydenham exhibits this style of art carried to greater perfection—the persons and things represented, though still barbarously coloured, are carved out with more truth and in greater detail: and in the winged lions and bulls used for the angles of gateways, we may see a considerable advance towards a completely sculptured figure; which, nevertheless, is still coloured, and still forms part of the building. But while in Assyria the production of a statue proper seems to have been little, if at all, attempted, we may trace in Egyptian art the gradual separation of the

sculptured figure from the wall. A walk through the collection in the British Museum will clearly show this; while it will at the same time afford an opportunity of observing the evident traces which the independent statues bear of their derivation from bas-relief: seeing that nearly all of them not only display that union of the limbs with the body which is the characteristic of bas-relief, but have the back of the statue united from head to foot with a block which stands in place of the original wall. Greece repeated the leading stages of this progress. As in Egypt and Assyria, these twin arts were at first united with each other and with their parent, Architecture, and were the aids of Religion and Government. On the friezes of Greek temples, we see coloured bas-reliefs representing sacrifices, battles, processions, games—all in some sort religious. On the pediments we see painted sculptures more or less united with the tympanum, and having for subjects the triumphs of gods or heroes. Even when we come to statues that are definitely separated from the buildings to which they pertain, we still find them coloured; and only in the later periods of Greek civilization does the differentiation of sculpture from painting appear to have become complete. In Christian art we may clearly trace a parallel re-gensis. All early paintings and sculptures throughout Europe were religious in subject—represented Christs, crucifixions, virgins, holy families, apostles, saints. They formed integral parts of church architecture, and were among the means of exciting worship: as in Roman Catholic countries they still are. Moreover, the early sculptures of Christ on the cross, of virgins, of saints, were coloured: and it needs but to call to mind the painted madonnas and crucifixes still abundant in continental churches and highways, to perceive the significant fact that painting and sculpture continue in closest connection with each other where they continue in closest connection with their parent. Even when Christian sculpture was pretty clearly differentiated from painting, it was still religious and governmental in its subjects—was used for tombs in churches and statues of kings: while,

at the same time, painting, where not purely ecclesiastical, was applied to the decoration of palaces, and besides representing royal personages, was almost wholly devoted to sacred legends. Only in quite recent times have painting and sculpture become entirely secular arts. Only within these few centuries has painting been divided into historical, landscape, marine, architectural, genre, animal; still-life, &c., and sculpture grown heterogeneous in respect of the variety of real and ideal subjects with which it occupies itself.

Strange as it seems then, we find it no less true, that all forms of written language, of painting, and of sculpture, have a common root in the politico-religious decorations of ancient temples and palaces. Little resemblance as they now have, the bust that stands on the console, the landscape that hangs against the wall, and the copy of the *Times* lying upon the table, are remotely akin; not only in nature, but by extraction. The brazen face of the knocker which the postman has just lifted, is related not only to the woodcuts of the *Illustrated London News* which he is delivering, but to the characters of the *billet-doux* which accompanies it. Between the painted window, the prayer-book on which its light falls, and the adjacent monument, there is consanguinity. The effigies on our coins, the signs over shops, the figures that fill every ledger, the coat of arms outside the carriage panel, and the placards inside the omnibus, are, in common with dolls, blue-books, paper-hangings, lineally descended from the rude sculpture-paintings in which the Egyptians represented the triumphs and worship of their god-kings. Perhaps no example can be given which more vividly illustrates the multiplicity and heterogeneity of the products that in course of time may arise by successive differentiations from a common stock.

Before passing to other classes of facts, it should be observed that the evolution of the homogeneous into the heterogeneous is displayed not only in the separation of Painting and Sculpture from Architecture and from each other, and in the greater variety of subjects they embody, but it is further shown in the

structure of each work. A modern picture or statue is of far more heterogeneous nature than an ancient one. An Egyptian sculpture-fresco represents all its figures as on one plane—that is, at the same distance from the eye ; and so is less heterogeneous than a painting that represents them as at various distances from the eye. It exhibits all objects as exposed to the same degree of light ; and so is less heterogenous than a painting which exhibits its different objects and different parts of each object as in different degrees of light. It uses scarcely any but the primary colours, and these in their full intensity ; and so is less heterogeneous than a painting which, introducing the primary colours but sparingly, employs an endless variety of intermediate tints, each of heterogeneous composition, and differing from the rest not only in quality but in intensity. Moreover, we see in these earliest works a great uniformity of conception. The same arrangement of figures is perpetually reproduced—the same actions, attitudes, faces, dresses. In Egypt the modes of representation were so fixed that it was sacrilege to introduce a novelty ; and indeed it could have been only in consequence of a fixed mode of representation that a system of hieroglyphics became possible. The Assyrian bas-reliefs display parallel characters. Deities, kings, attendants, winged-figures and animals, are severally depicted in like positions, holding like implements, doing like things, and with like expression or non-expression of face. If a palm-grove is introduced, all the trees are of the same height, have the same number of leaves, and are equidistant. When water is imitated, each wave is a counterpart of the rest ; and the fish, almost always of one kind, are evenly distributed over the surface. The beards of the kings, the gods, and the winged-figures, are everywhere similar ; as are the manes of the lions, and equally so those of the horses. Hair is represented throughout by one form of curl. The king's beard is quite architecturally built up of compound tiers of uniform curls, alternating with twisted tiers placed in a transverse direction, and arranged with perfect regularity ; and the terminal tufts of

the bulls' tails are represented in exactly the same manner. Without tracing out analogous facts in early Christian art, in which, though less striking, they are still visible, the advance in heterogeneity will be sufficiently manifest on remembering that in the pictures of our own day the composition is endlessly varied; the attitudes, faces, expressions, unlike; the subordinate objects different in size, form, position, texture; and more or less of contrast even in the smallest details. Or, if we compare an Egyptian statue, seated bolt upright on a block, with hands on knees, fingers outspread and parallel, eyes looking straight forward, and the two sides perfectly symmetrical in every particular, with a statue of the advanced Greek or the modern school, which is asymmetrical in respect of the position of the head, the body, the limbs, the arrangement of the hair, dress, appendages, and in its relations to neighbouring objects, we shall see the change from the homogeneous to the heterogeneous clearly manifested.

In the co-ordinate origin and gradual differentiation of Poetry, Music, and Dancing, we have another series of illustrations. Rhythm in speech, rhythm in sound, and rhythm in motion, were in the beginning parts of the same thing, and have only in process of time become separate things. Among various existing barbarous tribes we find them still united. The dances of savages are accompanied by some kind of monotonous chant, the clapping of hands, the striking of rude instruments: there are measured movements, measured words, and measured tones; and the whole ceremony, usually having reference to war or sacrifice, is of governmental character. In the early records of the historic races we similarly find these three forms of metrical action united in religious festivals. In the Hebrew writings we read that the triumphal ode composed by Moses on the defeat of the Egyptians, was sung to an accompaniment of dancing and timbrels. The Israelites danced and sung "at the inauguration of the golden calf. And as it is generally agreed that this representation of the Deity was borrowed from the mysteries of Apis, it is probable that the

dancing was copied from that of the Egyptians on those occasions." There was an annual dance in Shiloh on the sacred festival; and David danced before the ark. Again, in Greece the like relation is everywhere seen: the original type being there, as probably in other cases, a simultaneous chanting and mimetic representation of the life and adventures of the god. The Spartan dances were accompanied by hymns and songs; and in general the Greeks had "no festivals or religious assemblies but what were accompanied with songs and dances"—both of them being forms of worship used before altars. Among the Romans, too, there were sacred dances: the Salian and Lupercalian being named as of that kind. And even in Christian countries, as at Limoges, in comparatively recent times, the people have danced in the choir in honour of a saint. The incipient separation of these once united arts from each other and from religion, was early visible in Greece. Probably diverging from dances partly religious, partly warlike, as the Corybantian, came the war-dances proper, of which there were various kinds; and from these resulted secular dances. Meanwhile Music and Poetry, though still united, came to have an existence separate from dancing. The aboriginal Greek poems, religious in subject, were not recited, but chanted; and though at first the chant of the poet was accompanied by the dance of the chorus, it ultimately grew into independence. Later still, when the poem had been differentiated into epic and lyric—when it became the custom to sing the lyric and recite the epic—poetry proper was born. As during the same period musical instruments were being multiplied, we may presume that music came to have an existence apart from words. And both of them were beginning to assume other forms besides the religious. Facts having like implications might be cited from the histories of later times and peoples: as the practices of our own early minstrels, who sang to the harp heroic narratives versified by themselves to music of their own composition: thus uniting the now separate offices of poet, composer, vocalist, and instrumentalist. But, without further illustration, the

common origin and gradual differentiation of Dancing, Poetry, and Music will be sufficiently manifest.

The advance from the homogeneous to the heterogeneous is displayed not only in the separation of these arts from each other and from religion, but also in the multiplied differentiations which each of them afterwards undergoes. Not to dwell upon the numberless kinds of dancing that have, in course of time, come into use; and not to occupy space in detailing the progress of poetry, as seen in the development of the various forms of metre, of rhyme, and of general organization; let us confine our attention to music as a type of the group. As argued by Dr. Burney, and as implied by the customs of still extant barbarous races, the first musical instruments were, without doubt, percussive—sticks, calabashes, tom-toms—and were used simply to mark the time of the dance; and in this constant repetition of the same sound, we see music in its most homogeneous form. The Egyptians had a lyre with three strings. The early lyre of the Greeks had four, constituting their tetrachord. In course of some centuries lyres of seven and eight strings were employed. And, by the expiration of a thousand years, they had advanced to their “great system” of the double octave. Through all which changes there of course arose a greater heterogeneity of melody. Simultaneously there came into use the different modes—Dorian, Ionian, Phrygian, Æolian, and Lydian—answering to our keys: and of these there were ultimately fifteen. As yet, however, there was but little heterogeneity in the time of their music. Instrumental music during this period being merely the accompaniment of vocal music, and vocal music being completely subordinated to words,—the singer being also the poet, chanting his own compositions and making the lengths of his notes agree with the feet of his verses,—there unavoidably arose a tiresome uniformity of measure, which, as Dr. Burney says, “no resources of melody could disguise.” Lacking the compass obtained by our equal bars and unequal notes, the borrowed was that produced by the quantity of the syllables,

and was of necessity comparatively monotonous. And further, it may be observed that the chant thus resulting, being like recitative, was much less clearly differentiated from ordinary speech than is our modern song. Nevertheless, in virtue of the extended range of notes in use, the variety of modes, the occasional variations of time consequent on changes of metre, and the multiplication of instruments, music had, towards the close of Greek civilization, attained to considerable heterogeneity—not indeed as compared with our music, but as compared with that which preceded it. As yet, however, there existed nothing but melody : harmony was unknown. It was not until Christian church-music had reached some development, that music in parts was evolved ; and then it came into existence through a very unobtrusive differentiation. Difficult as it may be to conceive *à priori* how the advance from melody to harmony could take place without a sudden leap, it is none the less true that it did so. The circumstance which prepared the way for it was the employment of two choirs singing alternately the same air. Afterwards it became the practice—very possibly first suggested by a mistake—for the second choir to commence before the first had ceased ; thus producing a fugue. With the simple airs then in use, a partially harmonious fugue might not improbably thus result : and a very partially harmonious fugue satisfied the ears of that age, as we know from still preserved examples. The idea having once been given, the composing of airs productive of fugal harmony would naturally grow up ; as in some way it *did* grow up out of this alternate choir-singing. And from the fugue to concerted music of two, three, four, and more parts, the transition was easy. Without pointing out in detail the increasing complexity that resulted from introducing notes of various lengths, from the multiplication of keys, from the use of accidentals, from varieties of time, and so forth, it needs but to contrast music as it is, with music as it was, to see how immense is the increase of heterogeneity. We see this if, looking at music in its *ensemble*, we enumerate its many different genera and species

—if we consider the divisions into vocal, instrumental, and mixed; and their subdivisions into music for different voices and different instruments—if we observe the many forms of sacred music, from the simple hymn, the chant, the canon, motet, anthem, &c., up to the oratorio; and the still more numerous forms of secular music, from the ballad up to the serenata, from the instrumental solo up to the symphony. Again, the same truth is seen on comparing any one sample of aboriginal music with a sample of modern music—even an ordinary song for the piano; which we find to be relatively highly heterogeneous, not only in respect of the varieties in the pitch and in the length of the notes, the number of different notes sounding at the same instant in company with the voice, and the variations of strength with which they are sounded and sung, but in respect of the changes of key, the changes of time, the changes of *timbre* of the voice, and the many other modifications of expression. While between the old monotonous dance-chant and a grand opera of our own day, with its endless orchestral complexities and vocal combinations, the contrast in heterogeneity is so extreme that it seems scarcely credible that the one should have been the ancestor of the other.

Were they needed, many further illustrations might be cited. Going back to the early time when the deeds of the god-king, chanted and mimetically represented in dances round his altar, were further narrated in picture-writings on the walls of temples and palaces, and so constituted a rude literature, we might trace the development of Literature through phases in which, as in the Hebrew Scriptures, it presents in one work theology, cosmogony, history, biography, civil law, ethics, poetry; through other phases in which, as in the Iliad, the religious, martial, historical, the epic, dramatic, and lyric elements are similarly commingled; down to its present heterogeneous development, in which its divisions and subdivisions are so numerous and varied as to defy complete classification. Or we might trace out the evolution of Science; beginning with the era in which

it was not yet differentiated from Art, and was, in union with Art, the handmaid of Religion ; passing through the era in which the sciences were so few and rudimentary, as to be simultaneously cultivated by the same philosophers ; and ending with the era in which the genera and species are so numerous that few can enumerate them, and no one can adequately grasp even one genus. Or we might do the like with Architecture, with the Drama, with Dress. But doubtless the reader is already weary of illustrations ; and our promise has been amply fulfilled. We believe we have shown beyond question, that that which the German physiologists have found to be the law of organic development, is the law of all development. The advance from the simple to the complex, through a process of successive differentiations, is seen alike in the earliest changes of the Universe to which we can reason our way back, and in the earliest changes which we can inductively establish ; it is seen in the geologic and climatic evolution of the Earth, and of every single organism on its surface ; it is seen in the evolution of Humanity, whether contemplated in the civilized individual, or in the aggregation of races ; it is seen in the evolution of Society in respect alike of its political, its religious, and its economical organization ; and it is seen in the evolution of all those endless concrete and abstract products of human activity which constitute the environment of our daily life. From the remotest past which Science can fathom, up to the novelties of yesterday, that in which Progress essentially consists, is the transformation of the homogeneous into the heterogeneous.

And now, from this uniformity of procedure, may we not infer some fundamental necessity whence it results ? May we not rationally seek for some all-pervading principle which determines this all-pervading process of things ? Does not the universality of the *law* imply a universal *cause* ?

That we can fathom such cause, noumenally considered, is not to be supposed. To do this would be to solve that ultimate

mystery which must ever transcend human intelligence. But it still may be possible for us to reduce the law of all Progress, above established, from the condition of an empirical generalization, to the condition of a rational generalization. Just as it was possible to interpret Kepler's laws as necessary consequences of the law of gravitation; so it may be possible to interpret this law of Progress, in its multiform manifestations, as the necessary consequence of some similarly universal principle. As gravitation was assignable as the *cause* of each of the groups of phenomena which Kepler formulated; so may some equally simple attribute of things be assignable as the cause of each of the groups of phenomena formulated in the foregoing pages. We may be able to affiliate all these varied and complex evolutions of the homogeneous into the heterogeneous, upon certain simple facts of immediate experience, which, in virtue of endless repetition, we regard as necessary.

The probability of a common cause, and the possibility of formulating it, being granted, it will be well, before going further, to consider what must be the general characteristics of such cause, and in what direction we ought to look for it. We can with certainty predict that it has a high degree of generality; seeing that it is common to such infinitely varied phenomena: just in proportion to the universality of its application must be the abstractness of its character. We need not expect to see in it an obvious solution of this or that form of Progress; because it equally refers to forms of Progress bearing little apparent resemblance to them: its association with multiform orders of facts, involves its dissociation from any particular order of facts. Being that which determines Progress of every kind—astronomic, geologic, organic, ethnologic, social, economic, artistic, &c.—it must be concerned with some fundamental attribute possessed in common by these; and must be expressible in terms of this fundamental attribute. The only obvious respect in which all kinds of Progress are alike, is, that they are modes of *change*; and hence, in some characteristic of changes in general, the desired solution will probably

be found. We may suspect *à priori* that in some law of change lies the explanation of this universal transformation of the homogeneous into the heterogeneous.

Thus much premised, we pass at once to the statement of the law, which is this:—*Every active force produces more than one change—every cause produces more than one effect.*

Before this law can be duly comprehended, a few examples must be looked at. When one body is struck against another, that which we usually regard as the effect, is a change of position or motion in one or both bodies. But a moment's thought shows us that this is a careless and very incomplete view of the matter. Besides the visible mechanical result, sound is produced; or, to speak accurately, a vibration in one or both bodies, and in the surrounding air: and under some circumstances we call this the effect. Moreover, the air has not only been made to vibrate, but has had sundry currents caused in it by the transit of the bodies. Further, there is a disarrangement of the particles of the two bodies in the neighbourhood of their point of collision; amounting in some cases to a visible condensation. Yet more, this condensation is accompanied by the disengagement of heat. In some cases a spark—that is, light—results, from the incandescence of a portion struck off; and sometimes this incandescence is associated with chemical combination. Thus, by the original mechanical force expended in the collision, at least five, and often more, different kinds of changes have been produced. Take, again, the lighting of a candle. Primarily this is a chemical change consequent on a rise of temperature. The process of combination having once been set going by extraneous heat, there is a continued formation of carbonic acid, water, &c.—in itself a result more complex than the extraneous heat that first caused it. But accompanying this process of combination there is a production of heat; there is a production of light; there is an ascending column of hot gases generated; there are currents established in the surrounding air. Moreover, the decomposition of one force into many forces does not end here: each of the several changes produced becomes the

parent of further changes. The carbonic acid given off will by and by combine with some base ; or under the influence of sunshine give up its carbon to the leaf of a plant. The water will modify the hygrometric state of the air around ; or, if the current of hot gases containing it come against a cold body, will be condensed : altering the temperature, and perhaps the chemical state, of the surface it covers. The heat given out melts the subjacent tallow, and expands whatever it warms. The light, falling on various substances, calls forth from them reactions by which it is modified ; and so divers colours are produced. Similarly even with these secondary actions, which may be traced out into ever-multiplying ramifications, until they become too minute to be appreciated. And thus it is with all changes whatever. No case can be named in which an active force does not evolve forces of several kinds, and each of these, other groups of forces. Universally the effect is more complex than the cause.

Doubtless the reader already foresees the course of our argument. This multiplication of results, which is displayed in every event of to-day, has been going on from the beginning ; and is true of the grandest phenomena of the universe as of the most insignificant. From the law that every active force produces more than one change, it is an inevitable corollary that through all time there has been an ever-growing complication of things. Starting with the ultimate fact that every cause produces more than one effect, we may readily see that throughout creation there must have gone on, and must still go on, a never-ceasing transformation of the homogeneous into the heterogeneous. But let us trace out this truth in detail.*

Without committing ourselves to it as more than a speculation, though a highly probable one, let us again commence with the evolution of the solar system out of a nebulous

* A correlative truth which ought also to be taken into account (that the state of homogeneity is one of unstable equilibrium), but which it would greatly encumber the argument to exemplify in connection with the above, will be found developed in the essay on *Transcendental Physiology*.

medium.* From the mutual attraction of the atoms of a diffused mass whose form is unsymmetrical, there results not only condensation but rotation: gravitation simultaneously generates both the centripetal and the centrifugal forces. While the condensation and the rate of rotation are progressively increasing, the approach of the atoms necessarily generates a progressively increasing temperature. As this temperature rises, light begins to be evolved; and ultimately there results a revolving sphere of fluid matter radiating intense heat and light—a sun. There are good reasons for believing that, in consequence of the high tangential velocity, and consequent centrifugal force, acquired by the outer parts of the condensing nebulous mass, there must be a periodical detachment of rotating rings; and that, from the breaking up of these nebulous rings, there must arise masses which in the course of their condensation repeat the actions of the parent mass, and so produce planets and their satellites—an inference strongly supported by the still extant rings of Saturn. Should it hereafter be satisfactorily shown that planets and satellites were thus generated, a striking illustration will be afforded of the highly heterogeneous effects produced by the primary homogeneous cause; but it will serve our present purpose to point to the fact that from the mutual attraction of the particles of an irregular nebulous mass there result condensation, rotation, heat, and light.

It follows as a corollary from the Nebular Hypothesis, that the Earth must at first have been incandescent; and whether the Nebular Hypothesis be true or not, this original incandescence of the Earth is now inductively established—or, if not established, at least rendered so highly probable that it is a generally admitted geological doctrine. Let us look first at the astronomical attri-

* The idea that the Nebular Hypothesis has been disproved because what were thought to be existing nebulae have been resolved into clusters of stars is almost beneath notice. *A priori* it was highly improbable, if not impossible, that nebulous masses should still remain uncondensed, while others have been condensed millions of years ago.

butes of this once molten globe. From its rotation there result the oblateness of its form, the alternations of day and night, and (under the influence of the moon) the tides, aqueous and atmospheric. From the inclination of its axis, there result the precession of the equinoxes and the many differences of the seasons, both simultaneous and successive, that pervade its surface. Thus the multiplication of effects is obvious. Several of the differentiations due to the gradual cooling of the Earth have been already noticed—as the formation of a crust, the solidification of sublimed elements, the precipitation of water, &c.,—and we here again refer to them merely to point out that they are simultaneous effects of the one cause, diminishing heat. Let us now, however, observe the multiplied changes afterwards arising from the continuance of this one cause. The cooling of the Earth involves its contraction. Hence the solid crust first formed is presently too large for the shrinking nucleus; and as it cannot support itself, inevitably follows the nucleus. But a spheroidal envelope cannot sink down into contact with a smaller internal spheroid, without disruption: it must run into wrinkles as the rind of an apple does when the bulk of its interior decreases from evaporation. As the cooling progresses and the envelope thickens, the ridges consequent on these contractions must become greater, rising ultimately into hills and mountains; and the later systems of mountains thus produced must not only be higher, as we find them to be, but they must be longer, as we also find them to be. Thus, leaving out of view other modifying forces, we see what immense heterogeneity of surface has arisen from the one cause, loss of heat—a heterogeneity which the telescope shows us to be paralleled on the face of the moon, where aqueous and atmospheric agencies have been absent. But we have yet to notice another kind of heterogeneity of surface similarly and simultaneously caused. While the Earth's crust was still thin, the ridges produced by its contraction must not only have been small, but the spaces between these ridges must have rested with great evenness upon the subjacent liquid spheroid; and the water in

those arctic and antarctic regions in which it first condensed, must have been evenly distributed. But as fast as the crust grew thicker and gained corresponding strength, the lines of fracture from time to time caused in it, must have occurred at greater distances apart; the intermediate surfaces must have followed the contracting nucleus with less uniformity; and there must have resulted larger areas of land and water. If any one, after wrapping up an orange in wet tissue paper, and observing not only how small are the wrinkles, but how evenly the intervening spaces lie upon the surface of the orange, will then wrap it up in thick cartridge-paper, and note both the greater height of the ridges and the much larger spaces throughout which the paper does not touch the orange, he will realize the fact, that as the Earth's solid envelope grew thicker, the areas of elevation and depression must have become greater. In place of islands more or less homogeneously scattered over an all-embracing sea, there must have gradually arisen heterogeneous arrangements of continent and ocean, such as we now know. Once more, this double change in the extent and in the elevation of the lands, involved yet another species of heterogeneity—that of coast-line. A tolerably even surface raised out of the ocean must have a simple, regular sea-margin; but a surface varied by table-lands and intersected by mountain-chains must, when raised out of the ocean, have an outline extremely irregular both in its leading features and in its details. Thus endless is the accumulation of geological and geographical results slowly brought about by this one cause—the contraction of the Earth.

When we pass from the agency which geologists term igneous, to aqueous and atmospheric agencies, we see the like ever-growing complications of effects. The denuding actions of air and water have, from the beginning, been modifying every exposed surface; everywhere causing many different changes. Oxidation, heat, wind, frost, rain, glaciers, rivers, tides, waves, have been unceasingly producing disintegration; varying in kind and amount according to local circumstances. Acting

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upon a tract of granite, they here work scarcely an appreciable effect ; there cause exfoliations of the surface, and a resulting heap of *débris* and boulders ; and elsewhere, after decomposing the feldspar into a white clay, carry away this and the accompanying quartz and mica, and deposit them in separate beds, fluvial and marine. When the exposed land consists of several unlike formations, sedimentary and igneous, the denudation produces changes proportionably more heterogeneous. The formations being disintegrable in different degrees, there follows an increased irregularity of surface. The areas drained by different rivers being differently constituted, these rivers carry down to the sea different combinations of ingredients ; and so sundry new strata of distinct composition are formed. And here indeed we may see very simply illustrated, the truth, which we shall presently have to trace out in more involved cases, that in proportion to the heterogeneity of the object or objects on which any force expends itself, is the heterogeneity of the results. A continent of complex structure, exposing many strata irregularly distributed, raised to various levels, tilted up at all angles, must, under the same denuding agencies, give origin to immensely multiplied results : each district must be differently modified ; each river must carry down a different kind of detritus ; each deposit must be differently distributed by the entangled currents, tidal and other, which wash the contorted shores ; and this multiplication of results must manifestly be greatest where the complexity of the surface is greatest.

It is out of the question here to trace in detail the genesis of those endless complications described by Geology and Physical Geography : else we might show how the general truth, that every active force produces more than one change, is exemplified in the highly involved flow of the tides, in the ocean currents, in the winds, in the distribution of rain, in the distribution of heat, and so forth. But not to dwell upon these, let us, for the fuller elucidation of this truth in relation to the inorganic world, consider what would be the consequences of some extensive cosmical revolution—say the subsidence of Central America.

The immediate results of the disturbance would themselves be sufficiently complex. Besides the numberless dislocations of strata, the ejections of igneous matter, the propagation of earthquake vibrations thousands of miles around, the loud explosions, and the escape of gases; there would be the rush of the Atlantic and Pacific Oceans to supply the vacant space, the subsequent recoil of enormous waves, which would traverse both these oceans and produce myriads of changes along their shores, the corresponding atmospheric waves complicated by the currents surrounding each volcanic vent, and the electrical discharges with which such disturbances are accompanied. But these temporary effects would be insignificant compared with the permanent ones. The complex currents of the Atlantic and Pacific would be altered in direction and amount. The distribution of heat achieved by these ocean currents would be different from what it is. The arrangement of the isothermal lines, not only on the neighbouring continents, but even throughout Europe, would be changed. The tides would flow differently from what they do now. There would be more or less modification of the winds in their periods, strengths, directions, qualities. Rain would fall scarcely anywhere at the same times and in the same quantities as at present. In short, the meteorological conditions thousand of miles off, on all sides, would be more or less revolutionized. Thus, without taking into account the infinitude of modifications which these changes of climate would produce upon the flora and fauna, both of land and sea, the reader will see the immense heterogeneity of the results wrought out by one force, when that force expends itself upon a previously complicated area; and he will readily draw the corollary that from the beginning the complication has advanced at an increasing rate.

Before going on to show how organic progress also depends upon the universal law that every force produces more than one change, we have to notice the manifestation of this law in yet another species of inorganic progress—namely, chemical. The same general causes that have wrought out the heterogeneity of

the Earth, physically considered, have simultaneously wrought out its chemical heterogeneity. Without dwelling upon the general fact that the forces which have been increasing the variety and complexity of geological formations, have, at the same time, been bringing into contact elements not previously exposed to each other under conditions favourable to union, and so have been adding to the number of chemical compounds, let us pass to the more important complications that have resulted from the cooling of the Earth. There is every reason to believe that at an extreme heat the elements cannot combine. Even under such heat as can be artificially produced, some very strong affinities yield, as for instance, that of oxygen for hydrogen; and the great majority of chemical compounds are decomposed at much lower temperatures. But without insisting upon the highly probable inference, that when the Earth was in its first state of incandescence there were no chemical combinations at all, it will suffice our purpose to point to the unquestionable fact that the compounds that can exist at the highest temperatures, and which must, therefore, have been the first that were formed as the Earth cooled, are those of the simplest constitutions. The protoxides—including under that head the alkalis, earths, &c.—are, as a class, the most stable compounds we know: most of them resisting decomposition by any heat we can generate. These, consisting severally of one atom of each component element, are combinations of the simplest order—are but one degree less homogeneous than the elements themselves. More heterogeneous than these, less stable, and therefore later in the Earth's history, are the deutoxides, tritoxides, peroxides, &c.; in which two, three, four, or more atoms of oxygen are united with one atom of metal or other element. Higher in these in heterogeneity are the hydrates; in which an oxide of hydrogen, united with an oxide of some other element, forms a substance whose atoms severally contain at least four ultimate atoms of three different kinds. Yet more heterogeneous and less stable still are the salts; which present us with compound atoms each made up of

five, six, seven, eight, ten, twelve, or more atoms, of three, if not more, kinds. Then there are the hydrated salts, of a yet greater heterogeneity, which undergo partial decomposition at much lower temperatures. After them come the further-complicated supersalts and double salts, having a stability again decreased; and so throughout. Without entering into qualifications for which we lack space, we believe no chemist will deny it to be a general law of these inorganic combinations that, *other things equal*, the stability decreases as the complexity increases. And then when we pass to the compounds of organic chemistry, we find this general law still further exemplified: we find much greater complexity and much less stability. An atom of albumen, for instance, consists of 482 ultimate atoms of five different kinds. Fibrine, still more intricate in constitution, contains in each atom, 298 atoms of carbon, 49 of nitrogen, 2 of sulphur, 228 of hydrogen, and 92 of oxygen—in all, 660 atoms; or, more strictly speaking—equivalents. And these two substances are so unstable as to decompose at quite ordinary temperatures; as that to which the outside of a joint of roast meat is exposed. Thus it is manifest that the present chemical heterogeneity of the Earth's surface has arisen by degrees, as the decrease of heat has permitted; and that it has shown itself in three forms—first, in the multiplication of chemical compounds; second, in the greater number of different elements contained in the more modern of these compounds; and third, in the higher and more varied multiples in which these more numerous elements combine.

To say that this advance in chemical heterogeneity is due to the one cause, diminution of the Earth's temperature, would be to say too much; for it is clear that aqueous and atmospheric agencies have been concerned; and, further, that the affinities of the elements themselves are implied. The cause has all along been a composite one: the cooling of the Earth having been simply the most general of the concurrent causes, or assemblage of conditions. And here, indeed, it may be remarked that in the several classes of facts already dealt with (excepting, perhaps,

the first), and still more in those with which we shall presently deal, the causes are more or less compound; as indeed are nearly all causes with which we are acquainted. Scarcely any change can with logical accuracy be wholly ascribed to one agency, to the neglect of the permanent or temporary conditions under which only this agency produces the change. But as it does not materially affect our argument, we prefer, for simplicity's sake, to use throughout the popular mode of expression. Perhaps it will be further objected, that to assign loss of heat as the cause of any changes, is to attribute these changes not to a force, but to the absence of a force. And this is true. Strictly speaking, the changes should be attributed to those forces which come into action when the antagonist force is withdrawn. But though there is an inaccuracy in saying that the freezing of water is due to the loss of its heat, no practical error arises from it; nor will a parallel laxity of expression vitiate our statements respecting the multiplication of effects. Indeed, the objection serves but to draw attention to the fact, that not only does the exertion of a force produce more than one change, but the withdrawal of a force produces more than one change. And this suggests that perhaps the most correct statement of our general principle would be its most abstract statement—every change is followed by more than one other change.

Returning to the thread of our exposition, we have next to trace out, in organic progress, this same all-pervading principle. And here, where the evolution of the homogeneous into the heterogeneous was first observed, the production of many changes by one cause is least easy to demonstrate. The development of a seed into a plant, or an ovum into an animal, is so gradual, while the forces which determine it are so involved, and at the same time so unobtrusive, that it is difficult to detect the multiplication of effects which is elsewhere so obvious. Nevertheless, guided by indirect evidence, we may pretty safely reach the conclusion that here too the law holds. Observe, first, how numerous are the effects which any marked change works upon an adult organism—a human being, for instance. An

alarming sound or sight, besides the impressions on the organs of sense and the nerves, may produce a start, a scream, a distortion of the face, a trembling consequent upon a general muscular relaxation, a burst of perspiration, an excited action of the heart, a rush of blood to the brain, followed possibly by arrest of the heart's action and by syncope : and if the system be feeble, an indisposition with its long train of complicated symptoms may set in. Similarly in cases of disease. A minute portion of the small-pox virus introduced into the system, will, in a severe case, cause, during the first stage, rigors, heat of skin, accelerated pulse, furred tongue, loss of appetite, thirst, epigastric uneasiness, vomiting, headache, pains in the back and limbs, muscular weakness, convulsions, delirium, &c. ; in the second stage, cutaneous eruption, itching, tingling, sore throat, swelled fauces, salivation, cough, hoarseness, dyspnœa, &c. ; and in the third stage, œdematous inflammations, pneumonia, pleurisy, diarrhœa, inflammation of the brain, ophthalmia, erysipelas, &c. : each of which enumerated symptoms is itself more or less complex. Medicines, special foods, better air, might in like manner be instanced as producing multiplied results. Now it needs only to consider that the many changes thus wrought by one force upon an adult organism, will be in part paralleled in an embryo organism, to understand how here also, the evolution of the homogeneous into the heterogeneous may be due to the production of many effects by one cause. The external heat and other agencies which determine the first complications of the germ, may, by acting upon these, superinduce further complications ; upon these still higher and more numerous ones ; and so on continually : each organ as it is developed serving, by its actions and reactions upon the rest, to initiate new complexities. The first pulsations of the foetal heart must simultaneously aid the unfolding of every part. The growth of each tissue, by taking from the blood special proportions of elements, must modify the constitution of the blood ; and so must modify the nutrition of all the other tissues. The heart's action, implying as it does a certain waste,

necessitates an addition to the blood of effete matters, which must influence the rest of the system, and perhaps, as some think, cause the formation of excretory organs. The nervous connections established among the viscera must further multiply their mutual influences: and so continually. Still stronger becomes the probability of this view when we call to mind the fact, that the same germ may be evolved into different forms according to circumstances. Thus, during its earlier stages, every embryo is sexless—becomes either male or female as the balance of forces acting upon it determines. Again, it is a well-established fact that the larva of a working-bee will develop into a queen-bee, if, before it is too late, its food be changed to that on which the larvæ of queen-bees are fed. Even more remarkable is the case of certain entozoa. The ovum of a tape-worm, getting into its natural habitat, the intestine, unfolds into the well-known form of its parent; but if carried, as it frequently is, into other parts of the system, it becomes a sac-like creature, called by naturalists the *Echinococcus*—a creature so extremely different from the tape-worm in aspect and structure, that only after careful investigations has it been proved to have the same origin. All which instances imply that each advance in embryonic complication results from the action of incident forces upon the complication previously existing. Indeed, we may find *à priori* reason to think that the evolution proceeds after this manner. For since it is now known that no germ, animal or vegetable, contains the slightest rudiment, trace, or indication of the future organism—now that the microscope has shown us that the first process set up in every fertilized germ, is a process of repeated spontaneous fissions ending in the production of a mass of cells, not one of which exhibits any special character: there seems no alternative but to suppose that the partial organization at any moment subsisting in a growing embryo, is transformed by the agencies acting upon it into the succeeding phase of organization, and this into the next, until, through ever-increasing complexities, the ultimate form is reached. Thus,

though the subtilty of the forces and the slowness of the results, prevent us from *directly* showing that the stages of increasing heterogeneity through which every embryo passes, severally arise from the production of many changes by one force, yet, *indirectly*, we have strong evidence that they do so. We have marked how multitudinous are the effects which one cause may generate in an adult organism; that a like multiplication of effects must happen in the unfolding organism, we have observed in sundry illustrative cases; further, it has been pointed out that the ability which like germs have to originate unlike forms, implies that the successive transformations result from the new changes superinduced on previous changes; and we have seen that structureless as every germ originally is, the development of an organism out of it is otherwise incomprehensible. Not indeed that we can thus really explain the production of any plant or animal. We are still in the dark respecting those mysterious properties in virtue of which the germ, when subject to fit influences, undergoes the special changes that begin the series of transformations. All we aim to show, is, that given a germ possessing these mysterious properties, the evolution of an organism from it, probably depends upon that multiplication of effects which we have seen to be the cause of progress in general, so far as we have yet traced it.

When, leaving the development of single plants and animals, we pass to that of the Earth's flora and fauna, the course of our argument again becomes clear and simple. Though, as was admitted in the first part of this article, the fragmentary facts Palæontology has accumulated, do not clearly warrant us in saying that, in the lapse of geologic time, there have been evolved more heterogeneous organisms, and more heterogeneous assemblages of organisms, yet we shall now see that there *must* ever have been a tendency towards these results. We shall find that the production of many effects by one cause, which, as already shown, has been all along increasing the physical heterogeneity of the Earth, has further involved an increasing

heterogeneity in its flora and fauna, individually and collectively. An illustration will make this clear. Suppose that by a series of upheavals, occurring, as they are now known to do, at long intervals, the East Indian Archipelago were to be, step by step, raised into a continent, and a chain of mountains formed along the axis of elevation. By the first of these upheavals, the plants and animals inhabiting Borneo, Sumatra, New Guinea, and the rest, would be subjected to slightly modified sets of conditions. The climate in general would be altered in temperature, in humidity, and in its periodical variations; while the local differences would be multiplied. These modifications would affect, perhaps inappreciably, the entire flora and fauna of the region. The change of level would produce additional modifications: varying in different species, and also in different members of the same species, according to their distance from the axis of elevation. Plants, growing only on the sea-shore in special localities, might become extinct. Others, living only in swamps of a certain humidity, would, if they survived at all, probably undergo visible changes of appearance. While still greater alterations would occur in the plants gradually spreading over the lands newly raised above the sea. The animals and insects living on these modified plants, would themselves be in some degree modified by change of food, as well as by change of climate; and the modification would be more marked where, from the dwindling or disappearance of one kind of plant, an allied kind was eaten. In the lapse of the many generations arising before the next upheaval, the sensible or insensible alterations thus produced in each species would become organized—there would be a more or less complete adaptation to the new conditions. The next upheaval would superinduce further organic changes, implying wider divergences from the primary forms: and so repeatedly. But now let it be observed that the revolution thus resulting would not be a substitution of a thousand more or less modified species for the thousand original species; but in place of the thousand original species there would arise

several thousand species, or varieties, or changed forms. Each species being distributed over an area of some extent, and tending continually to colonize the new area exposed, its different members would be subject to different sets of changes. Plants and animals spreading towards the equator would not be affected in the same way with others spreading from it. Those spreading towards the new shores would undergo changes unlike the changes undergone by those spreading into the mountains. Thus, each original race of organisms, would become the root from which diverged several races differing more or less from it and from each other; and while some of these might subsequently disappear, probably more than one would survive in the next geologic period: the very dispersion itself increasing the chances of survival. Not only would there be certain modifications thus caused by change of physical conditions and food, but also in some cases other modifications caused by change of habit. The fauna of each island, peopling, step by step, the newly-raised tracts, would eventually come in contact with the faunas of other islands; and some members of these other faunas would be unlike any creatures before seen. Herbivores meeting with new beasts of prey, would, in some cases, be led into modes of defence or escape differing from those previously used; and simultaneously the beasts of prey would modify their modes of pursuit and attack. We know that when circumstances demand it, such changes of habit *do* take place in animals; and we know that if the new habits become the dominant ones, they must eventually in some degree alter the organization. Observe now, however, a further consequence. There must arise not simply a tendency towards the differentiation of each race of organisms into several races; but also a tendency to the occasional production of a somewhat higher organism. Taken in the mass these divergent varieties which have been caused by fresh physical conditions and habits of life, will exhibit changes quite indefinite in kind and degree; and changes that do not necessarily constitute an advance. Probably in most cases the modified type will be neither more

nor less heterogeneous than the original one. In some cases the habits of life adopted being simpler than before, a less heterogeneous structure will result: there will be a retrogradation. But it *must* now and then occur, that some division of a species, falling into circumstances which give it rather more complex experiences, and demand actions somewhat more involved, will have certain of its organs further differentiated in proportionately small degrees,—will become slightly more heterogeneous. Thus, in the natural course of things, there will from time to time arise an increased heterogeneity both of the Earth's flora and fauna, and of individual races included in them. Omitting detailed explanations, and allowing for the qualifications which cannot here be specified, we think it is clear that geological mutations have all along tended to complicate the forms of life, whether regarded separately or collectively. The same causes which have led to the evolution of the Earth's crust from the simple into the complex, have simultaneously led to a parallel evolution of the Life upon its surface. In this case, as in previous ones, we see that the transformation of the homogeneous into the heterogeneous is consequent upon the universal principle, that every active force produces more than one change.

The deduction here drawn from the established truths of geology and the general laws of life, gains immensely in weight on finding it to be in harmony with an induction drawn from direct experience. Just that divergence of many races from one race, which we inferred must have been continually occurring during geologic time, we know to have occurred during the pre-historic and historic periods, in man and domestic animals. And just that multiplication of effects which we concluded must have produced the first, we see has produced the last. Single causes, as famine, pressure of population, war, have periodically led to further dispersions of mankind and of dependent creatures: each such dispersion initiating new modifications, new varieties of type. Whether all the human races be or be not derived from one stock, philology makes it clear that

whole groups of races now easily distinguishable from each other, were originally one race,—that the diffusion of one race into different climates and conditions of existence, has produced many modified forms of it. Similarly with domestic animals. Though in some cases—as that of dogs—community of origin will perhaps be disputed, yet in other cases—as that of the sheep or the cattle of our own country—it will not be questioned that local differences of climate, food, and treatment, have transformed one original breed into numerous breeds now become so far distinct as to produce unstable hybrids. Moreover, through the complication of effects flowing from single causes, we here find, what we before inferred, not only an increase of general heterogeneity, but also of special heterogeneity. While of the divergent divisions and subdivisions of the human race, many have undergone changes not constituting an advance; while in some the type may have degraded; in others it has become decidedly more heterogeneous. The civilized European departs more widely from the vertebrate archetype than does the savage. Thus, both the law and the cause of progress, which, from lack of evidence, can be but hypothetically substantiated in respect of the earlier forms of life on our globe, can be actually substantiated in respect of the latest forms.

If the advance of Man towards greater heterogeneity is traceable to the production of many effects by one cause, still more clearly may the advance of Society towards greater heterogeneity be so explained. Consider the growth of an industrial organization. When, as must occasionally happen, some individual of a tribe displays unusual aptitude for making an article of general use—a weapon, for instance—which was before made by each man for himself, there arises a tendency towards the differentiation of that individual into a maker of such weapon. His companions—warriors and hunters all of them,—severally feel the importance of having the best weapons that can be made; and are therefore certain to offer strong inducements to this skilled individual to make weapons

for them. He, on the other hand, having not only an unusual faculty, but an unusual liking, for making such weapons (the talent and the desire for any occupation being commonly associated), is predisposed to fulfil these commissions on the offer of an adequate reward: especially as his love of distinction is also gratified. This first specialization of function, once commenced, tends ever to become more decided. On the side of the weapon-maker continued practice gives increased skill—increased superiority to his products: on the side of his clients, cessation of practice entails decreased skill. Thus the influences that determine this division of labour grow stronger in both ways; and the incipient heterogeneity is, on the average of cases, likely to become permanent for that generation, if no longer. Observe now, however, that this process not only differentiates the social mass into two parts, the one monopolizing, or almost monopolizing, the performance of a certain function, and the other having lost the habit, and in some measure the power, of performing that function; but it tends to initiate other differentiations. The advance we have described implies the introduction of barter,—the maker of weapons has, on each occasion, to be paid in such other articles as he agrees to take in exchange. But he will not habitually take in exchange one kind of article, but many kinds. He does not want mats only, or skins, or fishing gear, but he wants all these; and on each occasion will bargain for the particular things he most needs. What follows? If among the members of the tribe there exist any slight differences of skill in the manufacture of these various things, as there are almost sure to do, the weapon-maker will take from each one the thing which that one excels in making: he will exchange for mats with him whose mats are superior, and will bargain for the fishing gear of whoever has the best. But he who has bartered away his mats or his fishing gear, must make other mats or fishing gear for himself; and in so doing must, in some degree, further develop his aptitude. Thus it results that the small specialities of faculty possessed by various

members of the tribe, will tend to grow more decided. If such transactions are from time to time repeated, these specializations may become appreciable. And whether or not there ensue distinct differentiations of other individuals into makers of particular articles, it is clear that incipient differentiations take place throughout the tribe : the one original cause produces not only the first dual effect, but a number of secondary dual effects, like in kind, but minor in degree. This process, of which traces may be seen among groups of schoolboys, cannot well produce any lasting effects in an unsettled tribe ; but where there grows up a fixed and multiplying community, these differentiations become permanent, and increase with each generation. A larger population, involving a greater demand for every commodity, intensifies the functional activity of each specialized person or class ; and this renders the specialization more definite where it already exists, and establishes it where it is but nascent. By increasing the pressure on the means of subsistence, a larger population again augments these results ; seeing that each person is forced more and more to confine himself to that which he can do best, and by which he can gain most. This industrial progress, by aiding future production, opens the way for a further growth of population, which reacts as before : in all which the multiplication of effects is manifest. Presently, under these same stimuli, new occupations arise. Competing workers, ever aiming to produce improved articles, occasionally discover better processes or raw materials. In weapons and cutting tools, the substitution of bronze for stone entails upon him who first makes it a great increase of demand—so great an increase that he presently finds all his time occupied in making the bronze for the articles he sells, and is obliged to depute the fashioning of these articles to others : and, eventually, the making of bronze, thus gradually differentiated from a pre-existing occupation, becomes an occupation by itself. But now mark the ramified changes which follow this change. Bronze soon replaces stone, not only in the articles it was first used for, but in many others—

in arms, tools, and utensils of various kinds ; and so affects the manufacture of these things. Further, it affects the processes which these utensils subserve, and the resulting products—modifies buildings, carvings, dress, personal decorations. Yet again, it sets going sundry manufactures which were before impossible, from lack of a material fit for the requisite tools. And all these changes react on the people—increase their manipulative skill, their intelligence, their comfort,—refine their habits and tastes. Thus the evolution of a homogeneous society into a heterogeneous one, is clearly consequent on the general principle, that many effects are produced by one cause.

Our limits will not allow us to follow out this process in its higher complications : else might we show how the localization of special industries in special parts of a kingdom, as well as the minute subdivision of labour in the making of each commodity, are similarly determined. Or, turning to a somewhat different order of illustrations, we might dwell on the multitudinous changes—material, intellectual, moral,—caused by printing ; or the further extensive series of changes wrought by gunpowder. But leaving the intermediate phases of social development, let us take a few illustrations from its most recent and its passing phases. To trace the effects of steam-power, in its manifold applications to mining, navigation, and manufactures of all kinds, would carry us into unmanageable detail. Let us confine ourselves to the latest embodiment of steam-power—the locomotive engine. This, as the proximate cause of our railway system, has changed the face of the country, the course of trade, and the habits of the people. Consider, first, the complicated sets of changes that precede the making of every railway—the provisional arrangements, the meetings, the registration, the trial section, the parliamentary survey, the lithographed plans, the books of reference, the local deposits and notices, the application to Parliament, the passing Standing-Orders Committee, the first, second, and third readings : each of which brief heads indicates a multiplicity of transactions, and

the development of sundry occupations—as those of engineers, surveyors, lithographers, parliamentary agents, share-brokers; and the creation of sundry others—as those of traffic-takers, reference-takers. Consider, next, the yet more marked changes implied in railway construction—the cuttings, embankings, tunnellings, diversions of roads; the building of bridges and stations; the laying down of ballast, sleepers, and rails; the making of engines, tenders, carriages, and waggons: which processes, acting upon numerous trades, increase the importation of timber, the quarrying of stone, the manufacture of iron, the mining of coal, the burning of bricks; institute a variety of special manufactures weekly advertised in the *Railway Times*; and, finally, open the way to sundry new occupations, as those of drivers, stokers, cleaners, plate-layers, &c., &c. And then consider the changes, more numerous and involved still, which railways in action produce on the community at large. The organization of every business is more or less modified: ease of communication makes it better to do directly what was before done by proxy; agencies are established where previously they would not have paid; goods are obtained from remote wholesale houses instead of near retail ones; and commodities are used which distance once rendered inaccessible. Again, the rapidity and small cost of carriage tend to specialize more than ever the industries of different districts—to confine each manufacture to the parts in which, from local advantages, it can be best carried on. Further, the diminished cost of carriage, facilitating distribution, equalizes prices, and also, on the average, lowers prices: thus bringing divers articles within the means of those before unable to buy them, and so increasing their comforts and improving their habits. At the same time the practice of travelling is immensely extended. Classes who never before thought of it, take annual trips to the sea; visit their distant relations; make tours; and so we are benefited in body, feelings, and intellect. Moreover, the more prompt transmission of letters and of news produces further changes—makes the pulse of the nation faster. Yet more, there arises a wide dissemination

of cheap literature though railway book-stalls, and of advertisements in railway carriages : both of them aiding ulterior progress. And all the innumerable changes here briefly indicated are consequent on the invention of the locomotive engine. The social organism has been rendered more heterogeneous in virtue of the many new occupations introduced, and the many old ones further specialized ; prices in every place have been altered ; each trader has, more or less, modified his way of doing business ; and almost every person has been affected in his actions, thoughts, emotions.

Illustrations to the same effect might be indefinitely accumulated. That every influence brought to bear upon society works multiplied effects ; and that increase of heterogeneity is due to this multiplication of effects ; may be seen in the history of every trade, every custom, every belief. But it is needless to give additional evidence of this. The only further fact demanding notice, is, that we here see still more clearly than ever, the truth before pointed out, that in proportion as the area on which any force expends itself becomes heterogeneous, the results are in a yet higher degree multiplied in number and kind. While among the primitive tribes to whom it was first known, caoutchouc caused but few changes, among ourselves the changes have been so many and varied that the history of them occupies a volume.* Upon the small, homogeneous community inhabiting one of the Hebrides, the electric telegraph would produce, were it used, scarcely any results ; but in England the results it produces are multitudinous. The comparatively simple organization under which our ancestors lived five centuries ago, could have undergone but few modifications from an event like the recent one at Canton ; but now, the legislative decision respecting it sets up many hundreds of complex modifications, each of which will be the parent of numerous future ones.

Space permitting, we could willingly have pursued the argu-

* "Personal Narrative of the Origin of the Caoutchouc, or India-Rubber Manufacture in England." By Thomas Hancock.

ment in relation to all the subtler results of civilization. As before, we showed that the law of Progress to which the organic and inorganic worlds conform, is also conformed to by Language, Sculpture, Music, &c. ; so might we here show that the cause which we have hitherto found to determine Progress holds in these cases also. We might demonstrate in detail how, in Science, an advance of one division presently advances other divisions—how Astronomy has been immensely forwarded by discoveries in Optics, while other optical discoveries have initiated Microscopic Anatomy, and greatly aided the growth of Physiology—how Chemistry has indirectly increased our knowledge of Electricity, Magnetism, Biology, Geology—how Electricity has reacted on Chemistry and Magnetism, developed our views of Light and Heat, and disclosed sundry laws of nervous action. In Literature the same truth might be exhibited in the manifold effects of the primitive mystery-play, not only as originating the modern drama, but as affecting through it other kinds of poetry and fiction ; or in the still multiplying forms of periodical literature that have descended from the first newspaper, and which have severally acted and reacted on other forms of literature and on each other. The influence which a new school of Painting—as that of the pre-Raffaelites—exercises upon other schools ; the hints which all kinds of pictorial art are deriving from Photography ; the complex results of new critical doctrines, as those of Mr. Ruskin, might severally be dwelt upon as displaying the like multiplication of effects. But it would needlessly tax the reader's patience to pursue, in their many ramifications, these various changes: here become so involved and subtle as to be followed with some difficulty.

Without further evidence, we venture to think our case is made out. The imperfections of statement which brevity has necessitated, do not, we believe, militate against the propositions laid down. The qualifications here and there demanded would not, if made, affect the inferences. Though in one instance, where sufficient evidence is not attainable, we have been unable to show that the law of Progress applies ; yet there

is high probability that the same generalization holds which holds throughout the rest of creation. Though, in tracing the genesis of Progress, we have frequently spoken of complex causes as if they were simple ones; it still remains true that such causes are far less complex than their results. Detailed criticisms cannot affect our main position. Endless facts go to show that every kind of progress is from the homogeneous to the heterogeneous; and that it is so because each change is followed by many changes. And it is significant that where the facts are most accessible and abundant, there are these truths most manifest.

However, to avoid committing ourselves to more than is yet proved, we must be content with saying that such are the law and the cause of all progress that is known to us. Should the Nebular Hypothesis ever be established, then it will become manifest that the Universe at large, like every organism, was once homogeneous; that as a whole, and in every detail, it has unceasingly advanced towards greater heterogeneity; and that its heterogeneity is still increasing. It will be seen that as in each event of to-day, so from the beginning, the decomposition of every expended force into several forces has been perpetually producing a higher complication; that the increase of heterogeneity so brought about is still going on, and must continue to go on; and that thus Progress is not an accident, not a thing within human control, but a beneficent necessity.

A few words must be added on the ontological bearings of our argument. Probably not a few will conclude that here is an attempted solution of the great questions with which Philosophy in all ages has perplexed itself. Let none thus deceive themselves. Only such as know not the scope and the limits of Science can fall into so grave an error. The foregoing generalizations apply, not to the genesis of things in themselves, but to their genesis as manifested to the human consciousness. After all that has been said, the ultimate mystery remains just as it was. The explanation of that which is explicable, does but bring out

into greater clearness the inexplicableness of that which remains behind. However we may succeed in reducing the equation to its lowest terms, we are not thereby enabled to determine the unknown quantity: on the contrary, it only becomes more manifest that the unknown quantity can never be found. Little as it seems to do so, fearless inquiry tends continually to give a firmer basis to all true Religion. The timid sectarian, alarmed at the progress of knowledge, obliged to abandon one by one the superstitions of his ancestors, and daily finding his cherished beliefs more and more shaken, secretly fears that all things may some day be explained; and has a corresponding dread of Science: thus evincing the profoundest of all infidelity—the fear lest the truth be bad. On the other hand, the sincere man of science, content to follow wherever the evidence leads him, becomes by each new inquiry more profoundly convinced that the Universe is an insoluble problem. Alike in the external and the internal worlds, he sees himself in the midst of perpetual changes, of which he can discover neither the beginning nor the end. If, tracing back the evolution of things, he allows himself to entertain the hypothesis that all matter once existed in a diffused form, he finds it utterly impossible to conceive how this came to be so; and equally, if he speculates on the future, he can assign no limit to the grand succession of phenomena ever unfolding themselves before him. On the other hand, if he looks inward, he perceives that both terminations of the thread of consciousness are beyond his grasp: he cannot remember when or how consciousness commenced, and he cannot examine the consciousness that at any moment exists; for only a state of consciousness that is already past can become the object of thought, and never one which is passing. When, again, he turns from the succession of phenomena, external or internal, to their essential nature, he is equally at fault. Though he may succeed in resolving all properties of objects into manifestations of force, he is not thereby enabled to realize what force is; but finds, on the contrary, that the more he thinks about it, the more he is baffled. Similarly, though

analysis of mental actions may finally bring him down to sensations as the original materials out of which all thought is woven, he is none the forwarder; for he cannot in the least comprehend sensation—cannot even conceive how sensation is possible. Inward and outward things he thus discovers to be alike inscrutable in their ultimate genesis and nature. He sees that the Materialist and Spiritualist controversy is a mere war of words; the disputants being equally absurd—each believing he understands that which it is impossible for any man to understand. In all directions his investigations eventually bring him face to face with the unknowable; and he ever more clearly perceives it to be the unknowable. He learns at once the greatness and the littleness of human intellect—its power in dealing with all that comes within the range of experience; its impotence in dealing with all that transcends experience. He feels, with a vividness which no others can, the utter incomprehensibility of the simplest fact, considered in itself. He alone truly *sees* that absolute knowledge is impossible. He alone *knows* that under all things there lies an impenetrable mystery.

RAILWAY MORALS AND RAILWAY POLICY.

BELIEVERS in the intrinsic virtues of political forms, might draw an instructive lesson from the politics of our railways. If there needs a conclusive proof that the most carefully-framed constitutions are worthless, unless they be embodiments of the popular character—if there needs a conclusive proof, that governmental arrangements in advance of the time will inevitably lapse into congruity with the time; such proof may be found over and over again repeated in the current history of joint-stock enterprises. As devised by Act of Parliament, the administrations of our public companies are almost purely democratic. The representative system is carried out in them with scarcely a check. Shareholders elect their directors, directors their chairman; there is an annual retirement of a certain proportion of the board, giving facilities for superseding them; and, by this means, the whole ruling body may be changed in periods varying from three to five years. Yet, not only are the characteristic vices of our political state reproduced in each of these mercantile corporations—some even in an intenser degree—but the very form of government, while remaining nominally democratic, is substantially so remodelled as to become a miniature of our national constitution. The direction, ceasing to fulfil its theory as a deliberative body whose members possess like powers, falls under the control of some one member of superior cunning, will, or wealth, to whom the majority become so subordinate, that the decision on every question depends on the course he takes. Proprietors, instead of constantly exercising their franchise, allow it to become on all ordinary occasions a dead letter: retiring directors are so habitually re-elected without opposition, and have so great a power of insuring their

own election when opposed, that the board becomes practically a close body; and it is only when the misgovernment grows extreme enough to produce a revolutionary agitation among the shareholders, that any change can be effected. Thus, a mixture of the monarchic, the aristocratic, and the democratic elements, is repeated with such modifications only as the circumstances involve. The modes of action, too, are substantially the same: save in this, that the copy outruns the original. Threats of resignation, which ministries hold out in extreme cases, are commonly made by railway-boards to stave off a disagreeable inquiry. By no means regarding themselves as servants of the shareholders, directors rebel against dictation from them; and frequently construe any amendment to their proposals into a vote of want of confidence. At half-yearly meetings, disagreeable criticisms and objections are met by the chairman with the remark, that if the shareholders cannot trust his colleagues and himself, they had better choose others. With most, this assumption of offended dignity tells; and, under the fear that the company's interests may suffer from any disturbance, measures quite at variance with the wishes of the proprietary are allowed to be carried. The parallel holds yet further. If it be true of national administrations, that those in office count on the support of all public *employés*; it is not less true of incorporated companies, that the directors are greatly aided by their officials in their struggles with shareholders. If, in times past, there have been ministries who spent public money to secure party ends; there are, in times present, railway-boards who use the funds of the shareholders to defeat the shareholders. Nay, even in detail, the similarity is maintained. Like their prototype, joint-stock companies have their expensive election contests, managed by election committees, employing election agents; they have their canvassing with its sundry illegitimate accompaniments; they have their occasional manufacture of fraudulent votes. And, as a general result, that class-legislation, which has been habitually charged against statesmen, is now habitually displayed in the proceedings of

these trading associations: constituted though they are on purely representative principles.

These last assertions will probably surprise not a few. The general public who have little or no direct interest in railway matters—who never see a railway-journal, and who skip the reports of half-yearly meetings that appear in the daily papers—are under the impression that dishonesties akin to those gigantic ones so notorious during the mania, are no longer committed. They do not forget the doings of stags and stock-jobbers and runaway directors. They remember how men-of-straw held shares amounting to £100,000, and even £200,000; how numerous directorates were filled by the same persons—one having a seat at twenty-three boards; how subscription-contracts were made up with signatures bought at 10s. and 4s. each, and porters and errand-boys made themselves liable for £30,000 and £40,000 a-picce. They can narrate how boards kept their books in cipher, made false registries, and refrained from recording their proceedings in minute-books; how in one company, half-a-million of capital was put down to unreal names; how in another, directors bought for account more shares than they issued, and so forced up the price; and how in many others, they repurchased for the company their own shares, paying themselves with the depositors' money. But, though more or less aware of the iniquities that have been practised, the generality think of them solely as the accompaniments of bubble schemes. More recent enterprises they know to have been *bonâ fide* ones, mostly carried out by old-established companies; and knowing this, they do not suspect that in the getting-up of branch-lines and extensions, there are chicaneries near akin to those of Capel Court; and quite as disastrous in their ultimate results. Associating the ideas of wealth and respectability, and habitually using respectability as synonymous with morality, it seems to them incredible that many of the large capitalists and men of station who administer railway affairs, should be guilty of indirectly enriching themselves at the expense of their constituents. True, they occasionally

meet with a law-report disclosing some enormous fraud; or read a *Times* leader, characterising directorial acts in terms that are held libellous. But they regard the cases thus brought to light as entirely exceptional; and, under that feeling of loyalty which ever idealises men in authority, they constantly tend towards the conviction, if not that directors can do no wrong, yet that they are very unlikely to do wrong.

A history of railway management and railway intrigue, however, would quickly deceive them. In such a history, the doings of projectors and the mysteries of the share-market would occupy less space than the analysis of the multiform dishonesties which have been committed since 1845, and the genesis of that elaborate system of tactics by which companies are betrayed into ruinous undertakings that benefit the few at the cost of the many. Such a history would not only have to detail the doings of the personage famed for "making things pleasant;" nor would it have merely to add the misdeeds of his colleagues; but it would have to describe the kindred corruptness of other railway administrations. From the published report of an investigation-committee, it would be shown how, not many years since, the directors of one of our lines allotted among themselves 15,000 new shares then at a premium in the market; how to pay the deposits on these shares they used the company's funds; and how one of their number thus accommodated himself in meeting both deposits and calls to the extent of more than £80,000. We should read in it of one railway chairman who, with the secretary's connivance, retained shares exceeding a quarter of a million in amount, intending to claim them as his allotment if they rose to a premium; and who, as they did not do so, left them as unissued shares on the hands of the proprietors, to their vast loss. We should also read in it of directors who made loans to themselves out of the company's floating balances at a low rate of interest, when the market rate was high; and who paid themselves larger salaries than those assigned: entering the difference in an obscure corner of the ledger under the head of

“petty disbursements.” There would be a description of the manoeuvres by which a delinquent board, under impending investigation, gets a favourable committee nominated—“a whitewashing committee.” There would be documents showing that the proxies enabling boards to carry contested measures, have in some cases been obtained by garbled statements; and, again, that proxies given for a specific purpose have been used for other purposes. One of our companies would be proved to have projected a line, serving as a feeder, for which it obtained shareholders by offering a guaranteed dividend, which, though understood by the public to be unconditional, was really contingent upon a condition not likely to be fulfilled. The managers of another company would be convicted of having carried party measures by the aid of preference-shares standing in the names of station-masters; and of being aided by the proxies of the secretary’s children too young to write.

That the corruptions here glanced at are not merely exceptional evils, but result from some deep-seated vice ramifying throughout our system of railway-government, is sufficiently proved by the simple fact, that notwithstanding the depreciation of railway-dividends produced by the extension policy, that policy has been year after year continued. Does any tradesman, who, having enlarged his shop, finds a proportionate diminution in his rate of profits, go on, even under the stimulus of competition, making further enlargements at the risk of further diminutions? Does any merchant, however strong his desire to take away an opponent’s markets, make successive mortgages on his capital, and pay for each sum thus raised a higher interest than he gains by trading with it? Yet this course, so absurd that no one would insult a private individual by asking him to follow it, is the course which railway-boards, at meeting after meeting, persuade their clients to pursue. Since 1845, when the dividends of our leading lines ranged from 8 to 10 per cent., they have, notwithstanding an ever-growing traffic, fallen from 10 per cent. to 5, from 8 to 4,

from 9 to $3\frac{1}{4}$; and yet the system of extensions, leases, and guarantees, notoriously the cause of this, has been year by year persevered in. Is there not something needing explanation here—something more than the world is allowed to see? If there be any one to whom the broad fact of obstinate persistence in unprofitable expenditure does not alone carry the conviction that sinister influences are at work, let him read the seductive statements by which shareholders are led, to authorize new projects, and then compare these with the proved results. Let him look at the estimated cost, anticipated traffic, and calculated dividend on some proposed branch line; let him observe how the proprietary before whom the scheme is laid, are induced to approve it as promising a fair return; and then let him contemplate, in the resulting depreciation of stock, the extent of their loss. Is there any avoiding the inference? Clearly, railway-shareholders can never have habitually voted for new undertakings which they knew would be injurious to them. Every one knows, however, that these new undertakings have almost uniformly proved injurious to them. Obviously, therefore, railway-shareholders have been continually deluded by false representations. The only possible escape from this conclusion is in the belief that boards and their officers have been themselves deceived; and were the discrepancies between promises and results occasional only, there would be grounds for this lenient interpretation. But to suppose that a railway-government should repeatedly make such mistakes, and yet gain no wisdom from disastrous experiences—should after a dozen disappointments again mislead half-yearly meetings by bright anticipations into dark realities, and all in good faith—taxes credulity somewhat too far. Even, then, were there no demonstrated iniquities to rouse suspicion, we think that the continuous depreciation in the value of railway-stock, the determined perseverance of boards in the policy that has produced this depreciation, and the proved untruth of the statements by which they have induced shareholders to sanction this policy, would of themselves

suffice to show the essential viciousness of railway-administration.

That the existing evils, and the causes conspiring to produce them, may be better understood, it will be needful briefly to glance at the mode in which the system of extensions grew up. Earliest among the incentives to it was a feeling of rivalry. Even while yet their main lines were unmade, a contest for supremacy arose between our two greatest companies. This presently generated a confirmed antagonism; and the same impulse which in election contests and the like, has frequently led to the squandering of a fortune to gain a victory, has largely aided to make each of these great rivals submit to repeated sacrifices rather than be beaten. Feuds of like nature are in other cases perpetually prompting boards to make aggressions on each other's territories—every attack on the one side leading to a reprisal on the other: and so violent is the hostility occasionally produced, that directors might be pointed out whose votes are wholly determined by the desire to be revenged on their opponents. Among the first methods by which leading companies sought to strengthen themselves and weaken their competitors, was the leasing or purchase of subordinate neighbouring lines. Of course those to whom overtures were made, obtained bids from both sides; and it naturally resulted that the first sales thus effected, being at prices far above the real values, brought great profits to the sellers. What resulted? A few recurrences of this proceeding, made it clear to quick-witted speculators, that constructing lines so circumstanced as to be bid for by competing companies, would be a lucrative policy. Shareholders who had once pocketed these large and easily-made gains, were eager to repeat the process; and cast about for districts in which it might be done. Even the directors of the companies by whom these high prices were given, were under the temptation to aid in this; for it was manifest to them that by obtaining a larger interest in any such new undertaking than they possessed in the purchasing company, and by using their influence in the purchasing company

to obtain a good price or guarantee for the new undertaking, a great advantage would be gained: and that this motive has been largely operative, railway history abundantly proves. Once commenced, sundry other influences conspired to stimulate this making of feeders and extensions. The non-closure of capital-accounts rendered possible the "cooking" of dividends, which was at one period carried to a great extent. Under various incentives, speculative and other, expenditure that should have been charged against revenue was charged against capital: works and rolling stock were allowed to go unrepaired, or insufficient additions made to them, by which means the current expenses were rendered delusively small; long-credit agreements with contractors permitted sundry disbursements that had been virtually made, to be kept out of the accounts; and thus the net returns were made to appear much greater than they really were. Naturally the new undertakings put before the moneyed world by companies whose stock and dividends had been thus artificially raised, were received with proportionate favour. Under the prestige of their parentage their shares came out at high premiums, bringing large profits to the projectors. The hint was soon taken; and it presently became an established policy, under the auspices of a prosperity either real or mock, to get up these subsidiary lines—"calves," as they were called in the slang of the initiated—and to traffic in the premiums their shares commanded. Meanwhile had been developing, a secondary set of influences which also contributed to foster unwise enterprises; namely, the business interests of the lawyers, engineers, contractors, and others directly or indirectly employed in railway construction. The methods of projecting and carrying new schemes, could not fail, in the course of years, to become familiar to all persons concerned; and there could not fail to grow up among them a concerted system of tactics calculated to achieve their common end. Thus, partly from the jealousy of rival boards, partly from the avarice of shareholders in purchased lines, partly from the dishonest schemings of directors, partly from the manœuvres of those whose business it

is to carry out the projects legally authorized, partly, and perhaps mainly, from the delusive appearance of prosperity maintained by many established companies, there came the wild speculations of 1844 and 1845. The consequent disasters, while they pretty well destroyed the last of these incentives, left the rest much as they were. Though the painfully-undecided public have ceased to aid as they once did, the various private interests that had grown up have since been working together as before—have developed their systems of co-operation into still more complex and subtle forms; and are even now daily thrusting unfortunate shareholders into losing undertakings.

Before proceeding to analyze the existing state of things, however, we would have it clearly understood that we do not suppose those implicated to be *on the average* morally lower than the community at large. Men taken at random from any class, would, in all probability, behave much in the same way when placed in like positions. There are unquestionably directors grossly dishonest. Unquestionably also there are others whose standard of honour is far higher than that of most persons. And for the remainder, they are, we doubt not, as good as the mass. Of the engineers, parliamentary agents, lawyers, contractors, and various others concerned, it may be admitted that though daily custom has induced laxity of principle, yet they would be harshly judged were the transactions that may be recorded against them, used as tests. Those who do not see how in these involved affairs, the most inequitable results may be wrought out by men not correspondingly flagitious, will readily do so on considering all the conditions. In the first place, there is the familiar fact that the corporate conscience is ever inferior to the individual conscience—that a body of men will commit as a joint act, that which every individual of them would shrink from, did he feel personally responsible. And it may be remarked that not only is the conduct of a corporate body thus comparatively lax, but also the conduct towards one. There is ever a more or less distinct perception, that a broad-backed company scarcely feels what would be

ruinous to a private person ; and this perception is in constant operation on all railway-boards and their *employés*, as well as on all contractors, landowners, and others concerned ; leading them to show a graspingness and want of principle foreign to their general behaviour. Again, the indirectness and remoteness of the evils produced, greatly weaken the restraints on wrong-doing. Men's actions are proximately produced by mental representations of the results to be anticipated ; and the decisions come to, largely depend on the vividness with which these results can be imagined. A consequence, good or bad, that is immediate and clearly apprehended, influences conduct far more potently than a consequence that has to be traced through a long chain of causation, and, as eventually reached, is not a particular and readily conceivable one, but a general and vaguely conceivable one. Hence, in railway affairs, a questionable share-transaction, an exorbitant charge, a proceeding which brings great individual advantage without apparently injuring any one, but which, even if analyzed in its ultimate results, can but very circuitously affect unknown persons living no one knows where, may be brought home to men who, could the results be embodied before them, would be shocked at the cruel injustices they had committed—men who in their private business, where the results *can* be thus embodied, are sufficiently equitable. Further, it requires to be noted that most of these great delinquencies are wrought out, not by the extreme dishonesty of any one man or group of men, but by the combined self-interest of many men and groups of men, whose minor delinquencies are cumulative. Much as a story which, passing from mouth to mouth, and receiving a slight exaggeration at each repetition, comes round to the original narrator in a form scarcely to be recognised ; so, by a little improper influence on the part of landowners, a little favouritism on the part of members of Parliament, a little intriguing of lawyers, a little manœuvring by contractors and engineers, a little self-seeking on the part of directors, a little under-statement of estimates and over-statement of traffic, a little magnifying of the evils to be avoided and the benefits to be gained—it hap-

pens that shareholders are betrayed into ruinous undertakings by grossly untrue representations, without any one being guilty of more than a small portion of the fraud. Bearing in mind then, the comparative laxity of the corporate conscience; the diffusion and remoteness of the evils which malpractices produce; and the composite origin of these malpractices; it becomes possible to understand how, in railway affairs, gigantic dishonesties can be perpetrated by men, who, on the average, are little if at all below the generality in moral character.

With this preliminary mitigation we proceed to detail the various illegitimate agencies by which these seemingly insane extensions and this continual squandering of shareholders' property are brought about.

Conspicuous among these is the self-interest of landowners. Once the greatest obstacles to railway enterprise, owners of estates have of late years been among its chief promoters. Since the Liverpool and Manchester line was first defeated by landed opposition, and succeeded with its second bill only by keeping out of sight of all mansions, and avoiding the game preserves—since the time when the London and Birmingham Company, after seeing their project thrown out by a committee of peers who ignored the evidence, had to “conciliate” their antagonists by raising the estimate for land from £250,000 to £750,000—since the time when Parliamentary counsel bolstered up a groundless resistance by the flimsiest and absurdest excuses, even to reproaching engineers with having “trodden down the corn of widows” and “destroyed the strawberry-beds of gardeners”—since then, a marked change of policy has taken place. Nor was it in human nature that it should be otherwise. When it became known that railway companies commonly paid for “land and compensation,” sums varying from £4000 to £8000 per mile; that men were indemnified for supposed injury to their property, by sums so inordinate that the greater part has been known to be returned by the heir as conscience-money; that in one case £120,000 was given for land

said to be worth but £5000—when it was bruited abroad that large bonuses in the shape of preference shares and the like, were granted to buy off opposition—when it came to be an established fact that estates are greatly enhanced in value by the proximity of railways ; it is not surprising that country gentlemen should have become active supporters of schemes to which they were once the bitterest enemies. On considering the many temptations, we shall see nothing wonderful in the fact that in 1845 they were zealous provisional committee-men ; nor in the fact that their influence as promoters enabled them to get large sums for their own acres ; nor in the fact that they committed various acts sufficiently reprehensible from any but their own point of view. If we are told of squires soliciting interviews with the engineer of a projected railway ; prompting him to take their side of the country ; promising support if he did, and threatening opposition if he did not ; dictating the course to be followed through their domains ; and hinting that a good price would be expected ; we are simply told of the special modes in which certain private interests show themselves. If we hear of an extensive landowner using his influence as chairman of a board of directors, to project a branch running for many miles through his own estate, and putting his company to the cost of a parliamentary contest to carry this line ; we hear only of that which was likely to occur under such circumstances. If we find now before the public, a line proposed by a large capitalist, serving among other ends to effect desirable communications with his property, and the estimates for which line, though considered by the engineering world insufficient, are alleged by him to be ample ; we have but a marked case of the distorted representations which under such conditions self-interest is sure to engender. If we discover of this or that scheme, that it was got up by the local nobility and gentry—that they employed to make the survey a third-rate engineer, who was ready in anticipation of future benefit to do this for his bare expenses—that principals and agent wearied the directors of an adjacent trunk-line to take up their project ; threat-

ened that if they did not their great rival would ; alarmed them into concession ; asked for a contribution to their expenses ; and would have gained all these points but for shareholders' resistance—we do but discover the organized tactics which in process of time naturally grow up, under such stimuli. It is not that these facts are particularly remarkable. From the gross instance of the landowner who asked £8000 for that which he eventually accepted £80 for, down to the every-day instances of influence used to get railway accommodation for the neighbourhood, the acts of the landed class are simply manifestations of the average character acting under special conditions. All that it now behoves us to notice, is, that we have here a large and powerful body whose interests are ever pressing on railway extension, irrespective of its intrinsic propriety.

The great change in the attitude of the Legislature towards railways, from "the extreme of determined rejection or dilatory acquiescence, to the opposite extreme of unlimited concession," was simultaneous with the change above described. It could not well fail to be so. Supplying, as the landowning community does, so large a portion of both Houses of Parliament, it necessarily follows that the play of private interests seen in the first, repeats itself in the last under modified forms, and complicated by other influences. Remembering the extent to which legislators were themselves involved in the speculations of the mania, it is scarcely probable that they should since have been free from personal bias. A return proved, that in 1845 there were 157 members of Parliament whose names were on the registers of new companies for sums varying from £291,000 downwards. The supporters of new projects boasted of the number of votes they could command in the House. Members were personally canvassed, and peers were solicited. It was publicly complained in the upper chamber, that "it was nearly impossible to bring together a jury, some members of which were not interested in the railway they were about to assess." Doubtless this state of things was in a great degree exceptional ;

and there has since been not only a diminution of the temptations, but a marked increase of equitable feeling. Still, it is not to be expected that private interests should cease to act. It is not to be expected that a landowner who, out of Parliament, exerts himself to get a railway for his district, should, when in Parliament, not employ the power his new position gives him to the same end. It is not to be expected that the accumulation of such individual actions should leave the legislative policy unchanged. Hence the fact, that the influence once used to throw out railway bills is now used to carry them. Hence the fact, that railway committees no longer require a good traffic case to be made out in justification of the powers asked. Hence the fact, that the directors and chairmen of boards having seats in the House of Commons, are induced to pledge their companies to carry out extensions. We could name a member of Parliament, who, having bought an estate fitly situated, offered to an engineer, also in Parliament, the making of a railway running through it; and having obtained the Act (in doing which the influence of himself and his friend were of course useful), pitted three railway companies against each other for the purchase of it. We could name another member of Parliament, who, having projected, and obtained powers for, an extension through his property, induced the directors of the main line, with whom he had great influence, to subscribe half the capital for his extension, to work it for fifty per cent. of the gross receipts, and to give up all traffic brought by it on to the main line until he received four per cent. on his capital; which was tantamount to a four per cent. guarantee. But it is not only, nor indeed mainly, from directly personal motives that legislators have of late years unduly fostered railway enterprises. Indirect motives of various kinds have been largely operative. The wish to satisfy constituents has been one. Inhabitants of unaccommodated districts, are naturally urgent with their representatives to help them to a line. Such representatives are not unfrequently conscious that their next elections may possibly turn upon their successful response to this

appeal. Even when there is no popular pressure there is the pressure of their leading political supporters—of large landholders whom it will not do to neglect; of the magistracy, with whom it is needful to be on good terms; of local lawyers, important as electioneering friends, to whom a railway always brings business. Thus, without having any immediately private ends, members of Parliament are often almost coerced into pressing forward schemes which, from a national or from a shareholder's point of view, are very unwise ones. Then there come the still less direct stimuli. Where neither personal nor political ends are to be gained, there are still the interests of a relative to be subserved; or, if not those of a relative, still those of a friend. And where there is no decided impulse to the contrary, these motives, of course, have their weight. Moreover, it requires in fairness to be said, that possessed as most members of Parliament are, with the belief that all railway-making is nationally beneficial, there exist in their minds few or no reasons for resisting the influences brought to bear on them. True, shareholders may be injured; but that is their own affair:—the public will be better served; constituents will be satisfied; friends will be pleased; perhaps personal ends gained: and under some or all of these incentives affirmative votes are readily given. Thus, from the Legislature also, there has of late years proceeded a factitious stimulus to railway extensions.

From Parliament to Parliamentary agents, and the general body of lawyers concerned in railway enterprise, is a ready transition. With these, the getting up and carrying of new lines and branches is a matter of business. Whoever studies the process of obtaining a railway Act, or considers the number of legal transactions involved in the execution of railway works, or notes the large sums that figure in half-yearly reports under the head of "law charges;" will at once see how strong are the temptations which a new project holds out to solicitors, conveyancers, and counsel. It has been shown that in past years, parliamentary expenses have varied from £650 to £3000

per mile ; of which a large proportion has gone into the pockets of the profession. In one contest, £57,000 was spent among six counsel and twenty solicitors. At a late meeting of one of our companies it was pointed out, that the sum expended in legal and parliamentary expenses during nine years, had reached £480,000 ; or had averaged £53,500 a-year. With these and scores of like facts before them, it would indeed be strange did not so acute a body of men as lawyers use vigorous efforts and sagacious devices to promote fresh enterprises. Indeed, if we look back at the proceedings of 1845, we shall suspect, not only that lawyers are still the active promoters of fresh enterprises, but often the originators of them. Most people have heard how in those excited times the projects daily announced were frequently set afloat by local solicitors—how these looked over maps to see where plausible lines could be sketched out—how they canvassed the local gentry to obtain provisional committeemen—how they agreed with engineers to make trial surveys—how, under the wild hopes of the day, they found little difficulty in forming companies—and how most of them managed to get as far as the Committee on Standing Orders, if no farther. Remembering all this, and remembering that those who were successful are not likely to have forgotten their cunning, but rather to have yearly exercised and increased it, we may naturally expect to find railway lawyers among the most influential of the many parties conspiring to urge railway proprietaries into disastrous undertakings : and we shall not be deceived. To a great extent they are in league with engineers. From the proposal to the completion of a new line, the lawyer and the engineer work together ; and their interests are throughout identical. While the one makes the survey, the other prepares the book of reference. The parish plans which the one gets ready, the other deposits. The notices to owners and occupiers which the one fills in, the other serves upon those concerned. Throughout, there is continual consultation between them as to the dealing with local opposition and the obtainment of local support. In the getting up of their case for Parlia-

ment, they necessarily act in concert. While, before committee, the one gets his ten guineas per day for attending to give evidence; the other makes profits on all the complicated transactions which carrying a bill involves. During the execution of the works they are in frequent correspondence; and alike profit by any expansion of the undertaking. Thus there naturally arises in each, the perception that in aiding the other he is aiding himself: and gradually, as, in course of years, the proceedings come to be often repeated, and a perfect familiarity with railway politics gained, there grows up a well-organized system of co-operation between them—a system rendered the more efficient by the wealth and influence which each has year by year accumulated.

Among the manœuvres employed by railway solicitors thus established and thus helped, not the least remarkable is that of getting their own nominees elected as directors. Startling though it may seem, it is yet a fact, which we state on good authority, that there are puppet-directors who vote for this or that at the instigation of the company's lawyer, whose creatures they are. The obtainment of such tools is by no means difficult. Vacancies are about to occur in the directorate. Almost always there are sundry men over whom a solicitor, conducting the extensive law-business of a railway, has considerable power: not only connections and friends, but clients and persons to whom in his legal capacity he can do great benefit or great injury. He selects the most suitable of these; giving the preference, if other things are equal, to one living in the country near the line. On opening the matter to him, he points out the sundry advantages attendant on a director's position—the free pass and the many facilities it gives; the annual £100 or so which the office brings; the honour and influence accruing; the opportunities for profitable investment that are likely to occur; and so forth. Should ignorance of railway affairs be raised as an objection, the tempter, in whose eyes this ignorance is a chief recommendation, replies that he shall always be at hand to guide his votes. Should non-possession of a

due amount of the company's stock be pleaded, the tempter readily meets the difficulty by offering himself to furnish the needful qualification. Thus incited and flattered, and perhaps conscious that it would be dangerous to refuse, the intended puppet allows himself to be put in nomination; and as it is the general habit of half-yearly meetings, unless under great indignation, to elect any one proposed to them by those in authority, the nomination is successful. On subsequent occasions this proceeding can, of course, be repeated; and thus the company's legal agent and those leagued with him, may command sufficient votes to turn the scale in their own favour.

Then, to the personal interest and power of the head solicitor, have to be added those of the local ones, with whom he is in constant business intercourse. They, too, profit by new undertakings; they, therefore, are commonly urgent in pressing them forwards. Acting in co-operation with their chief, they form a local staff of great influence. They are active canvassers; they stimulate and concentrate the feeling of their districts; they encourage rivalry with other lines; they alarm local shareholders with rumours of threatened competition. When the question of extension or non-extension comes to a division, they collect proxies for the extension party. They bring pressure to bear on their shareholding clients and relatives. Nay, so deep an interest do they feel in the decision, as occasionally to manufacture votes with the view of influencing it. We have before us the case of a local solicitor, who, before the special meeting called to adopt or reject a contemplated branch, transferred portions of his own shares into the names of sundry members of his family, and so multiplied his seventeen votes into forty-one; all of which he recorded for the adoption of the new scheme.

The morality of railway engineers is not greatly above that of railway lawyers. The gossip of Great George Street is fertile in discreditable revelations. It tells how So-and-so, like others before him, testified to estimates which he well knew were insufficient. It makes jocose allusion to this man as

being employed to do his senior's "dirty work"—his hard-swearing; and narrates of the other, that when giving evidence before committee, he was told by counsel that he was not to be believed even on his knees. It explains how cheaply the projector of a certain line executed the parliamentary survey, by employing on it part of the staff in the pay of another company to which he was engineer. Now it alludes to the suspicion attaching to a certain member of the fraternity from his having let a permanent-way contract, for a term of years, at an extravagant sum per mile. Again it rumours the great profits which some of the leaders of the profession made in 1845, by charging for the use of their names at so much the prospectus; even up to a thousand guineas. And then, it enlarges upon the important advantages possessed by engineers who have seats in the House of Commons.

Thus lax as is the ethical code of engineers, and greatly as they are interested in railway enterprise, it is to be expected that they should be active and not very scrupulous promoters of it. To illustrate the vigour and skill with which they further new undertakings, a few facts may be cited. Not far from London, and lying between two lines of railway, is an estate that has been purchased by one of our engineers. He has since obtained Acts for branches to both of the adjacent lines. One of these branches he has leased to the company whose line it joins; and he has tried to do the like with the other, but as yet without success. Even as it is, however, he is considered to have doubled the value of his property. Again, an engineer of celebrity once very nearly succeeded in smuggling through Parliament, in the bill for a proposed railway, a clause extending the limits of deviation, through a certain district, to several miles on each side of the line—the usual limits being but five chains on each side; and the attempt is accounted for by the fact, that this engineer possessed mines in this district. To press forward extensions by the companies with which they are connected, they occasionally go to great lengths. Not long since, at a half-yearly meeting, certain

projects which the proprietary had already once rejected, were again brought forward by two engineers who attended in their capacity of shareholders. Though known to be personally interested, one of them moved and the other seconded, that some new proposals from the promoters of these schemes be considered without delay by the directors. The motion was carried; the directors approved the proposals; and again, the proprietors negatived them. A third time a like effort was made; a third time a conflict arose; and within a few days of the special meeting at which the division was to take place, one of these engineers circulated among the shareholders a pamphlet denying the allegations of the dissentient party and making counter-statements which it was then too late to meet—nay, he did more; he employed agents to canvass the shareholders for proxies in support of the new undertaking; and was obliged to confess as much when charged with it at the meeting.

Turn we now to contractors. Railway enterprise has given to this class of men a gigantic development, not only in respect of numbers, but in respect of the vast wealth to which some of them have attained. Originally, half a dozen miles of earth-work, fencing, and bridges, was as much as any single contractor undertook. Of late years, however, it has become common for one man to engage to construct an entire railway; and deliver it over to the company in a fit condition for opening. Great capital is necessarily required for this. Great profits are made by it. And the fortunes accumulated in course of time have been such, that sundry contractors are named as being each able to make a railway at his own cost. But they are as insatiate as millionnaires in general; and so long as they continue in business at all, are, in some sort, forced to provide new undertakings to keep their plant employed. As may be imagined, enormous stocks of working materials are needed: many hundreds of earth-waggons and of horses; many miles of temporary rails and sleepers; some half-dozen locomotive engines, and several fixed ones; innumerable tools; besides

vast stores of timber, bricks, stone, rails, and other constituents of permanent works, that have been bought on speculation. To keep the capital thus invested, and also a large staff of *employés*, standing idle, entails loss, partly negative, partly positive. The great contractor, therefore, is alike under a pressing stimulus to get fresh work, and enabled by his wealth to do this. Hence the not unfrequent inversion of the old arrangement under which companies and engineers employed contractors, into an arrangement under which contractors employ engineers and form companies. Many recent undertakings have been thus set on foot. The most gigantic project which private enterprise has yet dared—a project of which, unfortunately, there is now no hope—originated with a distinguished contracting firm. In some cases, as in this chief one, this mode of procedure may, perhaps, be advantageous; but in a far greater proportion of cases its results are disastrous. Interested in promoting railway extensions, even in a greater degree than engineers and lawyers, contractors frequently cooperate with these, either as agents or as coadjutors. Lines are fostered into being, which it is known from the beginning, will not pay. Of late, it has become common for landowners, merchants, and others personally interested, who, under the belief that their indirect gains will compensate for their meagre dividends, have themselves raised part of the capital for a local railway, but cannot raise the rest—it has become common for such to make an agreement with a wealthy contractor to construct the line, taking in part payment a portion of the shares, amounting to perhaps a third of the whole, and to charge for his work according to a schedule of prices to be thereafter settled between himself and the engineer. By this last clause the contractor renders himself secure. It would never answer his purpose to take part payment in shares likely to return some £2 per cent., unless he compensated himself by unusually high profits; and this subsequent settlement of prices with one whose interests, like his own, are wrapped up in the prosecution of the undertaking, ensures him high profits. Meanwhile, the facts that all the capital has been subscribed and

the line contracted for, unduly raise the public estimate of the scheme; the shares are quoted at much above their true worth; unwary persons buy; the contractor from time to time parts with his moiety at fair prices; and the new shareholders ultimately find themselves part owners of a railway which, unprofitable as it originally promised to be, had been made yet more unprofitable by expensiveness of construction. Nor are these the only cases in which contractors gain after this fashion. They do the like with undertakings of their own projection. To obtain Acts for these, they sign the subscription-contracts for large amounts; knowing that in the way above described, they can always make it answer to do this. So general had the practice latterly become, as to attract the attention of committees. As was remarked by a personage noted for his complicity in these transactions—"Committees are getting too knowing; they won't stand that dodge now." Nevertheless, the thing is still done under a disguised form. Though contractors no longer enter their own names on subscription lists for thousands of shares; yet they effect the same end by making nominal holders of their foremen and others: themselves being the real ones.

Of directorial misdoings some samples have already been referred to; and more might be added. Besides those arising from directly personal aims, there are sundry others. One of these is the still-increasing community between railway boards and the House of Commons. There are eighty-one directors sitting in Parliament; and though many of these take little or no part in the affairs of their respective railways, many of them are the most active members of the boards to which they belong. We have but to look back a few years, and mark the unanimity with which companies adopted the policy of getting themselves represented in the Legislature, to see that the furtherance of their respective interests—especially in cases of competition—was the incentive. How well this policy is understood among the initiated, may be judged from the fact, that gentlemen are now in some cases elected on boards, simply because they are members of Parliament. Of course this im-

plies that railway legislation is affected by a complicated play of private influences; and that these influences generally work towards the facilitation of new enterprises, is tolerably obvious. It naturally happens that directors whose companies are not opposed, exchange good offices. It naturally happens that they can more or less smooth the way of their annual batch of new bills through committees. Moreover, directors sitting in the House of Commons not only facilitate the passing of the schemes in which they are interested, but are solicited to undertake further schemes by those around them. It is a very common-sense conclusion that representatives of small towns and country districts needing railway accommodation, who are daily thrown in contact with the chairman of a company capable of giving this accommodation, will not neglect the opportunity of furthering their ends. It is a very common-sense conclusion that by hospitalities, by favours, by flattery, by the many means used to bias men, they will seek to obtain his assistance. And it is an equally common-sense conclusion that in many cases they will succeed—that by some complication of persuasions and temptations they will swerve him from his calmer judgment; and so introduce into the company he represents, influences at variance with its welfare.

Under some motives however—whether those of direct self-interest, of private favour, or of antagonistic feeling, need not here be discussed—it is certain that directors are constantly committing their constituents to unwise enterprises; and that they frequently employ unjustifiable means for either eluding or overcoming their opposition. Shareholders occasionally find that their directors have given to Parliament, pledges of extension much exceeding what they were authorised to give; and they are then persuaded that they are bound to endorse the promises made for them by their agents. In some cases, among the misleading statements laid before shareholders to obtain their consent to a new project, will be found an abstract of the earnings of a previously-executed branch or feeder to which the proposed one bears some analogy. These earnings are shown

(not always without "cooking") to be tolerably good and improving; and it is argued that the new project, having like prospects, offers a fair investment. Meanwhile, it is not stated that the capital for this previously-executed branch or feeder was raised on debentures or by guaranteed shares at a higher rate of interest than the dividend pays; it is not stated that as the capital for this further undertaking will be raised on like terms, the annual interest on debt will swallow up more than the annual revenue: and thus unsuspecting shareholders—some unacquainted with the company's antecedents, some unable to understand its complicated accounts—give their proxies, or raise their hands, for new works which will tell with disastrous effect on their future dividends. In pursuit of their ends, directors will from time to time go directly in the teeth of established regulations. Where it has been made a rule that proxies shall be issued only by order of a meeting of the proprietors, they will yet issue them without any such order, when by so doing they can steal a march on dissentients. If it suits their purpose, they will occasionally bring forward most important measures without due notice. In stating the amount of the company's stock which has voted with them on a division, they have been known to include thousands of shares on which a small sum only was paid up, counting them as though fully paid up.

To complete the sketch, something must be said on the management of board meetings and meetings of shareholders. For the first—their decisions are affected by various manœuvres. Of course, on fit occasions, there is a whipping-up of those favourable to any project which it is desired to carry. Were this all, there would be little to complain of; but something more than this is done. There are boards in which it is the practice to defeat opposition by stratagem. The extension party having summoned their forces for the occasion, and having entered on the minutes of business a notice worded with the requisite vagueness, shape their proceedings according to the character of the meeting. Should their antagonists muster more strongly than was expected, this vaguely-worded

notice serves simply to introduce some general statement or further information concerning the project named in it; and the matter is passed over as though nothing more had been meant. On the contrary, should the proportion of the two sides be more favourable, the notice becomes the basis of a definite motion committing the board to some important procedure. If due precautions have been taken, the motion is passed; and once passed, those who, if present, would have resisted it, have no remedy: for in railway government there is no "second reading," much less a third. So determined and so unscrupulous are the efforts sometimes made by the stronger party to overcome and silence their antagonists, that when a contested measure, carried by them at the board, has to go before a general meeting for confirmation, they have even been known to pass a resolution that their dissentient colleagues shall not address the proprietary!

How, at half-yearly and special meetings, shareholders should be so readily led by boards, even after repeated experience of their untrustworthiness, seems at first sight difficult to understand. The mystery disappears, however, on inquiry. Very frequently, contested measures are carried quite against the sense of the meetings before which they are laid, by means of the large number of proxies previously collected by the directors. These proxies are obtained mostly from proprietors scattered everywhere throughout the kingdom, who are very generally weak enough to sign the first document sent to them. Then, of those present when the question is brought to an issue, not many dare attempt a speech; of those who dare, but few are clear-headed enough to see the full bearings of the measure they are about to vote upon; and such as can see them are often prevented by nervousness from doing justice to the views they hold. Moreover, it must be borne in mind that the party displaying antagonism to the board are apt to be regarded by their brother proprietors with more or less reprobation. Unless the misconduct of the governing body has been very glaring and very recent, there ever arises in the mass a prejudice against all playing the part of an opposition. They are

condemned as noisy, and factious, and obstructive; and often only by determined courage avoid being put down. Besides these negative reasons for the general inefficiency of shareholders' resistance, there are sundry positive ones. As writes a Member of Parliament who has been an extensive holder of stock in many companies from the first days of railway enterprise:—"My large and long acquaintance with Railway Companies' affairs, enables me to say, that a large majority of shareholders trust wholly to their directors, having little or no information, nor caring to have any opinion of their own. . . . Some others, better informed but timid, are afraid, by opposing the directors, of causing a depreciation of the value of their stock in the market, and are more alarmed at the prospect of this temporary depreciation than at the permanent loss entailed on the company by the useless, and therefore unprofitable, outlay of additional capital. . . . Others again, believing that the impending permanent evil is inevitable, resolve on the spot to sell out immediately, and to keep up the prices of their shares, also give their support to the directors." Thus, from lack of organization and efficiency among those who express their opposition, and from the timidity and double-facedness of those who do not, it happens that extremely unwise projects are carried by large majorities. Nor is this all. The tactics of the aggressive party are commonly as skilful as those of their antagonists are bungling. In the first place, the chairman, who is very generally the chief promoter of the contested scheme, has it in his power to favour those who take his own side, and to throw difficulties in the way of opponents; and this he not unfrequently does to a great extent—refusing to hear, putting down on some plea of breach of order, brow-beating, even using threats.* It generally turns out too, that,

* We may remark in passing, that the practice of making the chairman of the board also chairman of the half-yearly meetings, is a very injudicious one. The directors are the servants of the proprietary; and meet them from time to time to render an account of their stewardship. That the chief of these servants, whose proceedings are about to be examined, should himself act as chief of the jury is absurd. Obviously, the business of each meeting should

whether intentionally or not, some of the most important motions are postponed until nearly the close of the meeting, when the greater portion of the shareholders are gone. Large money-votes, extensive powers, unlimited permits to directors to take, in certain matters, "such steps as in their judgment they may deem most expedient,"—these, and the like, are left to be hurried over during the last half-hour, when the tired and impatient remnant will no longer listen to objectors; and when those who have personal ends to serve by outstaying the rest, carry everything their own way. Indeed, in some instances, the arrangements are such as almost to ensure the meeting becoming a pro-extension one towards the end. This result is brought about thus:—A certain portion of the general body of proprietors are also proprietors of some subordinate work—some branch line, or steam-boats, or canal, which the Company has purchased or leased; and as holders of guaranteed stock, probably having capital to take up further such stock if they can get it, they are naturally favourable to projects that are to be executed on the preference-share system. These hold their meeting for the declaration of dividend, &c., as soon as the meeting of the Company at large has been dissolved; and in the same room. Hence it happens, that being kept together by the prospect of subsequent business, they gradually, towards the close of the general meeting, come to form the majority of those present; and the few ordinary shareholders who have been patient enough to stay, are outvoted by those having interests quite distinct from their own—quite at variance with the welfare of the Company.

And here this allusion to the preference-share system, introduces us to a fact which may fitly close this detail of private interests and questionable practices—a fact serving at once to illustrate the subtlety and concert of railway officialism, and the power it can exert. That this fact may be fully appreciated, it must be premised, that though preference-shares do not

be conducted by some one independently chosen for the purpose; as the Speaker is chosen by the House of Commons.

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usually carry votes, they are sometimes specially endowed with them; and further, that they occasionally remain unpaid up until the expiration of a time after which no further calls can be legally made. In the case in question, a large number of £50 preference-shares had thus long stood with but £5 paid. Those desirous of promoting extensions, &c., had here a fine opportunity of getting great power in the Company at small cost; and as we shall see, they duly availed themselves of it. Already had their party twice tried to thrust the proprietary into a new undertaking of great magnitude. Twice had they entailed on them an expensive and harassing contest. A third time, notwithstanding a professed relinquishment of it, they brought forward substantially the same scheme, and were defeated only by a small majority. The following extracts from the division lists we take from the statement of one of the scrutineers.

	50l. Preference Shares with 5l. paid up.	Additional Stock or Shares.	Recorded Stock at the Poll as held.	Total actual Capital paid up.	Number of Votes scored for the Extension.
			£	£	
The Company's solicitor ..	800	{ 7,500l. stock, and 100 50l. shares, with 42l. 10s. paid up.	75,650	18,140	188
Ditto in joint account with another	778	None.			
The solicitor's partner ...	60	None.	3,000	300	20
The Company's engineer ...	150	None.	7,500	750	33
The engineer's partner ...	1,354	4,266l. stock.	71,966	11,036	161
One of the Company's par- liamentary counsel	200	1,000l. stock.	11,000	2,000	40
Another ditto, ditto	125	200l. stock.	6,450	825	30
Local solicitor for the pro- posed extension	7	None.	380	35	7
The Company's contractor for permanent-way	347	52,833l. 333l. stock.	70,183	54,568	158
The Company's conveyancer	1,003		50,483	5,348	118
The Company's furniture printer	35	10,000l. stock.	11,750	10,175	41
The Company's surveyor ...	360	1,250l. stock.	19,250	3,050	55
The Company's architect ..	217	14,916l. stock; 119 80v. shares, with 42l. 10s. paid up; and 13 40v. shares, with 34l. paid up.	32,330	20,416	82
One of the Company's car- riers	17	833l. stock.	1,683	918	14
The Company's bankers:—					
One partner .....	.. ..	.. ..	33,366	32,366	90
Another partner .....	.. ..	.. ..	2,500	2,500	18
Ditto in joint account with another .....	.. ..	.. ..	1,000	850	12

To this list, some seven or eight of the Company's tradesmen, similarly armed, might be added; raising the number of the almost factitious shares held by functionaries to about 5200, and increasing the votes commanded by them, from its present total of 1068 to upwards of 1100. If now we separate the £380,000, which these gentlemen bring to bear against their brother shareholders, into real and nominal; we find that while not quite £120,000 of it is *bond fide* property invested, the remaining £260,000 is nine parts shadow and one part substance. And thus it results, that by virtue of certain stock actually representing but £26,000, these lawyers, engineers, counsel, conveyancers, contractors, bankers, and others interested in the promotion of new schemes, outweigh more than a quarter of a million of the real capital held by shareholders whom these schemes will injure!

Need we any longer wonder, then, at the persistence of Railway Companies in seemingly reckless competition and ruinous extensions? Is not this obstinate continuance of a policy that has year after year proved disastrous, sufficiently explicable on contemplating the many illegitimate influences at work? Is it not manifest that the small organized party always out-manceuvres the large unorganized one? Consider their respective characters and circumstances. Here are the shareholders diffused throughout the whole kingdom, in towns and country houses; knowing nothing of each other, and too remote to co-operate were they acquainted. Very few of them see a railway journal; not many a daily one; and scarcely any know much of railway politics. Necessarily a fluctuating body, only a small number are familiar with the Company's history—its acts, engagements, policy, management. A great proportion are incompetent to judge of the questions that come before them, and lack decision to act out such judgments as they may form—executors who do not like to take steps involving much responsibility; trustees fearful of interfering with the property under their care, lest possible loss should entail a

lawsuit; widows who have never in their lives acted for themselves in any affair of moment; maiden ladies, alike nervous and innocent of all business knowledge; clergymen whose daily discipline has been little calculated to make them acute men of the world; retired tradesmen whose retail transactions have given them small ability for grasping large considerations; servants possessed of accumulated savings and cramped notions; with sundry others of like helpless character—all of them rendered more or less conservative by ignorance or timidity, and proportionately inclined to support those in authority. To these should be added the class of temporary shareholders, who, having bought stock on speculation, and knowing that a revolution in the Company is likely to depress prices for a time, have an interest in supporting the board irrespective of the goodness of its policy. Turn now to those whose efforts are directed to railway expansion. Consider the constant pressure of local interests—of small towns, of rural districts, of landowners: all of them eager for branch accommodation; all of them with great and definite advantages in view; few of them conscious of the loss those advantages may entail on others. Remember the influence of legislators, prompted, some by their constituents, some by personal aims, and encouraged by the belief that additional railway facilities are in every case nationally beneficial; and then calculate the extent to which, as stated to Mr. Cardwell's committee, Parliament has "excited and urged forward" Companies into rivalry. Observe the temptations under which lawyers are placed—the vast profits accruing to them from every railway contest, whether ending in success or failure; and then imagine the magnitude and subtlety of their extension manœuvring. Conceive the urgency of the engineering profession; to the richer of whom more railway-making means more wealth; to the mass of whom more railway-making means daily bread. Estimate the capitalist-power of contractors; whose unemployed plant brings heavy loss; whose plant when employed brings great gain. Then recollect that to lawyers, engineers, and contractors the

getting up and executing of new undertakings is a business—a business to which every energy is directed; in which long years of practice have given great skill; and to the facilitation of which, all means tolerated by men of the world are thought justifiable. Finally, consider that the classes interested in carrying out new schemes, are in constant communication, and have every facility for combined action. A great part of them live in London, and most of these have offices at Westminster—in Great George Street, in Parliament Street, clustering round the Legislature. Not only are they thus concentrated—not only are they throughout the year in frequent business intercourse; but during the session they are daily together, in Palace-Yard Hotels, in the lobbies, in the committee-rooms, in the House of Commons itself. Is it any wonder then, that the wide-spread, ill-informed, unorganized body of shareholders, standing severally alone, and each pre-occupied with his daily affairs, should be continually out-generalled by the comparatively small but active, skilful, combined body opposed to them, whose very occupation is at stake in gaining the victory?

“But how about the directors?” it will perhaps be asked. “How can they be parties to these obviously unwise undertakings? They are themselves shareholders: they gain by what benefits the proprietary at large; they lose by what injures it. And if without their consent, or rather their agency, no new scheme can be adopted by the Company, the classes interested in fostering railway enterprise are powerless to do harm.”

This belief in the identity of directorial and proprietary interests, is the fatal error commonly made by shareholders. It is this which, in spite of many bitter experiences, leads them to be so careless and so trustful. “Their profit is our profit; their loss is our loss; they know more than we do; therefore let us leave the matter to them.” Such is the argument which more or less definitely passes through the shareholding mind—

an argument of which the premises are vicious, and the inference disastrous. Let us consider it in detail.

Not to dwell upon the disclosures that have in years past been made respecting the share-trafficking of boards, and the large profits realized by it—disclosures which alone suffice to disprove the assumed identity between the interests of directors and proprietary—and taking for granted that little, if any, of this now takes place; let us go on to notice the still-prevailing influences which render this apparent unity of purpose illusive. The immediate interest which directors have in the prosperity of the Company, is often much less than is supposed. Occasionally they possess only the bare qualification of £1000 worth of stock. In some instances even this is partly nominal. Admitting, however, as we do frankly, that in the great majority of cases the full qualification, and much more than the qualification, is held; yet it must be borne in mind that the indirect advantages which a wealthy member of a board may gain from the prosecution of a new undertaking, will often far outweigh the direct injury it will inflict on him by the depreciation of his shares. A board usually consists, to a considerable extent, of gentlemen residing at different points throughout the tract of country traversed by the railway they control: some of them landowners; some merchants or manufacturers; some owners of mines or shipping. Almost always these are advantaged more or less by a new branch or feeder. Those in close proximity to it, gain either by enhanced value of their lands, or by increased facilities of transit for their commodities. Those at more remote parts of the main line, though less directly interested, are still frequently interested in some degree: for every extension opens up new markets either for produce or raw materials; and if it is one effecting a junction with some other system of railways, the greater mercantile conveniences afforded to directors thus circumstanced, become important. Obviously, therefore, the indirect profits accruing to such from one of these new undertakings, may more than

counterbalance the direct loss upon their railway investments; and though there are, doubtless, men far too honourable to let such considerations sway them, yet the generality can scarcely fail to be affected by temptations so strong. Then we have further to remember the influences brought to bear upon directors having seats in Parliament. Already these have been noticed; and we recur to them only for the purpose of pointing out that the immediate evil of an increased discount on his £1000 worth of stock, may be to a director of much less consequence than the favours, patronage, connections, position, which his aid in carrying a new scheme will bring him—a consideration which, without saying how far it applies, suffices to show that in this respect, also, the supposed identity of interests between directors and shareholders does not hold.

Moreover, the disunion of interests produced by these influences is increased by the system of preference-stock. Were there no other cause in action, this practice of raising capital for supplementary undertakings, by issuing shares bearing a guaranteed interest of 5, 6, and 7 per cent.; would alone destroy that community of motives supposed to exist between a railway proprietary and its executive. Little as the fact is at present recognized, it is yet readily demonstrable that by raising one of these mortgages, a Company is forthwith divided into two classes: the one consisting of the richer shareholders, inclusive of the directors, and the other of the poorer shareholders; of which classes the richer one can protect itself from the losses which the poorer one has to bear—nay, can even profit by the losses of the poorer one. This assertion, startling as it will be to many, we will proceed to prove.

When the capital required for a branch or extension is raised by means of guaranteed shares, it is the custom to give each proprietor the option of taking up a number of such shares proportionate to the number of his original shares. By availing himself of this offer, he more or less effectually protects himself against any possible loss which the new undertaking may entail. Should this, not fulfilling the promises of its advo-

cates, diminish in some degree the general dividend; yet, a high dividend on the due proportion of preference-stock, may nearly or quite compensate for this. Hence, it becomes the policy of all who can do so, to take up as many guaranteed shares as they can get. But what happens when the circular announcing this apportionment of guaranteed shares is sent round to the proprietary? Those who possess much stock, being generally capitalists, forthwith apply for as many as they are entitled to. On the other hand, the smaller holders, constituting as they do the bulk of the Company, having no available funds with which to pay the calls on new shares, are obliged to decline them. What results? When this additional line has been opened, and it turns out, as usual, that its revenue is insufficient to meet the guaranteed dividend on its shares—when the general income of the Company is laid under contribution to make up this guaranteed dividend—when as a consequence, the dividend on the original stock is diminished; then the poorer shareholders who possess original stock only, find themselves losers; while the richer ones, possessing guaranteed shares in addition, find that their gain on preference-dividends nearly or quite counterbalances their loss on general dividends. Indeed, as above hinted, the case is even worse. For as the large share-proprietor who has obtained his proportion of guaranteed stock, is not obliged to retain his original stock—as, if he doubts the paying character of the new undertaking, he can always sell such part of his shares as will suffer from it; it is obvious that he may, if he pleases, become the possessor of preference-shares only: and may so obtain a handsome return for his money at the expense of the Company at large and the small shareholders in particular. How far this policy is pursued we do not pretend to say. All which it here concerns us to notice, is, that directors being mostly men of large means, and being therefore able to avail themselves of this guaranteed stock, by which at least much loss may be warded off if not profit made, are liable to be swayed by motives different from those of the general proprietary. And that they often are so swayed there

cannot be a doubt. Without assuming any of them to be guilty of so flagitious an intention as that of benefiting at the cost of their co-proprietors ; and believing, as we do, that few of them duly realize the fact that the protection they will have, is a protection not available to the mass of the shareholders ; we think it is a rational deduction from common experience, that this prospect of compensation will often turn the scale in the minds of those who are hesitating, and diminish the opposition on the part of those who disapprove.

Thus, the belief which leads the majority of railway shareholders to place implicit faith in their directors, is an erroneous one. It is not true that there is an identity of interest between the proprietary and its executive. It is not true that the board forms an efficient guard against the intrigues of lawyers, engineers, contractors, and others who profit by railway-making. On the contrary, it is true that its members are not only liable to be drawn from their line of duty by various indirect motives, but that by the system of guaranteed shares they are placed under a positive temptation to betray their constituents.

And now what is the proximate origin of all these corruptions ? and what is the remedy for them ? What general error in railway legislation is it that has made possible such complicated chicaneries ? Whence arises this facility with which interested persons continually thrust companies into unwise enterprises ? We believe there is a very simple answer to these questions. It is an answer, however, which will at first sight be thought quite irrelevant : and we doubt not that the corollary we propose drawing from it, will be forthwith condemned by practical men as incapable of being acted on. Nevertheless, if such will give us a little time to explain, we are not without hope of showing, both that the evils laboured under would be excluded were this principle recognized, and that the recognition of it is not only feasible, but would even open the way out of sundry perplexities in which railway legislation is at present involved.

We conceive, then, that the fundamental vice of our system, as hitherto carried out, lies in *the misinterpretation of the proprietary contract*—the contract tacitly entered into between each shareholder and the body of shareholders with whom he unites; and that the remedy desired lies simply in the enforcement of an equitable interpretation of this contract. In reality it is a strictly limited one: in practice it is treated as altogether unlimited: and the thing needed is, that it should be clearly defined and abided by.

Our popular form of government has so habituated us to seeing public questions decided by the voice of the majority, and the system is so manifestly equitable in the cases daily before us, that there has been produced in the general mind, an unhesitating belief that the majority's power is unbounded. Under whatever circumstances, or for whatever ends, a number of men co-operate, it is held that if difference of opinion arises among them, justice requires that the will of the greater number shall be executed rather than that of the smaller number; and this rule is supposed to be uniformly applicable, be the question at issue what it may. So confirmed is this conviction, and so little have the ethics of the matter been considered, that to most this mere suggestion of a doubt will cause some astonishment. Yet it needs but a brief analysis to show that the opinion is little better than a political superstition. Instances may readily be selected, which prove, by *reductio ad absurdum*, that the right of a majority is a purely conditional right, valid only within specific limits. Let us take a few. Suppose that at the general meeting of some philanthropic association, it was resolved that in addition to relieving distress the association should employ home-missionaries to preach down popery. Might the subscriptions of Catholics, who had joined the body with charitable views, be rightfully used for this end? Suppose that of the members of a book-club, the greater number, thinking that under existing circumstances rifle-practice was more important than reading, should decide to change the purpose of their union, and to apply the funds in hand for the purchase of

powder, ball, and targets. Would the rest be bound by this decision? Suppose that under the excitement of news from Australia, the majority of a Freehold Land Society should determine, not simply to start in a body for the gold diggings, but to use their accumulated capital to provide outfits. Would this appropriation of property be just to the minority? and must these join the expedition? Scarcely any one would venture an affirmative answer even to the first of these questions; much less to the others. And why? Because everyone must perceive that by uniting himself with others, no man can equitably be betrayed into acts utterly foreign to the purpose for which he joined them. Each of these supposed minorities would properly reply to those seeking to coerce them:—"We combined with you for a defined object; we gave money and time for the furtherance of that object; on all questions thence arising, we tacitly agreed to conform to the will of the greater number; but we did not agree to conform on any other questions. If you induce us to join you by professing a certain end, and then undertake some other end of which we were not apprised, you obtain our support under false pretences; you exceed the expressed or understood compact to which we committed ourselves; and we are no longer bound by your decisions." Clearly this is the only rational interpretation of the matter. The general principle underlying the right government of every incorporated body, is, that its members contract with each other severally to submit to the will of the majority *in all matters concerning the fulfilment of the objects for which they are incorporated; but in no others.* To this extent only can the contract hold. For as it is implied in the very nature of a contract, that those entering into it must know what they contract to do; and as those who unite with others for a specified object, cannot contemplate all the unspecified objects which it is hypothetically possible for the union to undertake; it follows that the contract entered into cannot extend to such unspecified objects: and if there exists no expressed or understood contract between the union and its members respecting

unspecified objects, then for the majority to coerce the minority into undertaking them, is nothing less than gross tyranny.

Now this almost self-evident principle is wholly ignored alike in our railway legislation and the proceedings of our companies. Definite as is the purpose with which the promoters of a public enterprise combine, endless other purposes not dreamed of at the outset are commonly added to it; and this, apparently without any suspicion that such a course is altogether unwarrantable, unless taken with the *unanimous* consent of the proprietors. The unsuspecting shareholder who signed the subscription contract for a line from Greatborough to Grandport, did so under the belief that this line would not only be a public benefit but a good investment. He was familiar with the country. He had been at some trouble to estimate the traffic. And, fully believing that he knew what he was embarking in, he put down his name for a large amount. The line has been made; a few years of prosperity have justified his foresight; when, at some fatal special meeting, a project is put before him for a branch from Littlehomestead to Stonyfield. The will of the board and the intrigues of the interested, overbear all opposition; and in spite of the protests of many who like him see its impolicy, he presently finds himself involved in an undertaking which, when he joined the promoters of the original line, he had not the remotest conception would ever be proposed. From year to year this proceeding is repeated. His dividends dwindle and his shares go down; and eventually the congeries of enterprises to which he is committed, grows so vast that the first enterprise of the series becomes but a small fraction of the whole. Yet it is in virtue of his consent to this first of the series, that all the rest are thrust upon him. He feels that there is an injustice somewhere; but, believing in the unlimited right of a majority, fails to detect it. He does not see that when the first of these extensions was proposed, he should have denied the power of his brother-shareholders to implicate him in an undertaking not named in their deed of incorporation. He should have told

the advocates of this new undertaking that they were perfectly free to form a separate Company for the execution of it; but that they could not rightfully compel dissentients to join in a new project, any more than they could rightfully have compelled dissentients to join in the original project. Had such a shareholder united with others for the specified general purpose of *making railways*, he would have had no ground for protest. But he united with others for the specified purpose of *making a particular railway*. Yet such is the confusion of ideas on the subject, that there is absolutely no difference recognized between these cases!

It will doubtless be alleged in defence of all this, that these secondary enterprises are supplementary to the original one—are in some sense undertaken for the furtherance of it; professedly minister to its prosperity; cannot, therefore, be regarded as altogether separate enterprises. And it is true that they have this for their excuse. But if it is a sufficient excuse for accessories of this nature, it may be made a sufficient excuse for any accessories whatever. Already, Companies have carried the practice beyond the making of branches and extensions. Already, under the plea of bringing more traffic to their lines, they have constructed docks; bought lines of steam-packets; built vast hotels; deepened river-channels. Already, they have created small towns for their workmen; erected churches and schools; salaried clergymen and teachers. Are these warranted on the ground of advancing the Companies' interests? Then thousands of other undertakings are similarly warranted. If a view to the development of traffic, justifies the making of a branch to some neighbouring coal-mines; then, should the coal-mines be inefficiently worked, the same view would justify the purchase of them—would justify the Company in becoming coal-miner and coal-seller. If anticipated increase of goods and passengers is a sufficient reason for carrying a feeder into an agricultural district; then, it is a sufficient reason for organizing a system of coaches and waggons to run in connection with this feeder; for making the requisite horse-breeding esta-

ishments; for hiring the needful farms; for buying estates; for becoming agriculturists. If it be allowable to purchase steamers plying in conjunction with the railway; it must be allowable to purchase merchant vessels to trade in conjunction with it; it must be allowable to set up a yard for building such vessels; it must be allowable to erect depôts at foreign ports for the receipt of goods; it must be allowable to employ commission agents for the collection of such goods; it must be allowable to extend a mercantile organization all over the world. From making its own engines and carriages, a Company may readily progress to manufacturing its own iron and growing its own timber. From giving its *employés* secular and religious instruction, and providing houses for them, it may go on to supply them with food, clothing, medical attendance, and all the needs of life. Beginning simply as a corporation to make and work a railway between A and B; it may become a miner, manufacturer, merchant, ship-owner, canal-proprietor, hotel-keeper, landowner, house-builder, farmer, retail-trader, priest, teacher—an organization of indefinite extent and complication. There is no logical alternative between permitting this, and strictly limiting the corporation to the object first agreed upon. A man joining with others for a specific purpose, must be held to commit himself to that purpose only; or else to all purposes whatever that they may choose to undertake.

But proprietors dissenting from one of these supplementary projects are told that they have the option of selling out. So might the dissentients from a new State-enforced creed be told, that if they did not like it they might leave the country. The one reply is little more satisfactory than the other would be. The opposing shareholder sees himself in possession of a good investment—one perhaps which, as an original subscriber, he ran some risk in obtaining. This investment is about to be endangered by an act not named in the deed of incorporation. And his protests are met by saying, that if he fears the danger he may part with his investment. Surely this choice between

two evils scarcely meets his claims. Moreover, he has not even this in any fair sense. It is often an unfavourable time to sell. The very rumour of one of these extensions frequently causes a depreciation of stock. And if many of the minority throw their shares on the market, this depreciation is greatly increased; a fact which further hinders them from selling. Thus, the choice is in reality between parting with a good investment at much less than its value; and running the risk of having its value greatly diminished.

The injustice thus inflicted on minorities is, indeed, already recognized in a certain vague way. The recently-established Standing Order of the House of Lords, that before a Company can carry out any new undertaking, three-fourths of the votes of the proprietors shall be recorded in its favour, clearly implies a perception that the usual rule of the majority does not apply. And again, in the case of The Great Western Railway Company *versus* Rushout, the decision that the funds of the Company could not be used for purposes not originally authorized, without a special legislative permit, involves the doctrine that the will of the greater number is not of unlimited validity. In both these cases, however, it is taken for granted that a State-warrant can justify what without it would be unjustifiable. We must take leave to question this. If it be held that an Act of Parliament can make murder proper, or can give rectitude to robbery; it may be consistently held that it can sanctify a breach of contract; but not otherwise. We are not about to enter upon the vexed question of the standard of right and wrong; and to inquire whether it is the function of a government to make rules of conduct, or simply to enforce rules deducible from the laws of social life. We are content, for the occasion, to adopt the expediency-hypothesis; and adopting it, must yet contend, that, rightly interpreted, it gives no countenance to this supposed power of a Government to alter the limits of an equitable contract against the wishes of some of the contracting parties. For, as understood by its teachers and their chief disciples, the doctrine of expediency

is not a doctrine implying that each particular act is to be determined by the particular consequences that may be expected to flow from it; but that the general consequences of entire classes of acts having been ascertained by induction from experience, rules shall be framed for the regulation of such classes of acts, and each rule shall be uniformly applied to every act coming under it. Our whole administration of justice proceeds on this principle of invariably enforcing an ordained course, regardless of special results. Were immediate consequences to be considered, the verdict gained by the rich creditor against the poor debtor would generally be reversed; for the starvation of the last is a much greater evil than the inconvenience of the first. Most thefts arising from distress would go unpunished; a great portion of men's wills would be cancelled; many of the wealthy would be dispossessed of their fortunes. But it is clearly seen, that were judges thus guided by proximate evils and benefits, the ultimate result would be social confusion; that what was immediately expedient would be ultimately inexpedient; and hence the aim at rigorous uniformity, spite of incidental hardships. Now, the binding nature of agreements is one of the commonest and most important principles of civil law. A large part of the causes daily heard in our courts, involve the question, whether in virtue of some expressed or understood contract, those concerned are, or are not, bound to certain acts or certain payments. And when it has been decided what the contract implies, the matter is settled. The contract itself is held sacred. And this sacredness of a contract, being, according to the expediency-hypothesis, justified by the experience of all nations in all times that it is generally beneficial, it is *not* competent for a Legislature to declare that contracts are violable. Assuming always that the contracts are themselves equitable, there is no rational system of ethics which warrants the alteration or dissolving of them, save by the consent of all concerned. If then it be shown, as we think it has been shown, that the contract tacitly entered into by railway shareholders with each other, has

definite limits ; it is the function of the Government to *enforce*, and not to *abolish*, those limits. It cannot decline to enforce them without running counter, not only to all theories of moral obligation, but to its own judicial system. It cannot abolish them without glaring self-stultification.

Returning, for a moment, to the manifold evils of which the misinterpretation of the proprietary contract was assigned as the cause ; it only remains to point out that, were the just construction of this contract insisted upon, such evils would, in great part, be impossible. The various illicit influences by which Companies are daily betrayed into disastrous extensions, would necessarily be inoperative when such extensions could not be undertaken by them. When such extensions had to be undertaken by independent bodies of shareholders, with no one to guarantee them good dividends, the local and class interests would find it a less easy matter than at present to aggrandize themselves at the expense of others.

And now as to the policy of thus modifying railway legislation—the commercial policy we mean. Leaving out of sight the more general social interests, let us glance at the effects on mercantile interests—the proximate instead of the ultimate effects. The implication contained in the last paragraph, that the making of branches and supplementary lines would no longer be so facile, will be thought to prove the disadvantage of any such limit as the one advocated. Many will argue, that to restrict Companies to their original undertakings would fatally cripple railway enterprise. Many others will remark, that, however detrimental to shareholders this extension system may have been, it has manifestly proved beneficial to the public. Both these positions seem to us more than questionable. We will first look at the last of them.

Even were travelling accommodation the sole thing to be considered, it would not be true that prodigality in new lines has been advantageous. The districts supplied have, in many cases, themselves been injured by it. It is shown by the

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evidence given before the Select Committee on Railway and Canal Bills, that in Lancashire, the existence of competing lines has, in some cases, both diminished the facilities of communication and increased the cost. It is further shown by this evidence, that a town obtaining branches from two antagonist Companies, by-and-by, in consequence of a working arrangement between these Companies, comes to be worse off than if it had but one branch : and Hastings is quoted as an example. It is again shown that a district may be wholly deprived of railway accommodation by granting a superfluity of lines ; as in the case of Wilts and Dorset. In 1844-5, the Great Western and the South Western Companies projected rival systems of lines, supplying these and parts of the adjacent counties. The Board of Trade, "asserting that there was not sufficient traffic to remunerate an outlay for two independent railways," reported in favour of the Great Western schemes ; and bills were granted for them : a certain agreement, suggested by the Board of Trade, being at the same time made with the South Western, which, in return for specified advantages, conceded this district to its rival. Notwithstanding this agreement, the South Western, in 1847, projected an extension calculated to take most of the traffic from the Great Western extensions ; and in 1848, Parliament, though it had virtually suggested this agreement, and though the Great Western Company had already spent a million and a half in the part execution of the new lines, authorized the South Western project. The result was, that the Great Western Company suspended their works ; the South Western Company were unable, from financial difficulties, to proceed with theirs ; the district has remained for years unaccommodated ; and only since the powers granted to the South Western have expired from delay, has the Great Western recommenced its long-suspended undertakings.

And if this undue multiplication of supplementary lines has often directly decreased the facilities of communication, still more has it done this indirectly, by maintaining the cost

of travelling on the main lines. Little as the public are conscious of the fact, it is nevertheless true, that they pay for the accommodation of unremunerative districts, by high fares in remunerative districts. Before this reckless branch-making commenced, 8 and 9 per cent. were the dividends returned by our chief railways; and these dividends were rapidly increasing. The maximum dividend allowed by their Acts is 10 per cent. Had there not been unprofitable extensions, this maximum would have been reached many years since; and in the absence of the power to undertake new works, the fact that it had been reached could not have been hidden. Lower rates for goods and passengers would necessarily have followed. These would have caused a large additional traffic; and with the aid of the natural increase otherwise going on, the maximum would shortly again have been reached. There can scarcely be a doubt that repetitions of this process would, before now, have reduced the fares and freights on our main lines to at least one-third less than the present ones. This reduction, be it remembered, would have affected those railways which subserve commercial and social intercourse in the greatest degree—would, therefore, have applied to the most important part of the traffic throughout the kingdom. As it is, however, this greater proportion of the traffic has been heavily taxed for the benefit of the smaller proportion. That the tens who travel on branches might have railway communication, the hundreds who travel along main lines have been charged 30, perhaps 40 per cent. extra. Nay, worse: that these tens might be accommodated, the hundreds who would have been brought on to the main lines by lower fares have gone unaccommodated. Is it then so clear that undertakings which have been disastrous to shareholders have yet been beneficial to the public?

But it is not only in greater cost of transit that the evil has been felt; it has been felt also in diminished safety. The multiplication of railway accidents, which has of late years drawn so much attention, has been in no inconsiderable degree caused by the extension policy. The relation is not obvious; and we

had ourselves no conception that such a relation existed, until the facts illustrative of it were furnished to us by a director who had witnessed the whole process of causation. When preference-share dividends and guarantees began to make large draughts upon half-yearly revenues—when original stock was greatly depreciated, and the dividends upon it fell from 9 and 8 per cent. to $4\frac{1}{2}$ and 4 and $3\frac{1}{2}$, great dissatisfaction necessarily arose among shareholders. There were stormy meetings, motions of censure, and committees of investigation. Retrenchment was the general cry; and retrenchment was carried to a most imprudent extent. Directors with an indignant proprietary to face, and under the fear that their next dividend would be no greater, perhaps less, than the last, dared not to lay out money for the needful repairs. Permanent way, reported to them as requiring to be replaced, was made to serve awhile longer. Old rolling stock was not superseded by new to the proper extent; nor increased in proportion to the demand. Committees, appointed to examine where the expenditure could be cut down, went round discharging a porter here, dispensing with a clerk there, and diminishing the salaries of the officials in general. To such a length was this policy carried, that in one case, to effect a saving of £1200 per annum, the working staff was so crippled as to cause, in the course of a few years, a loss of probably £100,000: such, at least, is the opinion of the gentleman on whose authority we make this statement, who was himself one of the retrenchment committee. What, now, was the necessary result of all this? With the line out of condition; with engines and carriages neither sufficient in number nor in the best working order; with drivers, guards, porters, clerks, and the rest, decreased to the smallest number with which it was possible to work; with inexperienced managers in place of the experienced ones driven away by reduced salaries; what was likely to occur? Was it not certain that an apparatus of means just competent to deal with the ordinary traffic, would be incompetent to deal with extraordinary traffic? that a decimated body of officials under inferior regulation, would

fail in the emergencies sure from time to time to occur? that with way and works and rolling stock all below par, there would occasionally be a concurrence of small defects, permitting something to go wrong? Was not a multiplication of accidents inevitable? No one can doubt it. And if we trace back this result step by step to its original cause—the reckless expenditure in new lines—we shall see further reason to doubt whether such expenditure has been as advantageous to the public as is supposed. We shall hesitate to indorse the opinion of the Select Committee on Railway and Canal Bills, that it is desirable “to increase the facility for obtaining lines of local convenience.”

Still more doubtful becomes the alleged benefit accruing to the public from extensions that cause loss to shareholders, when, from considering the question as one of traffic, we turn to consider it as a general commercial question—a question of political economy. Were there no facts showing that the travelling facilities gained were counterbalanced, if not more than counterbalanced, by the travelling facilities lost; we should still contend that the making of branches which do not return fair dividends, is a national evil, and not a national good. The prevalent error committed in studying matters of this nature, consists in looking at them separately, rather than in connection with other social wants and social benefits. Not only does one of these undertakings, when executed, affect society in various ways, but the effort put forth in the execution of it affects society in various ways; and to form a true estimate, the two sets of results must be compared. The axiom that “action and re-action are equal, and in opposite directions,” is true, not only in mechanics—it is true everywhere. No power can be put forth by a nation to achieve a given end, without producing, for the time being, a corresponding inability to achieve some other end. No amount of capital can be abstracted for one purpose, without involving an equivalent lack of capital for another purpose. Every advantage wrought out by labour, is purchased by the relinquishment of

some alternative advantage which that labour might else have wrought out. In judging, therefore, of the benefits flowing from any public undertaking, it is requisite to consider them not by themselves, but as contrasted with the benefits which the invested capital would otherwise have secured. But how can these relative benefits be measured? it may be asked. Very simply. The rate of interest which the capital will bring as thus respectively applied, is the measure. Money which, if used for a specific end, gives a smaller return than it would give if otherwise used, is used disadvantageously, not only to its possessors, but to the community. This is a corollary from the commonest principles of political economy—a corollary so simple that we can scarcely understand how, after the free-trade controversy, a committee, numbering among its members Mr. Bright and Mr. Cardwell, should have overlooked it. Have we not been long ago taught, that in the mercantile world capital goes where it is most wanted—that the business which is at any time attracting capital by unusually high returns, is a business proved by that very fact to be unusually active—that its unusual activity shows society to be making great demands upon it; giving it high profits; wanting its commodities or services more than other commodities or services? Do not comparisons among our railways demonstrate that those paying large dividends are those subserving the public needs in a greater degree than those paying smaller dividends? and is it not obvious that the efforts of capitalists to get these larger dividends led them to supply the greater needs before the lesser needs? Surely, the same law which holds in ordinary commerce, and also holds between one railway investment and another, holds likewise between railway investments and other investments. If the money spent in making branches and feeders is yielding an average return of from 1 to 2 per cent.; while if employed in land-draining or ship-building, it would return 4 or 5 per cent. or more; it is a conclusive proof that money is more wanted for land-draining and ship-building than for branch-making. And the general

conclusions to be drawn are, that that large proportion of railway capital which does not pay the current rate of interest, is capital ill laid out; that if the returns on such proportion were capitalized at the current rate of interest, the resulting sum would represent its real value; and that the difference between this sum and the amount expended, would indicate the national loss—a loss which, on the lowest estimate, would exceed £100,000,000. And however true it may be that the sum invested in unprofitable lines will go on increasing in productiveness; yet as, if more wisely invested, it would similarly have gone on increasing in productiveness, perhaps even at a greater rate, this vast loss must be regarded as a permanent and not as a temporary one.

Again then, we ask, is it so obvious that undertakings which have been disastrous to shareholders have been advantageous to the public? Is it not obvious, rather, that in this respect, as in others, the interests of shareholders and the public are in the end identical? And does it not seem that instead of recommending “increased facilities for obtaining lines of local convenience,” the Select Committee might properly have reported that the existing facilities are abnormally great, and should be decreased?

There remains still to be considered the other of the two objections above stated as liable to be raised against the proposed interpretation of the proprietary contract—the objection, namely, that it would be a serious hindrance to railway enterprise. After what has already been said, it is scarcely needful to reply, that the hindrance would be no greater than is natural and healthful—no greater than is requisite to hold in check the private interests at variance with public ones. This notion that railway enterprise will not go on with due activity without artificial incentives—that bills for local extensions “rather need encouragement,” as the committee say, is nothing but a remnant of protectionism. The motive which has hitherto led to the formation of all independent railway companies—the search of capitalists for good investments—may safely be left to form

others as fast as local requirements become great enough to promise fair returns; as fast, that is, as local requirements should be satisfied. This would be manifest enough without illustration; but there are facts proving it.

Already we have incidentally referred to the circumstance, that it has of late become common for landowners, merchants, and others locally interested, to get up railways for their own accommodation, which they do not expect to pay satisfactory dividends; and in which they are yet content to invest considerable sums, under the belief that the indirect profits accruing to them from increased facilities of traffic, will out-balance the direct loss. To so great an extent is this policy being carried, that, as stated to the Select Committee, "in Yorkshire and Northumberland, where branch lines are being made through mere agricultural districts, the landowners are *giving their land* for the purpose, and taking shares." With such examples before us, it cannot rationally be doubted that there will always be capital forthcoming for making local lines as soon as the sum of the calculated benefits, direct and indirect, justifies its expenditure.

"But," it will be urged, "a branch that would be unremunerative as an independent property, is often remunerative to the company that has made it, in virtue of the traffic it brings to the trunk line. Though yielding meagre returns on its own capital, yet, by increasing the returns on the capital of the trunk line, it compensates, or more than compensates. Were the existing company, however, forbidden to extend its undertaking, such a branch would not be made; and injury would result." This is all true, with the exception of the last assertion, that such a branch would not be made. Though in its corporate capacity the company owning the trunk line would be unable to join in a work of this nature, there would be nothing to prevent individual shareholders in the trunk line from doing so to any extent they thought fit: and were the prospects as favourable as is assumed, this course, being manifestly advantageous to individual shareholders, would be pur-

sued by many of them. If, acting in concert with others similarly circumstanced, the owner of £10,000 worth of stock in the trunk line, could aid the carrying out of a proposed feeder promising to return only 2 per cent. on its cost, by taking shares to the extent of £1000, it would answer his purpose to do this, providing the extra traffic it brought would raise the trunk-line dividend by one-fourth per cent. Thus, under a limited proprietary contract, companies would still, as now, foster extensions where they were wanted; the only difference being, that in the absence of guaranteed dividends, some caution would be shown; and the poorer shareholders would not, as at present, be sacrificed to the richer.

In brief, our position is, that whenever, by the efforts of all parties to be advantaged—local landowners, manufacturers, merchants, trunk-line shareholders, &c., the capital for an extension can be raised—whenever it becomes clear to all such, that their indirect profits plus their direct profits will make the investment a paying one; the fact is proof that the line is wanted. On the contrary, whenever the prospective gains to those interested are insufficient to induce them to undertake it, the fact is proof that the line is not wanted so much as other things are wanted, and therefore *ought not to be made*. Instead, then, of the principle we advocate being objectionable as a check to railway enterprise, one of its merits is, that by destroying the artificial incentives to such enterprise, it would confine it within normal limits.

A perusal of the evidence given before the Select Committee will show that it has sundry other merits, which we have space only to indicate.

It is estimated by Mr. Laing—and Mr. Stephenson, while declining to commit himself to the estimate, “does not believe he has overstated it,”—that out of the £280,000,000 already raised for the construction of our railways, £70,000,000 has been needlessly spent in contests, in duplicate lines, in “the multiplication of an immense number of schemes prosecuted at an almost reckless expense;” and Mr. Stephenson believes

that this sum is "a very inadequate representative of the actual loss in point of convenience, economy, and other circumstances connected with traffic, which the public has sustained by reason of parliamentary carelessness in legislating for railways." Under an equitable interpretation of the proprietary contract, the greater part of this would have been avoided.

The competition between rival companies in extension and branch-making, which has already done vast injury, and the effects of which, if not stopped, will, in the opinion of Mr. Stephenson, be such that "property now paying $5\frac{1}{2}$ per cent. will in ten years be worth only 3 per cent., and that on twenty-one millions of money"—this competition could never have existed in its intense and deleterious form under the limiting principle we advocate.

Prompted by jealousy and antagonism, our companies have obtained powers for 2000 miles of railway which they have never made. The millions thus squandered in surveys and parliamentary contests—"food for lawyers and engineers"—would nearly all have been saved, had each supplementary line been obtainable only by an independent body of proprietors with no one to shield them from the penalties of reckless scheming.

It is admitted that the branches and feeders constructed from competitive motives have not been laid out in the best directions for the public. To defeat, or retaliate upon, opponents, having been one of the ends—often the chief end—in making them, routes have been chosen especially calculated to effect this end; and the local traffic has in consequence been ill provided for. Had these branches and feeders, however, been left to the enterprise of their respective districts, aided by such other enterprise as they could attract, the reverse would have been the fact: seeing that on the average, in these smaller cases as in the greater ones, the routes which most accommodate the public must be the routes most profitable to projectors.

Were the illegitimate competition in extension-making done

away, there would remain between companies just that normal competition which is advantageous to all. It is not true, as is alleged, that there cannot exist between railways a competition analogous to that which exists between traders. The evidence of Mr. Saunders, the secretary of the Great Western Company, proves the contrary. He shows that where the Great Western and the North Western railways communicate with the same towns, as at Birmingham and Oxford, each has tacitly adopted the fare which the other was charging; and that while there is thus no competition in fares, there is competition in speed and accommodation. The results are, that each takes that portion of the traffic, which, in virtue of its position and local circumstances, naturally falls to its share; that each stimulates the other to give the greatest advantages it can afford; and that each keeps the other in order by threatening to take away its natural share of the traffic, if, by ill-behaviour or inefficiency, it counterbalances the special advantages it offers. Now, this is just the form which competition eventually assumes between traders. After it has been ascertained by underselling what is the lowest remunerative price at which any commodity can be sold, the general results are, that that becomes the established price; that each trader is content to supply those only who, from proximity or other causes, naturally come to him; and that only when he treats his customers badly, need he fear that they will inconvenience themselves by going elsewhere for their goods.

Is there not, then, pressing need for an amendment of the laws affecting the proprietary contract—an amendment which shall transform it from an unlimited into a limited contract; or rather—not *transform* it into such, but *recognize* it as such? If there be truth in our argument, the absence of any limitation has been the chief cause of the manifold evils of our railway administration. The share-trafficking of directors; the complicated intrigues of lawyers, engineers, contractors, and others; the betrayal of proprietaries—all the complicated

corruptions which we have detailed, have primarily arisen from it, have been made possible by it. It has rendered travelling more costly and less safe than it would have been; and while apparently facilitating traffic, has indirectly hindered it. By fostering antagonism, it has led to the ill laying-out of supplementary lines; to the wasting of enormous sums in useless parliamentary contests; to the loss of an almost incredible amount of national capital in the making of railways for which there is no due requirement. Regarded in the mass, the investments of shareholders have been reduced by it to less than half the average productiveness which such investments should possess; and, as all authorities admit, railway property is, even now, kept below its real value, by the fear of future depreciations consequent on future extensions. Considering, then, the vastness of the interests at stake—considering that the total capital of our companies will soon reach £300,000,000—considering, on the one hand, the immense number of persons owning this capital (many of them with no incomes but what are derived from it), and, on the other hand, the great extent to which the community is concerned, both directly as to its commercial facilities, and indirectly as to the economy of its resources—considering all this, it becomes extremely important that railway property should be placed on a secure footing, and railway enterprise confined within normal bounds. The change is demanded alike for the welfare of shareholders and the public; and it is one which equity manifestly dictates. No charge of over-legislation can be brought against it. It is simply an extension to joint-stock contracts, of the principle applied to all other contracts; it is merely a fulfilment of the State's judicial function in cases hitherto neglected; it is nothing but a better administration of justice.

MANNERS AND FASHION.

WHOEVER has studied the physiognomy of political meetings, cannot fail to have remarked a connection between democratic opinions and peculiarities of costume. At a Chartist demonstration, a lecture on Socialism, or a *soirée* of the Friends of Italy, there will be seen many among the audience, and a still larger ratio among the speakers, who get themselves up in a style more or less unusual. One gentleman on the platform divides his hair down the centre, instead of on one side; another brushes it back off the forehead, in the fashion known as "bringing out the intellect;" a third has so long forsworn the scissors, that his locks sweep his shoulders. A considerable sprinkling of moustaches may be observed; here and there an imperial; and occasionally some courageous breaker of conventions exhibits a full-grown beard.* This nonconformity in hair is countenanced by various nonconformities in dress, shown by others of the assemblage. Bare necks, shirt-collars *à la* Byron, waistcoats cut Quaker fashion, wonderfully shaggy great coats, numerous oddities in form and colour, destroy the monotony usual in crowds. Even those exhibiting no conspicuous peculiarity, frequently indicate by something in the pattern or make-up of their clothes, that they pay small regard to what their tailors tell them about the prevailing taste. And when the gathering breaks up, the varieties of head gear displayed—the number of caps, and the abundance

* This was written before moustaches and beards had become common.

of felt hats—suffice to prove that were the world at large like-minded, the black cylinders which tyrannize over us would soon be deposed.

The foreign correspondence of our daily press shows that this relationship between political discontent and the disregard of customs exists on the Continent also. Red republicanism has always been distinguished by its hirsuteness. The authorities of Prussia, Austria, and Italy, alike recognize certain forms of hat as indicative of disaffection, and fulminate against them accordingly. In some places the wearer of a blouse runs a risk of being classed among the *suspects*; and in others, he who would avoid the bureau of police, must beware how he goes out in any but the ordinary colours. Thus, democracy abroad, as at home, tends towards personal singularity. Nor is this association of characteristics peculiar to modern times, or to reformers of the State. It has always existed; and it has been manifested as much in religious agitations as in political ones. Along with dissent from the chief established opinions and arrangements, there has ever been some dissent from the customary social practices. The Puritans, disapproving of the long curls of the Cavaliers, as of their principles, cut their own hair short, and so gained the name of "Round-heads." The marked religious nonconformity of the Quakers was accompanied by an equally-marked nonconformity of manners—in attire, in speech, in salutation. The early Moravians not only believed differently, but at the same time dressed differently, and lived differently, from their fellow Christians. That the association between political independence and independence of personal conduct, is not a phenomenon of to-day only, we may see alike in the appearance of Franklin at the French court in plain clothes, and in the white hats worn by the last generation of radicals. Originality of nature is sure to show itself in more ways than one. The mention of George Fox's suit of leather, or Pestalozzi's school name, "Harry Oddity," will at once suggest the remembrance that men who have in great things diverged from the beaten track, have fre-

quently done so in small things likewise. Minor illustrations of this truth may be gathered in almost every circle. We believe that whoever will number up his reforming and rationalist acquaintances, will find among them more than the usual proportion of those who in dress or behaviour exhibit some degree of what the world calls eccentricity.

If it be a fact that men of revolutionary aims in politics or religion, are commonly revolutionists in custom also, it is not less a fact that those whose office it is to uphold established arrangements in State and Church, are also those who most adhere to the social forms and observances bequeathed to us by past generations. Practices elsewhere extinct still linger about the head quarters of government. The monarch still gives assent to Acts of Parliament in the old French of the Normans; and Norman French terms are still used in law. Wigs, such as those we see depicted in old portraits, may yet be found on the heads of judges and barristers. The Beefeaters at the Tower wear the costume of Henry VIIIth's body-guard. The University dress of the present year varies but little from that worn soon after the Reformation. The claret-coloured coat, knee-breeches, lace shirt frills, ruffles, white silk stockings, and buckled shoes, which once formed the usual attire of a gentleman, still survive as the court-dress. And it need scarcely be said that at *levées* and drawing-rooms, the ceremonies are prescribed with an exactness, and enforced with a rigour, not elsewhere to be found.

Can we consider these two series of coincidences as accidental and unmeaning? Must we not rather conclude that some necessary relationship obtains between them? Are there not such things as a constitutional conservatism, and a constitutional tendency to change? Is there not a class which clings to the old in all things; and another class so in love with progress as often to mistake novelty for improvement? Do we not find some men ready to bow to established authority of whatever kind; while others demand of every such authority its reason, and reject it if it fails to justify itself? And must

not the minds thus contrasted tend to become respectively conformist and nonconformist, not only in politics and religion, but in other things? Submission, whether to a government, to the dogmas of ecclesiastics, or to that code of behaviour which society at large has set up, is essentially of the same nature; and the sentiment which induces resistance to the despotism of rulers, civil or spiritual, likewise induces resistance to the despotism of the world's opinion. Look at them fundamentally, and all enactments, alike of the legislature, the consistory, and the saloon—all regulations, formal or virtual, have a common character: they are all limitations of men's freedom. "Do this—Refrain from that," are the blank formulas into which they may all be written: and in each case the understanding is that obedience will bring approbation here and paradise hereafter; while disobedience will entail imprisonment, or sending to Coventry, or eternal torments, as the case may be. And if restraints, however named, and through whatever apparatus of means exercised, are one in their action upon men, it must happen that those who are patient under one kind of restraint, are likely to be patient under another; and conversely, that those impatient of restraint in general, will, on the average, tend to show their impatience in all directions.

That Law, Religion, and Manners are thus related—that their respective kinds of operation come under one generalization—that they have in certain contrasted characteristics of men a common support and a common danger—will, however, be most clearly seen on discovering that they have a common origin. Little as from present appearances we should suppose it, we shall yet find that at first, the control of religion, the control of laws, and the control of manners, were all one control. However incredible it may now seem, we believe it to be demonstrable that the rules of etiquette, the provisions of the statute-book, and the commands of the decalogue, have grown from the same root. If we go far enough back into the ages of primeval Fetishism, it becomes manifest that originally

Deity, Chief, and Master of the ceremonies were identical. To make good these positions, and to show their bearing on what is to follow, it will be necessary here to traverse ground that is in part somewhat beaten, and at first sight irrelevant to our topic. We will pass over it as quickly as consists with the exigencies of the argument.

That the earliest social aggregations were ruled solely by the will of the strong man, few dispute. That from the strong man proceeded not only Monarchy, but the conception of a God, few admit: much as Carlyle and others have said in evidence of it. If, however, those who are unable to believe this, will lay aside the ideas of God and man in which they have been educated, and study the aboriginal ideas of them, they will at least see some probability in the hypothesis. Let them remember that before experience had yet taught men to distinguish between the possible and the impossible; and while they were ready on the slightest suggestion to ascribe unknown powers to any object and make a fetish of it; their conceptions of humanity and its capacities were necessarily vague, and without specific limits. The man who by unusual strength, or cunning, achieved something that others had failed to achieve, or something which they did not understand, was considered by them as differing from themselves; and, as we see in the belief of some Polynesians that only their chiefs have souls, or in that of the ancient Peruvians that their nobles were divine by birth, the ascribed difference was apt to be not one of degree only, but one of kind. Let them remember next, how gross were the notions of God, or rather of gods, prevalent during the same era and afterwards—how concretely gods were conceived as men of specific aspects dressed in specific ways—how their names were literally “the strong,” “the destroyer,” “the powerful one,”—how, according to the Scandinavian mythology, the “sacred duty of blood-revenge” was acted on by the gods themselves,—and how they were not only human in their vindictiveness, their cruelty, and their quarrels with each other,

but were supposed to have amours on earth, and to consume the viands placed on their altars. Add to which, that in various mythologies, Greek, Scandinavian, and others, the oldest beings are giants; that according to a traditional genealogy the gods, demi-gods, and in some cases men, are descended from these after the human fashion; and that while in the East we hear of sons of God who saw the daughters of men that they were fair, the Teutonic myths tell of unions between the sons of men and the daughters of the gods. Let them remember, too, that at first the idea of death differed widely from that which we have; that there are still tribes who, on the decease of one of their number, attempt to make the corpse stand, and put food into its mouth; that the Peruvians had feasts at which the mummies of their dead Incas presided, when, as Prescott says, they paid attention "to these insensible remains as if they were instinct with life;" that among the Fejees it is believed that every enemy has to be killed twice; that the Eastern Pagans give extension and figure to the soul, and attribute to it all the same members, all the same substances, both solid and liquid, of which our bodies are composed; and that it is the custom among most barbarous races to bury food, weapons, and trinkets along with the dead body, under the manifest belief that it will presently need them. Lastly, let them remember that the other world, as originally conceived, is simply some distant part of this world—some Elysian fields, some happy hunting-ground, accessible even to the living, and to which, after death, men travel in anticipation of a life analogous in general character to that which they led before. Then, co-ordinating these general facts—the ascription of unknown powers to chiefs and medicine men; the belief in deities having human forms, passions, and behaviour; the imperfect comprehension of death as distinguished from life; and the proximity of the future abode to the present, both in position and character—let them reflect whether they do not almost unavoidably suggest the conclusion that the aboriginal god is the dead chief: the chief not dead

in our sense, but gone away, carrying with him food and weapons to some rumoured region of plenty, some promised land, whither he had long intended to lead his followers, and whence he will presently return to fetch them. This hypothesis once entertained, is seen to harmonize with all primitive ideas and practices. The sons of the deified chief reigning after him, it necessarily happens that all early kings are held descendants of the gods; and the fact that alike in Assyria, Egypt, among the Jews, Phœnicians, and ancient Britons, kings' names were formed out of the names of the gods, is fully explained. The genesis of Polytheism out of Fetishism, by the successive migrations of the race of god-kings to the other world—a genesis illustrated in the Greek mythology, alike by the precise genealogy of the deities, and by the specifically asserted apotheosis of the later ones—tends further to bear it out. It explains the fact that in the old creeds, as in the still extant creed of the Otaheitans, every family has its guardian spirit, who is supposed to be one of their departed relatives; and that they sacrifice to these as minor gods—a practice still pursued by the Chinese and even by the Russians. It is perfectly congruous with the Grecian myths concerning the wars of the Gods with the Titans and their final usurpation; and it similarly agrees with the fact that among the Teutonic gods proper was one Freir who came among them by adoption, “but was born among the *Vanes*, a somewhat mysterious *other* dynasty of gods, who had been conquered and superseded by the stronger and more warlike Odin dynasty.” It harmonizes, too, with the belief that there are different gods to different territories and nations, as there were different chiefs; that these gods contend for supremacy as chiefs do; and it gives meaning to the boast of neighbouring tribes—“Our god is greater than your god.” It is confirmed by the notion universally current in early times, that the gods come from this other abode, in which they commonly live, and appear among men—speak to them, help them, punish them. And remembering this, it becomes manifest that the

prayers put up by primitive peoples to their gods for aid in battle, are meant literally—that their gods are expected to come back from the other kingdom they are reigning over, and once more fight the old enemies they had before warred against so implacably; and it needs but to name the Iliad, to remind every one how thoroughly they believed the expectation fulfilled.

All government, then, being originally that of the strong man who has become a fetish by some manifestation of superiority, there arises, at his death—his supposed departure on a long-projected expedition, in which he is accompanied by the slaves and concubines sacrificed at his tomb—there arises, then, the incipient division of religious from political control, of civil rule from spiritual. His son becomes deputed chief during his absence; his authority is cited as that by which his son acts; his vengeance is invoked on all who disobey his son; and his commands, as previously known or as asserted by his son, become the germ of a moral code: a fact we shall the more clearly perceive if we remember, that early moral codes inculcate mainly the virtues of the warrior, and the duty of exterminating some neighbouring tribe whose existence is an offence to the deity. From this point onwards, these two kinds of authority, at first complicated together as those of principal and agent, become slowly more and more distinct. As experience accumulates, and ideas of causation grow more precise, kings lose their supernatural attributes; and, instead of God-king, become God-descended king, God-appointed king, the Lord's anointed, the vicegerent of Heaven, ruler reigning by Divine right. The old theory, however, long clings to men in feeling, after it has disappeared in name; and "such divinity doth hedge a king," that even now, many, on first seeing one, feel a secret surprise at finding him an ordinary sample of humanity. The sacredness attaching to royalty attaches afterwards to its appended institutions—to legislatures, to laws. Legal and illegal are synonymous with right and wrong; the authority of Parliament is held unlimited; and a lingering faith in governmental power

continually generates unfounded hopes from its enactments. Political scepticism, however, having destroyed the divine *prestige* of royalty, goes on ever increasing, and promises ultimately to reduce the State to a purely secular institution, whose regulations are limited in their sphere, and have no other authority than the general will. Meanwhile, the religious control has been little by little separating itself from the civil, both in its essence and in its forms. While from the God-king of the savage have arisen in one direction, secular rulers who, age by age, have been losing the sacred attributes men ascribed to them; there has arisen in another direction, the conception of a deity, who, at first human in all things, has been gradually losing human materiality, human form, human passions, human modes of action: until now, anthropomorphism has become a reproach. Along with this wide divergence in men's ideas of the divine and civil ruler has been taking place a corresponding divergence in the codes of conduct respectively proceeding from them. While the king was a deputy-god—a governor such as the Jews looked for in the Messiah—a governor considered, as the Czar still is, “our God upon earth,”—it, of course, followed that his commands were the supreme rules. But as men ceased to believe in his supernatural origin and nature, his commands ceased to be the highest; and there arose a distinction between the regulations made by him, and the regulations handed down from the old god-kings, who were rendered ever more sacred by time and the accumulation of myths. Hence came respectively, Law and Morality: the one growing ever more concrete, the other more abstract; the authority of the one ever on the decrease, that of the other ever on the increase; originally the same, but now placed daily in more marked antagonism. Simultaneously there has been going on a separation of the institutions administering these two codes of conduct. While they were yet one, of course Church and State were one: the king was arch-priest, not nominally, but really—alike the giver of new commands and the chief interpreter of the old commands; and the deputy-priests coming out of his family were thus

simply expounders of the dictates of their ancestry : at first as recollected, and afterwards as ascertained by professed interviews with them. This union—which still existed practically during the middle ages, when the authority of kings was mixed up with the authority of the pope, when there were bishop-rulers having all the powers of feudal lords, and when priests punished by penances—has been, step by step, becoming less close. Though monarchs are still “defenders of the faith,” and ecclesiastical chiefs, they are but nominally such. Though bishops still have civil power, it is not what they once had. Protestantism shook loose the bonds of union ; Dissent has long been busy in organizing a mechanism for the exercise of religious control, wholly independent of law ; in America, a separate organization for that purpose already exists ; and if anything is to be hoped from the Anti-State-Church Association—or, as it has been newly named, “The Society for the Liberation of Religion from State Patronage and Control”—we shall presently have a separate organization here also. Thus alike in authority, in essence, and in form, political and spiritual rule have been ever more widely diverging from the same root. That increasing division of labour which marks the progress of society in other things, marks it also in this separation of government into civil and religious ; and if we observe how the morality which forms the substance of religions in general, is beginning to be purified from the associated creeds, we may anticipate that this division will be ultimately carried much further.

Passing now to the third species of control—that of Manners—we shall find that this, too, while it had a common genesis with the others, has gradually come to have a distinct sphere and a special embodiment. Among early aggregations of men before yet social observances existed, the sole forms of courtesy known were the signs of submission to the strong man ; as the sole law was his will, and the sole religion the awe of his supposed supernaturalness. Originally, ceremonies were modes of behaviour to the god-king. Our commonest titles

have been derived from his names. And all salutations were primarily worship paid to him. Let us trace out these truths in detail, beginning with titles.

The fact already noticed, that the names of early kings among divers races are formed by the addition of certain syllables to the names of their gods—which certain syllables, like our *Mac* and *Fitz*, probably mean “son of,” or “descended from”—at once gives meaning to the term *Father* as a divine title. And when we read, in Selden, that “the composition out of these names of Deities was not only proper to Kings: their Grandes and more honorable Subjects” (no doubt members of the royal race) “had sometimes the like;” we see how the term *Father*, properly used by these also, and by their multiplying descendants, came to be a title used by the people in general. And it is significant as bearing on this point, that among the most barbarous nation in Europe, where belief in the divine nature of the ruler still lingers, *Father* in this higher sense is still a regal distinction. When, again, we remember how the divinity at first ascribed to kings was not a complimentary fiction but a supposed fact; and how, further, under the Fetish-philosophy the celestial bodies are believed to be personages who once lived among men; we see that the appellations of oriental rulers, “Brother to the Sun,” &c., were probably once expressive of a genuine belief; and have simply, like many other things, continued in use after all meaning has gone out of them. We may infer, too, that the titles God, Lord, Divinity, were given to primitive rulers literally—that the *nostra divinitas* applied to the Roman emperors, and the various sacred designations that have been borne by monarchs, down to the still extant phrase, “Our Lord the King,” are the dead and dying forms of what were once living facts. From these names, God, Father, Lord, Divinity, originally belonging to the God-king, and afterwards to God and the king, the derivation of our commonest titles of respect is clearly traceable. There is reason to think that these titles were originally proper names. Not only do we see among

the Egyptians, where Pharaoh was synonymous with king, and among the Romans, where to be Cæsar, meant to be Emperor, that the proper names of the greatest men were transferred to their successors, and so became class names; but in the Scandinavian mythology we may trace a human title of honour up to the proper name of a divine personage. In Anglo-Saxon *bealdor*, or *baldor*, means *Lord*; and Balder is the name of the favourite of Odin's sons—the gods who with him constitute the Teutonic Pantheon. How these names of honour became general is easily understood. The relatives of the primitive kings—the grandees described by Selden as having names formed on those of the gods, and shown by this to be members of the divine race—necessarily shared in the epithets, such as *Lord*, descriptive of superhuman relationships and nature. Their ever-multiplying offspring inheriting these, gradually rendered them comparatively common. And then they came to be applied to every man of power: partly from the fact that, in these early days when men conceived divinity simply as a stronger kind of humanity, great persons could be called by divine epithets with but little exaggeration; partly from the fact that the unusually potent were apt to be considered as unrecognised or illegitimate descendants of “the strong, the destroyer, the powerful one;” and partly, also, from compliment and the desire to propitiate. Progressively as superstition diminished, this last became the sole cause. And if we remember that it is the nature of compliment, as we daily hear it, to attribute more than is due—that in the constantly widening application of “esquire,” in the perpetual repetition of “your honour” by the fawning Irishman, and in the use of the name “gentleman” to any coalheaver or dustman by the lower classes of London, we have current examples of the depreciation of titles consequent on compliment—and that in barbarous times, when the wish to propitiate was stronger than now, this effect must have been greater; we shall see that there naturally arose an extensive misuse of all early distinctions. Hence the facts, that the Jews called Herod a god; that *Father*, in its

higher sense, was a term used among them by servants to masters; that *Lord* was applicable to any person of worth and power. Hence, too, the fact that, in the later periods of the Roman Empire, every man saluted his neighbour as *Dominus* and *Rex*. But it is in the titles of the middle ages, and in the growth of our modern ones out of them, that the process is most clearly seen. *Herr*, *Don*, *Signior*, *Seigneur*, *Sennor*, were all originally names of rulers—of feudal lords. By the complimentary use of these names to all who could, on any pretence, be supposed to merit them, and by successive degradations of them from each step in the descent to a still lower one, they have come to be common forms of address. At first the phrase in which a serf accosted his despotic chief, *mein herr* is now familiarly applied in Germany to ordinary people. The Spanish title *Don*, once proper to noblemen and gentlemen only, is now accorded to all classes. So, too, is it with *Signior* in Italy. *Seigneur* and *Monseigneur*, by contraction in *Sieur* and *Monsieur*, have produced the term of respect claimed by every Frenchman. And whether *Sire* be or be not a like contraction of *Signior*, it is clear that, as it was borne by sundry of the ancient feudal lords of France, who, as Selden says, “affected rather to be stiled by the name of *Sire* than Baron, as *Le Sire de Montmorencie*, *Le Sire de Beauieu*, and the like,” and as it has been commonly used to monarchs, our word *Sir*, which is derived from it, originally meant lord or king. Thus, too, is it with feminine titles. *Lady*, which, according to Horne Tooke, means *exalted*, and was at first given only to the few, is now given to all women of education. *Dame*, once an honourable name to which, in old books, we find the epithets of “high-born” and “stately” affixed, has now, by repeated widenings of its application, become relatively a term of contempt. And if we trace the compound of this, *ma Dame*, through its contractions—*Madam*, *ma’am*, *mam*, *mum*, we find that the “Yes’m” of Sally to her mistress is originally equivalent to “Yes, my exalted,” or “Yes, your highness.” Throughout, therefore, the genesis of words of honour has

been the same. Just as with the Jews and with the Romans, has it been with the modern Europeans. Tracing these everyday names to their primitive significations of *lord* and *king*, and remembering that in aboriginal societies these were applied only to the gods and their descendants, we arrive at the conclusion that our familiar *Sir* and *Monsieur* are, in their primary and expanded meanings, terms of adoration.

Further to illustrate this gradual depreciation of titles, and to confirm the inference drawn, it may be well to notice in passing, that the oldest of them have, as might be expected, been depreciated to the greatest extent. Thus, *Master*—a word proved by its derivation and by the similarity of the connate words in other languages (Fr., *maître* for *maister*; Russ., *master*; Dan., *mester*; Ger., *meister*) to have been one of the earliest in use for expressing lordship—has now become applicable to children only, and, under the modification of “Mister,” to persons next above the labourer. Again, knighthood, the oldest kind of dignity, is also the lowest; and Knight Bachelor, which is the lowest order of knighthood, is more ancient than any other of the orders. Similarly, too, with the peerage: Baron is alike the earliest and least elevated of its divisions. This continual degradation of all names of honour has, from time to time, made it requisite to introduce new ones having that distinguishing effect which the originals had lost by generality of use; just as our habit of misapplying superlatives has, by gradually destroying their force, entailed the need for fresh ones. And if, within the last thousand years, this process has produced effects thus marked, we may readily conceive how, during previous thousands, the titles of gods and demi-gods came to be used to all persons exercising power; as they have since come to be used to persons of respectability.

If from names of honour we turn to phrases of honour, we find similar facts. The oriental styles of address, applied to ordinary people—“I am your slave,” “All I have is yours,” “I am your sacrifice”—attribute to the individual spoken to the same greatness that *Monsieur* and *My Lord* do: they

ascribe to him the character of an all-powerful ruler, so immeasurably superior to the speaker as to be his owner. So, likewise, with the Polish expressions of respect—"I throw myself under your feet," "I kiss your feet." In our now meaningless subscription to a formal letter—"Your most obedient servant"—the same thing is visible. Nay, even in the familiar signature "Yours faithfully," the "yours," if interpreted as originally meant, is the expression of a slave to his master. All these dead forms were once living embodiments of fact—were primarily the genuine indications of that submission to authority which they verbally assert; were afterwards naturally used by the weak and cowardly to propitiate those above them; gradually grew to be considered the due of such; and, by a continually wider misuse, have lost their meanings, as *Sir* and *Master* have done. That, like titles, they were in the beginning used only to the God-king, is indicated by the fact that, like titles, they were subsequently used in common to God and the king. Religious worship has ever largely consisted of professions of obedience, of being God's servants, of belonging to him to do what he will with. Like titles, therefore, these common phrases of honour had a devotional origin. Perhaps, however, it is in the use of the word *you* as a singular pronoun that the popularizing of what were once supreme distinctions is most markedly illustrated. This speaking of a single individual in the plural, was originally an honour given only to the highest—was the reciprocal of the imperial "we" assumed by such. Yet now, by being applied to successively lower and lower classes, it has become all but universal. Only by one sect of Christians, and in a few secluded districts, is the primitive *thou* still used. And the *you*, in becoming common to all ranks, has simultaneously lost every vestige of the honour once attaching to it.

But the genesis of Manners out of forms of allegiance and worship, is above all shown in men's modes of salutation. Note first the significance of the word. Among the Romans, the *salutatio* was a daily homage paid by clients and inferiors to

their superiors. This was alike the case with civilians and in the army. The very derivation of our word, therefore, is suggestive of submission. Passing to particular forms of obeisance (mark the work again), let us begin with the Eastern one of baring the feet. This was, primarily, a mark of reverence, alike to a god and a king. The act of Moses before the burning bush, and the practice of Mahometans, who are sworn on the Koran with their shoes off, exemplify the one employment of it; the custom of the Persians, who remove their shoes on entering the presence of their monarch, exemplifies the other. As usual, however, this homage, paid next to inferior rulers, has descended from grade to grade. In India it is a common mark of respect; a polite man in Turkey always leaves his shoes at the door, while the lower orders of Turks never enter the presence of their superiors but in their stockings; and in Japan, this baring of the feet is an ordinary salutation of man to man. Take another case. Selden, describing the ceremonies of the Romans, says:—"For whereas it was usuall either to kiss the Images of their Gods, or adoring them, to stand somewhat off before them, solemnly moving the right hand to the lips, and then, casting it as if they had cast kisses, to turne the body on the same hand (which was the right forme of Adoration), it grew also by custom, first that the Emperors, being next to Deities, and by some accounted as Deities, had the like done to them in acknowledgment of their Greatnes." If, now, we call to mind the awkward salute of a village school-boy, made by putting his open hand up to his face and describing a semicircle with his forearm; and if we remember that the salute thus used as a form of reverence in country districts, is most likely a remnant of the feudal times; we shall see reason for thinking that our common wave of the hand to a friend across the street, represents what was primarily a devotional act.

Similarly have originated all forms of respect depending upon inclinations of the body. Entire prostration is the aboriginal sign of submission. The passage of Scripture, "Thou

hast put all under his feet," and that other one, so suggestive in its anthropomorphism, "The Lord said unto my Lord, sit thou at my right hand, until I make thine enemies thy footstool," imply, what the Assyrian sculptures fully bear out, that it was the practice of the ancient god-kings of the East to trample upon the conquered. And when we bear in mind that there are existing savages who signify submission by placing the neck under the foot of the person submitted to, it becomes obvious that all prostration, especially when accompanied by kissing the foot, expressed a willingness to be trodden upon—was an attempt to mitigate wrath by saying, in signs, "Tread on me if you will." Remembering, further, that kissing the foot, as of the Pope and of a saint's statue, still continues in Europe to be a mark of extreme reverence; that prostration to feudal lords was once general; and that its disappearance must have taken place, not abruptly, but by gradual modification into something else; we have ground for deriving from these deepest of humiliations all inclinations of respect: especially as the transition is traceable. The reverence of a Russian serf, who bends his head to the ground, and the salaam of the Hindoo, are abridged prostrations; a bow is a short salaam; a nod is a short bow. Should any hesitate to admit this conclusion, then perhaps, on being reminded that the lowest of these obeisances are common where the submission is most abject; that among ourselves the profundity of the bow marks the amount of respect; and lastly, that the bow is even now used devotionally in our churches—by Catholics to their altars, and by Protestants at the name of Christ—they will see sufficient evidence for thinking that this salutation also was originally worship.

The same may be said, too, of the curtsy, or courtesy, as it is otherwise written. Its derivation from *courtoisie*, courteousness, that is, behaviour like that at court, at once shows that it was primarily the reverence paid to a monarch. And if we call to mind that falling upon the knees, or upon one knee, has been a common obeisance of subjects to rulers; that in ancient

manuscripts and tapestries, servants are depicted as assuming this attitude while offering the dishes to their masters at table; and that this same attitude is assumed towards our own queen at every presentation; we may infer, what the character of the curtsy itself suggests, that it is an abridged act of kneeling. As the word has been contracted from *courtoisie* into curtsy; so the motion has been contracted from a placing of the knee on the floor, to a lowering of the knee towards the floor. Moreover, when we compare the curtsy of a lady with the awkward one a peasant girl makes, which, if continued, would bring her down on both knees, we may see in this last a remnant of that greater reverence required of serfs. And when, from considering that simple kneeling of the West, still represented by the curtsy, we pass Eastward, and note the attitude of the Mahomedan worshipper, who not only kneels but bows his head to the ground, we may infer that the curtsy also, is an evanescent form of the aboriginal prostration. In further evidence of this it may be remarked, that there has but recently disappeared from the salutations of men, an action having the same proximate derivation with the curtsy. That backward sweep of the foot with which the conventional stage-sailor accompanies his bow—a movement which prevailed generally in past generations, when “a bow and a scrape” went together, and which, within the memory of living persons, was made by boys to their schoolmaster with the effect of wearing a hole in the floor—is pretty clearly a preliminary to going on one knee. A motion so ungainly could never have been intentionally introduced; even if the artificial introduction of obeisances were possible. Hence we must regard it as the remnant of something antecedent: and that this something antecedent was humiliating may be inferred from the phrase, “scraping an acquaintance;” which, being used to denote the gaining of favour by obsequiousness, implies that the scrape was considered a mark of servility—that is, of *serf*-ility.

Consider, again, the uncovering of the head. Almost everywhere this has been a sign of reverence, alike in temples and

before potentates; and it yet preserves among us some of its original meaning. Whether it rains, hails, or shines, you must keep your head bare while speaking to the monarch; and on no plea may you remain covered in a place of worship. As usual, however, this ceremony, at first a submission to gods and kings, has become in process of time a common civility. Once an acknowledgment of another's unlimited supremacy, the removal of the hat is now a salute accorded to very ordinary persons; and that uncovering, originally reserved for entrance into "the house of God," good manners now dictates on entrance into the house of a common labourer.

Standing, too, as a mark of respect, has undergone like extensions in its application. Shown, by the practice in our churches, to be intermediate between the humiliation signified by kneeling and the self-respect which sitting implies, and used at courts as a form of homage when more active demonstrations of it have been made, this posture is now employed in daily life to show consideration; as seen alike in the attitude of a servant before a master, and in that rising which politeness prescribes on the entrance of a visitor.

Many other threads of evidence might have been woven into our argument. As, for example, the significant fact, that if we trace back our still existing law of primogeniture—if we consider it as displayed by Scottish clans, in which not only ownership but government devolved from the beginning on the eldest son of the eldest—if we look further back, and observe that the old titles of lordship, *Signor*, *Seigneur*, *Sennor*, *Sire*, *Sieur*, all originally mean senior, or elder—if we go Eastward, and find that *Sheick* has a like derivation, and that the Oriental names for priests, as *Pir*, for instance, are literally interpreted *old man*—if we note in Hebrew records how primeval is the ascribed superiority of the first-born, how great the authority of elders, and how sacred the memory of patriarchs—and if, then, we remember that among divine titles are "Ancient of Days," and "Father of Gods and men;"—we see how completely these facts harmonize with the hypothesis, that the aboriginal god is the

first man sufficiently great to become a tradition, the earliest whose power and deeds made him remembered; that hence antiquity unavoidably became associated with superiority, and age with nearness in blood to "the powerful one;" that so there naturally arose that domination of the eldest which characterizes all history, and that theory of human degeneracy which even yet survives. We might further dwell on the facts, that *Lord* signifies high-born, or, as the same root gives a word meaning heaven, possibly heaven-born; that, before it became common, *Sir* or *Sire*, as well as *Father*, was the distinction of a priest; that *worship*, originally worth-ship—a term of respect that has been used commonly, as well as to magistrates—is also our term for the act of attributing greatness or worth to the Deity; so that to ascribe worth-ship to a man is to worship him. We might make much of the evidence that all early governments are more or less distinctly theocratic; and that among ancient Eastern nations even the commonest forms and customs appear to have been influenced by religion. We might enforce our argument respecting the derivation of ceremonies, by tracing out the aboriginal obsecration made by putting dust on the head, which probably symbolizes putting the head in the dust; by affiliating the practice prevailing among certain tribes, of doing another honour by presenting him with a portion of hair torn from the head—an act which seems tantamount to saying, "I am your slave;" by investigating the Oriental custom of giving to a visitor any object he speaks of admiringly, which is pretty clearly a carrying out of the compliment, "All I have is yours."

Without enlarging, however, on these and many minor facts, we venture to think that the evidence already assigned is sufficient to justify our position. Had the proofs been few, or of one kind, little faith could have been placed in the inference. But numerous as they are, alike in the case of titles, in that of complimentary phrases, and in that of salutes—similar and simultaneous, too, as the process of depreciation has been in all of these; the evidences become strong by mutual confirma-

tion. And when we recollect, also, that not only have the results of this process been visible in various nations and in all times, but that they are occurring among ourselves at the present moment, and that the causes assigned for previous depreciations may be seen daily working out other ones—when we recollect this, it becomes scarcely possible to doubt that the process has been as alleged; and that our ordinary words, acts, and phrases of civility were originally acknowledgments of submission to another's omnipotence.

Thus the general doctrine, that all kinds of government exercised over men were at first one government—that the political, the religious, and the ceremonial forms of control are divergent branches of a general and once indivisible control—begins to look tenable. When, with the above facts fresh in mind, we read primitive records, and find that “there were giants in those days”—when we remember that in Eastern traditions Nimrod, among others, figures in all the characters of giant, king, and divinity—when we turn to the sculptures exhumed by Mr. Layard, and contemplating in them the effigies of kings driving over enemies, trampling on prisoners, and adored by prostrate slaves, then observe how their actions correspond to the primitive names for the divinity, “the strong,” “the destroyer,” “the powerful one”—when we find that the earliest temples were also the residences of the kings—and when, lastly, we discover that among races of men still living, there are current superstitions analogous to those which old records and old buildings indicate; we begin to realize the probability of the hypothesis that has been set forth. Going back, in imagination, to the remote era when men's theories of things were yet unformed; and conceiving to ourselves the conquering chief as dimly figured in ancient myths, and poems, and ruins; we may see that all rules of conduct whatever spring from his will. Alike legislator and judge, all quarrels among his subjects are decided by him; and his words become the Law. Awe of him is the incipient Religion; and his maxims furnish its first precepts. Submission is made to him

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in the forms he prescribes; and these give birth to Manners. From the first, time develops political allegiance and the administration of justice; from the second, the worship of a being whose personality becomes ever more vague, and the inculcation of precepts ever more abstract; from the third, forms of honour and the rules of etiquette. In conformity with the law of evolution of all organized bodies, that general functions are gradually separated into the special functions constituting them, there have grown up in the social organism for the better performance of the governmental office, an apparatus of law-courts, judges, and barristers; a national church, with its bishops and priests; and a system of caste, titles, and ceremonies, administered by society at large. By the first, overt aggressions are cognized and punished; by the second, the disposition to commit such aggressions is in some degree checked; by the third, those minor breaches of good conduct, which the others do not notice, are denounced and chastised. Law and Religion control behaviour in its essentials: Manners control it in its details. For regulating those daily actions which are too numerous and too unimportant to be officially directed, there comes into play this subtler set of restraints. And when we consider what these restraints are—when we analyze the words, and phrases, and salutes employed, we see that in origin as in effect, the system is a setting up of temporary governments between all men who come in contact, for the purpose of better managing the intercourse between them.

From the proposition, that these several kinds of government are essentially one, both in genesis and function, may be deduced several important corollaries, directly bearing on our special topic.

Let us first notice, that there is not only a common origin and office for all forms of rule, but a common necessity for them. The aboriginal man, coming fresh from the killing of bears and from lying in ambush for his enemy, has, by the necessities of his condition, a nature requiring to be curbed in

its every impulse. Alike in war and in the chase, his daily discipline has been that of sacrificing other creatures to his own needs and passions. His character, bequeathed to him by ancestors who led similar lives, is moulded by this discipline—is fitted to this existence. The unlimited selfishness, the love of inflicting pain, the bloodthirstiness, thus kept active, he brings with him into the social state. These dispositions put him in constant danger of conflict with his equally savage neighbour. In small things as in great, in words as in deeds, he is aggressive; and is hourly liable to the aggressions of others like natured. Only, therefore, by the most rigorous control exercised over all actions, can the primitive unions of men be maintained. There must be a ruler strong, remorseless, and of indomitable will; there must be a creed terrible in its threats to the disobedient; and there must be the most servile submission of all inferiors to superiors. The law must be cruel; the religion must be stern; the ceremonies must be strict. The co-ordinate necessity for these several kinds of restraint might be largely illustrated from history were there space. Suffice it to point out, that where the civil power has been weak, the multiplication of thieves, assassins, and banditti, has indicated the approach of social dissolution; that when, from the corruptness of its ministry, religion has lost its influence, as it did just before the Flagellants appeared, the State has been endangered; and that the disregard of established social observances has ever been an accompaniment of political revolutions. Whoever doubts the necessity for a government of manners proportionate in strength to the co-existing political and religious governments, will be convinced on calling to mind that until recently even elaborate codes of behaviour failed to keep gentlemen from quarrelling in the streets and fighting duels in taverns; and on remembering further, that even now people exhibit at the doors of a theatre, where there is no ceremonial law to rule them, a degree of aggressiveness which would produce confusion if carried into social intercourse.

As might be expected, we find that, having a common origin and like general functions, these several controlling agencies act during each era with similar degrees of vigour. Under the Chinese despotism, stringent and multitudinous in its edicts and harsh in the enforcement of them, and associated with which there is an equally stern domestic despotism exercised by the eldest surviving male of the family, there exists a system of observances alike complicated and rigid. There is a tribunal of ceremonies. Previous to presentation at court, ambassadors pass many days in practising the required forms. Social intercourse is cumbered by endless compliments and obeisances. Class distinctions are strongly marked by badges. The chief regret on losing an only son is, that there will be no one to perform the sepulchral rites. And if there wants a definite measure of the respect paid to social ordinances, we have it in the torture to which ladies submit in having their feet crushed. In India, and indeed throughout the East, there exists a like connection between the pitiless tyranny of rulers, the dread terrors of immemorial creeds, and the rigid restraint of unchangeable customs: the caste regulations continue still unalterable; the fashions of clothes and furniture have remained the same for ages; suttees are so ancient as to be mentioned by Strabo and Diodorus Siculus; justice is still administered at the palace-gates as of old; in short, "every usage is a precept of religion and a maxim of jurisprudence." A similar relationship of phenomena was exhibited in Europe during the Middle Ages. While all its governments were autocratic, while feudalism held sway, while the Church was unshorn of its power, while the criminal code was full of horrors and the hell of the popular creed full of terrors, the rules of behaviour were both more numerous and more carefully conformed to than now. Differences of dress marked divisions of rank. Men were limited by law to a certain width of shoes; and no one below a specified degree might wear a cloak less than so many inches long. The symbols on banners and shields were carefully attended to. Heraldry was an important

branch of knowledge. Precedence was strictly insisted on. And those various salutes of which we now use the abridgments were gone through in full. Even during our own last century, with its corrupt House of Commons and little-curbed monarchs, we may mark a correspondence of social formalities. Gentlemen were still distinguished from lower classes by dress; people sacrificed themselves to inconvenient requirements—as powder, hooped petticoats, and towering head-dresses; and children addressed their parents as *Sir* and *Madam*.

A further corollary naturally following this last, and almost, indeed, forming part of it, is, that these several kinds of government decrease in stringency at the same rate. Simultaneously with the decline in the influence of priesthoods, and in the fear of eternal torments—simultaneously with the mitigation of political tyranny, the growth of popular power, and the amelioration of criminal codes; has taken place that diminution of formalities and that fading of distinctive marks, now so observable. Looking at home, we may note that there is less attention to precedence than there used to be. No one in our day ends an interview with the phrase “your humble servant.” The employment of the word *Sir*, once general in social intercourse, is at present considered bad breeding; and on the occasions calling for them, it is held vulgar to use the words “Your Majesty,” or “Your Royal Highness,” more than once in a conversation. People no longer formally drink each other’s healths; and even the taking wine with each other at dinner has ceased to be fashionable. The taking-off of hats between gentlemen has been gradually falling into disuse. Even when the hat is removed, it is no longer swept out at arm’s length, but is simply lifted. Hence the remark made upon us by foreigners, that we take off our hats less than any other nation in Europe—a remark that should be coupled with the other, that we are the freest nation in Europe. As already implied, this association of facts is not accidental. These titles of address and modes of salutation, bearing about them, as they all do, something of that scrvility which marks

their origin, become distasteful in proportion as men become more independent themselves, and sympathise more with the independence of others. The feeling which makes the modern gentleman tell the labourer standing bareheaded before him to put on his hat—the feeling which gives us a dislike to those who cringe and fawn—the feeling which makes us alike assert our own dignity and respect that of others—the feeling which thus leads us more and more to discountenance all forms and names which confess inferiority and submission; is the same feeling which resists despotic power and inaugurates popular government, denies the authority of the Church and establishes the right of private judgment.

A fourth fact, akin to the foregoing, is, that these several kinds of government not only decline together, but corrupt together. By the same process that a Court of Chancery becomes a place not for the administration of justice, but for the withholding of it—by the same process that a national church, from being an agency for moral control, comes to be merely a thing of formulas and tithes and bishopricks—by this same process do titles and ceremonies that once had a meaning and a power become empty forms. Coats of arms which served to distinguish men in battle, now figure on the carriage panels of retired grocers. Once a badge of high military rank, the shoulder-knot has become, on the modern footman, a mark of servitude. The name Banneret, which once marked a partially-created Baron—a Baron who had passed his military “little go”—is now, under the modification of Baronet, applicable to any one favoured by wealth or interest or party feeling. Knighthood has so far ceased to be an honour, that men now honour themselves by declining it. The military dignity *Escuyer* has, in the modern Esquire, become a wholly un-military affix. Not only do titles, and phrases, and salutes cease to fulfil their original functions, but the whole apparatus of social forms tends to become useless for its original purpose—the facilitation of social intercourse. Those most learned in ceremonies, and most precise in the observance of them, are

not always the best behaved ; as those deepest read in creeds and scriptures are not therefore the most religious ; nor those who have the clearest notions of legality and illegality, the most honest. Just as lawyers are of all men the least noted for probity ; as cathedral towns have a lower moral character than most others ; so, if Swift is to be believed, courtiers are "the most insignificant race of people that the island can afford, and with the smallest tincture of good manners."

But perhaps it is in that class of social observances comprehended under the term Fashion, which we must here discuss parenthetically, that this process of corruption is seen with the greatest distinctness. As contrasted with Manners, which dictate our minor acts in relation to other persons, Fashion dictates our minor acts in relation to ourselves. While the one prescribes that part of our deportment which directly affects our neighbours ; the other prescribes that part of our deportment which is primarily personal, and in which our neighbours are concerned only as spectators. Thus distinguished as they are, however, the two have a common source. For while, as we have shown, Manners originate by imitation of the behaviour pursued *towards* the great ; Fashion originates by imitation of the behaviour *of* the great. While the one has its derivation in the titles, phrases, and salutes used *to* those in power ; the other is derived from the habits and appearances exhibited *by* those in power. The Carrib mother who squeezes her child's head into a shape like that of the chief ; the young savage who makes marks on himself similar to the scars carried by the warriors of his tribe (which is probably the origin of tattooing) ; the Highlander who adopts the plaid worn by the head of his clan ; the courtiers who affect greyness, or limp, or cover their necks, in imitation of their king ; and the people who ape the courtiers ; are alike acting under a kind of government connate with that of Manners, and, like it too, primarily beneficial. For notwithstanding the numberless absurdities into which this copyism has led people, from nose-rings to ear-rings, from painted faces to beauty-spots, from shaven heads to powdered wigs, from filed teeth and stained nails to bell-girdles, peaked shoes, and

breeches stuffed with bran,—it must yet be concluded, that as the strong men, the successful men, the men of will, intelligence, and originality, who have got to the top, are, on the average, more likely to show judgment in their habits and tastes than the mass, the imitation of such is advantageous. By and by, however, Fashion, corrupting like these other forms of rule, almost wholly ceases to be an imitation of the best, and becomes an imitation of quite other than the best. As those who take orders are not those having a special fitness for the priestly office, but those who see their way to a living by it; as legislators and public functionaries do not become such by virtue of their political insight and power to rule, but by virtue of birth, acreage, and class influence; so, the self-elected clique who set the fashion, gain this prerogative, not by their force of nature, their intellect, their higher worth or better taste, but gain it solely by their unchecked assumption. Among the initiated are to be found neither the noblest in rank, the chief in power, the best cultured, the most refined, nor those of greatest genius, wit, or beauty; and their reunions, so far from being superior to others, are noted for their inanity. Yet, by the example of these sham great, and not by that of the truly great, does society at large now regulate its goings and comings, its hours, its dress, its small usages. As a natural consequence, these have generally little or none of that suitableness which the theory of fashion implies they should have. But instead of a continual progress towards greater elegance and convenience, which might be expected to occur did people copy the ways of the really best, or follow their own ideas of propriety, we have a reign of mere whim, of unreason, of change for the sake of change, of wanton oscillations from either extreme to the other—a reign of usages without meaning, times without fitness, dress without taste. And thus life *à la mode*, instead of being life conducted in the most rational manner, is life regulated by spendthrifts and idlers, milliners and tailors, dandies and silly women.

To these several corollaries—that the various orders of control exercised over men have a common origin and a common func-

tion, are called out by co-ordinate necessities and co-exist in like stringency, decline together and corrupt together—it now only remains to add that they become needless together. Consequent as all kinds of government are upon the unfitness of the aboriginal man for social life; and diminishing in coerciveness as they all do in proportion as this unfitness diminishes; they must one and all come to an end as humanity acquires complete adaptation to its new conditions. That discipline of circumstances which has already wrought out such great changes in us, must go on eventually to work out yet greater ones. That daily curbing of the lower nature and culture of the higher, which out of cannibals and devil-worshippers has evolved philanthropists, lovers of peace, and haters of superstition, cannot fail to evolve out of these, men as much superior to them as they are to their progenitors. The causes that have produced past modifications are still in action; must continue in action as long as there exists any incongruity between man's desires and the requirements of the social state; and must eventually make him organically fit for the social state. As it is now needless to forbid man-eating and Fetishism, so will it ultimately become needless to forbid murder, theft, and the minor offences of our criminal code. When human nature has grown into conformity with the moral law, there will need no judges and statute-books; when it spontaneously takes the right course in all things, as in some things it does already, prospects of future reward or punishment will not be wanted as incentives; and when fit behaviour has become instinctive, there will need no code of ceremonies to say how behaviour shall be regulated.

Thus, then, may be recognised the meaning, the naturalness, the necessity of those various eccentricities of reformers which we set out by describing. They are not accidental; they are not mere personal caprices, as people are apt to suppose. On the contrary, they are inevitable results of the law of relationship above illustrated. That community of genesis, function, and decay which all forms of restraint exhibit, is simply the obverse

of the fact at first pointed out, that they have in two sentiments of human nature a common preserver and a common destroyer. Awe of power originates and cherishes them all: love of freedom undermines and periodically weakens them all. The one defends despotism and asserts the supremacy of laws, adheres to old creeds and supports ecclesiastical authority, pays respect to titles and conserves forms; the other, putting rectitude above legality, achieves periodical instalments of political liberty, inaugurates Protestantism and works out its consequences, ignores the senseless dictates of Fashion and emancipates men from dead customs. To the true reformer no institution is sacred, no belief above criticism. Everything shall conform itself to equity and reason; nothing shall be saved by its prestige. Conceding to each man liberty to pursue his own ends and satisfy his own tastes, he demands for himself like liberty; and consents to no restrictions on this, save those which other men's equal claims involve. No matter whether it be an ordinance of one man, or an ordinance of all men, if it trenches on his legitimate sphere of action, he denies its validity. The tyranny that would impose on him a particular style of dress and a set mode of behaviour, he resists equally with the tyranny that would limit his buyings and sellings, or dictate his creed. Whether the regulation be formally made by a legislature, or informally made by society at large—whether the penalty for disobedience be imprisonment, or frowns and social ostracism, he sees to be a question of no moment. He will utter his belief notwithstanding the threatened punishment; he will break conventions spite of the petty persecutions that will be visited on him. Show him that his actions are inimical to his fellow-men, and he will pause. Prove that he is disregarding their legitimate claims—that he is doing what in the nature of things must produce unhappiness; and he will alter his course. But until you do this—until you demonstrate that his proceedings are essentially inconvenient or inelegant, essentially irrational, unjust, or ungenerous, he will persevere.

Some, indeed, argue that his conduct is unjust and un-

generous. They say that he has no right to annoy other people by his whims; that the gentleman to whom his letter comes with no "Esq." appended to the address, and the lady whose evening party he enters with gloveless hands, are vexed at what they consider his want of respect or want of breeding; that thus his eccentricities cannot be indulged save at the expense of his neighbours' feelings; and that hence his nonconformity is in plain terms selfishness.

He answers that this position, if logically developed, would deprive men of all liberty whatever. Each must conform all his acts to the public taste, and not his own. The public taste on every point having been once ascertained, men's habits must thenceforth remain for ever fixed; seeing that no man can adopt other habits without sinning against the public taste, and giving people disagreeable feelings. Consequently, be it an era of pig-tails or high-heeled shoes, of starched ruffs or trunk-hose, all must continue to wear pig-tails, high-heeled shoes, starched ruffs, or trunk-hose to the crack of doom.

If it be still urged that he is not justified in breaking through others' forms that he may establish his own, and so sacrificing the wishes of many to the wishes of one, he replies that all religious and political changes might be negated on like grounds. He asks whether Luther's sayings and doings were not extremely offensive to the mass of his cotemporaries; whether the resistance of Hampden was not disgusting to the time-servers around him; whether every reformer has not shocked men's prejudices and given immense displeasure by the opinions he uttered. The affirmative answer he follows up by demanding what right the reformer has, then, to utter these opinions; whether he is not sacrificing the feelings of many to the feelings of one: and so proves that, to be consistent, his antagonists must condemn not only all nonconformity in actions, but all nonconformity in thoughts.

His antagonists rejoin that *his* position, too, may be pushed to an absurdity. They argue that if a man may offend by the disregard of some forms, he may as legitimately do so by the disregard of all; and they inquire—Why should he not go

out to dinner in a dirty shirt, and with an unshorn chin? Why should he not spit on the drawing-room carpet, and stretch his heels up to the mantel-shelf?

The convention-breaker answers, that to ask this, implies a confounding of two widely-different classes of actions—the actions that are *essentially* displeasurable to those around, with the actions that are but *incidentally* displeasurable to them. He whose skin is so unclean as to offend the nostrils of his neighbours, or he who talks so loudly as to disturb a whole room, may be justly complained of, and rightly excluded by society from its assemblies. But he who presents himself in a surtout in place of a dress-coat, or in brown trousers instead of black, gives offence not to men's senses, or their innate tastes, but merely to their prejudices, their bigotry of convention. It cannot be said that his costume is less elegant or less intrinsically appropriate than the one prescribed; seeing that a few hours earlier in the day it is admired. It is the implied rebellion, therefore, that annoys. How little the cause of quarrel has to do with the dress itself, is seen in the fact that a century ago black clothes would have been thought preposterous for hours of recreation, and that a few years hence some now forbidden style may be nearer the requirements of Fashion than the present one. Thus the reformer explains that it is not against the natural restraints, but against the artificial ones, that he protests; and that manifestly the fire of sneers and angry glances which he has to bear, is poured upon him because he will not bow down to the idol which society has set up.

Should he be asked how we are to distinguish between conduct that is *absolutely* disagreeable to others, and conduct that is *relatively* so, he answers, that they will distinguish themselves, if men will let them. Actions intrinsically repugnant will ever be frowned upon, and must ever remain as exceptional as now. Actions not intrinsically repugnant will establish themselves as proper. No relaxation of customs will introduce the practice of going to a party in muddy boots, and with unwashed hands; for the dislike of dirt would continue were Fashion abolished to-morrow. That love of approbation which

now makes people so solicitous to be *en règle* would still exist—would still make them careful of their personal appearance—would still induce them to seek admiration by making themselves ornamental—would still cause them to respect the natural laws of good behaviour, as they now do the artificial ones. The change would simply be from a repulsive monotony to a picturesque variety. And if there be any regulations respecting which it is uncertain whether they are based on reality or on convention, experiment will soon decide, if due scope be allowed.

When at length the controversy comes round, as controversies often do, to the point whence it started, and the "party of order" repeat their charge against the rebel, that he is sacrificing the feelings of others to the gratification of his own wilfulness, he replies once for all that they cheat themselves by mis-statements. He accuses them of being so despotic, that, not content with being masters over their own ways and habits, they would be masters over his also; and grumble because he will not let them. He merely asks the same freedom which they exercise; they, however, propose to regulate his course as well as their own—to cut and clip his mode of life into agreement with their approved pattern; and then charge him with wilfulness and selfishness, because he does not quietly submit! He warns them that he shall resist, nevertheless; and that he shall do so, not only for the assertion of his own independence, but for their good. He tells them that they are slaves, and know it not; that they are shackled, and kiss their chains; that they have lived all their days in prison, and complain at the walls being broken down. He says he must persevere, however, with a view to his own release; and, in spite of their present expostulations, he prophesies that when they have recovered from the fright which the prospect of freedom produces, they will thank him for aiding in their emancipation.

Unamiable as seems this find-fault mood, offensive as is this defiant attitude, we must beware of overlooking the truths

enunciated, in dislike of the advocacy. It is an unfortunate hindrance to all innovation, that in virtue of their very function, the innovators stand in a position of antagonism; and the disagreeable manners, and sayings, and doings, which this antagonism generates, are commonly associated with the doctrines promulgated. Quite forgetting that whether the thing attacked be good or bad, the combative spirit is necessarily repulsive; and quite forgetting that the toleration of abuses seems amiable merely from its passivity; the mass of men contract a bias against advanced views, and in favour of stationary ones, from intercourse with their respective adherents. "Conservatism," as Emerson says, "is debonnaire and social; reform is individual and imperious." And this remains true, however vicious the system conserved, however righteous the reform to be effected. Nay, the indignation of the purists is usually extreme in proportion as the evils to be got rid of are great. The more urgent the required change, the more intemperatè is the vehemence of its promoters. Let no one, then, confound with the principles of this social nonconformity the acerbity and the disagreeable self-assertion of those who first display it.

The most plausible objection raised against resistance to conventions, is grounded on its impolicy, considered even from the progressist's point of view. It is urged by many of the more liberal and intelligent—usually those who have themselves shown some independence of behaviour in earlier days—that to rebel in these small matters is to destroy your own power of helping on reform in greater matters. "If you show yourself eccentric in manners or dress, the world," they say, "will not listen to you. You will be considered as crotchety, and impracticable. The opinions you express on important subjects, which might have been treated with respect had you conformed on minor points, will now inevitably be put down among your singularities; and thus, by dissenting in trifles, you disable yourself from spreading dissent in essentials."

Only noting, as we pass, that this is one of those anticipations which bring about their own fulfilment—that it is because most who disapprove these conventions do not show their disapproval, that the few who do show it look eccentric—and that did all act out their convictions, no such inference as the above would be drawn, and no such evil would result;—noting this as we pass, we go on to reply that these social restraints, and forms, and requirements, are not small evils, but among the greatest. Estimate their sum total, and we doubt whether they would not exceed most others. Could we add up the trouble, the cost, the jealousies, vexations, misunderstandings, the loss of time and the loss of pleasure, which these conventions entail—could we clearly realize the extent to which we are all daily hampered by them, daily enslaved by them; we should perhaps come to the conclusion that the tyranny of Mrs. Grundy is worse than any other tyranny we suffer under. Let us look at a few of its hurtful results; beginning with those of minor importance.

It produces extravagance. The desire to be *comme il faut*, which underlies all conformities, whether of manners, dress, or styles of entertainment, is the desire which makes many a spendthrift and many a bankrupt. To “keep up appearances,” to have a house in an approved quarter furnished in the latest taste, to give expensive dinners and crowded *soirées*, is an ambition forming the natural outcome of the conformist spirit. It is needless to enlarge on these follies: they have been satirized by hosts of writers, and in every drawing-room. All that here concerns us, is to point out that the respect for social observances, which men think so praiseworthy, has the same root with this effort to be fashionable in mode of living; and that, other things equal, the last cannot be diminished without the first being diminished also. If, now, we consider all that this extravagance entails—if we count up the robbed tradesmen, the stinted governesses, the ill-educated children, the fleeced relatives, who have to suffer from it—if we mark the anxiety and the many moral delin-

quencies which its perpetrators involve themselves in; we shall see that this regard for conventions is not quite so innocent as it looks.

Again, it decreases the amount of social intercourse. Passing over the reckless, and those who make a great display on speculation with the occasional result of getting on in the world to the exclusion of much better men, we come to the far larger class who, being prudent and honest enough not to exceed their means, and yet having a strong wish to be "respectable," are obliged to limit their entertainments to the smallest possible number; and that each of these may be turned to the greatest advantage in meeting the claims upon their hospitality, are induced to issue their invitations with little or no regard to the comfort or mutual fitness of their guests. A few inconveniently-large assemblies, made up of people mostly strange to each other or but distantly acquainted, and having scarcely any tastes in common, are made to serve in place of many small parties of friends intimate enough to have some bond of thought and sympathy. Thus the quantity of intercourse is diminished, and the quality deteriorated. Because it is the custom to make costly preparations and provide costly refreshments; and because it entails both less expense and less trouble to do this for many persons on few occasions than for few persons on many occasions; the reunions of our less wealthy classes are rendered alike infrequent and tedious.

Let it be further observed, that the existing formalities of social intercourse drive away many who most need its refining influence; and drive them into injurious habits and associations. Not a few men, and not the least sensible men either, give up in disgust this going out to stately dinners and stiff evening-parties; and instead, seek society in clubs, and cigar-divans, and taverns. "I'm sick of this standing about in drawing-rooms, talking nonsense, and trying to look happy," will answer one of them when taxed with his desertion. "Why should I any longer waste time and money, and temper? Once

I was ready enough to rush home from the office to dress ; I sported embroidered shirts, submitted to tight boots, and cared nothing for tailors' and haberdashers' bills. I know better now. My patience lasted a good while ; for though I found each night pass stupidly, I always hoped the next would make amends. But I'm undeceived. Cab-hire and kid gloves cost more than any evening party pays for ; or rather—it is worth the cost of them to avoid the party. No, no ; I'll no more of it. Why should I pay five shillings a time for the privilege of being bored ?” If, now, we consider that this very common mood tends towards billiard-rooms, towards long sittings over cigars and brandy-and-water, towards Evans's and the Coal Hole, towards every place where amusement may be had ; it becomes a question whether these precise observances which hamper our set meetings, have not to answer for much of the prevalent dissoluteness. Men must have excitements of some kind or other ; and if debarred from higher ones will fall back upon lower. It is not that those who thus take to irregular habits are essentially those of low tastes. Often it is quite the reverse. Among half a dozen intimate friends, abandoning formalities and sitting at ease round the fire, none will enter with greater enjoyment into the highest kind of social intercourse—the genuine communion of thought and feeling ; and if the circle includes women of intelligence and refinement, so much the greater is their pleasure. It is because they will no longer be choked with the mere dry husks of conversation which society offers them, that they fly its assemblies, and seek those with whom they may have discourse that is at least real, though unpolished. The men who thus long for substantial mental sympathy, and will go where they can get it, are often, indeed, much better at the core than the men who are content with the inanities of gloved and scented party-goers—men who feel no need to come morally nearer to their fellow-creatures than they can come while standing, tea-cup in hand, answering trifles with trifles ; and who, by feeling no such need, prove themselves shallow-thoughted and cold-hearted. It is true,

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that some who shun drawing-rooms do so from inability to bear the restraints prescribed by a genuine refinement, and that they would be greatly improved by being kept under these restraints. But it is not less true that, by adding to the legitimate restraints, which are based on convenience and a regard for others, a host of factitious restraints based only on convention, the refining discipline, which would else have been borne with benefit, is rendered unbearable, and so misses its end. Excess of government invariably defeats itself by driving away those to be governed. And if over all who desert its entertainments in disgust either at their emptiness or their formality, society thus loses its salutary influence—if such not only fail to receive that moral culture which the company of ladies, when rationally regulated, would give them, but, in default of other relaxation, are driven into habits and companionships which often end in gambling and drunkenness; must we not say that here, too, is an evil not to be passed over as insignificant?

Then consider what a blighting effect these multitudinous preparations and ceremonies have upon the pleasures they profess to subserve. Who, on calling to mind the occasions of his highest social enjoyments, does not find them to have been wholly informal, perhaps impromptu? How delightful a picnic of friends, who forget all observances save those dictated by good nature! How pleasant the little unpretended gatherings of book-societies, and the like; or those purely accidental meetings of a few people well known to each other! Then, indeed, we may see that “a man sharpeneth the countenance of his friend.” Checks flush, and eyes sparkle. The witty grow brilliant, and even the dull are excited into saying good things. There is an overflow of topics; and the right thought, and the right words to put it in, spring up unsought. Grave alternates with gay: now serious converse, and now jokes, anecdotes, and playful raillery. Everyone’s best nature is shown; everyone’s best feelings are in pleasurable activity; and, for the time, life seems well worth having. Go now and dress for some half-past eight dinner, or some ten o’clock “at home;” and present

yourself in spotless attire, with every hair arranged to perfection. How great the difference! The enjoyment seems in the inverse ratio of the preparation. These figures, got up with such finish and precision, appear but half alive. They have frozen each other by their primness; and your faculties feel the numbing effects of the atmosphere the moment you enter it. All those thoughts, so nimble and so apt awhile since, have disappeared—have suddenly acquired a preternatural power of eluding you. If you venture a remark to your neighbour, there comes a trite rejoinder, and there it ends. No subject you can hit upon outlives half a dozen sentences. Nothing that is said excites any real interest in you; and you feel that all you say is listened to with apathy. By some strange magic, things that usually give pleasure seem to have lost all charm. You have a taste for art. Weary of frivolous talk, you turn to the table, and find that the book of engravings and the portfolio of photographs are as flat as the conversation. You are fond of music. Yet the singing, good as it is, you hear with utter indifference; and say "Thank you" with a sense of being a profound hypocrite. Wholly at ease though you could be, for your own part, you find that your sympathies will not let you. You see young gentlemen feeling whether their ties are properly adjusted, looking vacantly round, and considering what they shall do next. You see ladies sitting disconsolately, waiting for some one to speak to them, and wishing they had the wherewith to occupy their fingers. You see the hostess standing about the doorway, keeping a factitious smile on her face, and racking her brain to find the requisite nothings with which to greet her guests as they enter. You see numberless traits of weariness and embarrassment; and, if you have any fellow feeling, these cannot fail to produce a sense of discomfort. The disorder is catching; and do what you will, you cannot resist the general infection. You struggle against it; you make spasmodic efforts to be lively; but none of your sallies or your good stories do more than raise a simper or a forced laugh: intellect and feeling are alike asphyxiated. And when, at length, yielding to your disgust,

you rush away, how great is the relief when you get into the fresh air, and see the stars! How you "Thank God, that's over!" and half resolve to avoid all such boredom for the future! What, now, is the secret of this perpetual miscarriage and disappointment? Does not the fault lie with all these needless adjuncts—these elaborate dressings, these set forms, these expensive preparations, these many devices and arrangements that imply trouble and raise expectation? Who that has lived thirty years in the world has not discovered that Pleasure is coy; and must not be too directly pursued, but must be caught unawares? An air from a street-piano, heard while at work, will often gratify more than the choicest music played at a concert by the most accomplished musicians. A single good picture seen in a dealer's window, may give keener enjoyment than a whole exhibition gone through with catalogue and pencil. By the time we have got ready our elaborate apparatus by which to secure happiness, the happiness is gone. It is too subtle to be contained in these receivers, garnished with compliments, and fenced round with etiquette. The more we multiply and complicate appliances, the more certain are we to drive it away. The reason is patent enough. These higher emotions to which social intercourse ministers, are of extremely complex nature; they consequently depend for their production upon very numerous conditions; the more numerous the conditions, the greater the liability that one or other of them will be disturbed, and the emotions consequently prevented. It takes a considerable misfortune to destroy appetite; but cordial sympathy with those around may be extinguished by a look or a word. Hence it follows, that the more multiplied the *unnecessary* requirements with which social intercourse is surrounded, the less likely are its pleasures to be achieved. It is difficult enough to fulfil continuously all the *essentials* to a pleasurable communion with others: how much more difficult, then, must it be continuously to fulfil a host of *non-essentials* also! It is, indeed, impossible. The attempt inevitably ends in the sacrifice of the first to the last—the essentials to the non-essentials. What chance is there of getting any genuine

response from the lady who is thinking of your stupidity in taking her in to dinner on the wrong arm? How are you likely to have agreeable converse with the gentleman who is fuming internally because he is not placed next to the hostess? Formalities, familiar as they may become, necessarily occupy attention—necessarily multiply the occasion for mistake, misunderstanding, and jealousy, on the part of one or other—necessarily distract all minds from the thoughts and feelings that should occupy them—necessarily, therefore, subvert those conditions under which only any sterling intercourse is to be had.

And this indeed is the fatal mischief which these conventions entail—a mischief to which every other is secondary. They destroy those highest of our pleasures which they profess to subserve. All institutions are alike in this, that however useful, and needful even, they originally were, they not only in the end cease to be so, but become detrimental. While humanity is growing, they continue fixed; daily get more mechanical and unvital; and by and by tend to strangle what they before preserved. It is not simply that they become corrupt and fail to act: they become obstructions. Old forms of government finally grow so oppressive, that they must be thrown off even at the risk of reigns of terror. Old creeds end in being dead formulas, which no longer aid but distort and arrest the general mind; while the State-churches administering them, come to be instruments for subsidizing conservatism and repressing progress. Old schemes of education, incarnated in public schools and colleges, continue filling the heads of new generations with what has become relatively useless knowledge, and, by consequence, excluding knowledge which is useful. Not an organization of any kind—political, religious, literary, philanthropic—but what, by its ever-multiplying regulations, its accumulating wealth, its yearly addition of officers, and the creeping into it of patronage and party feeling, eventually loses its original spirit, and sinks into a mere lifeless mechanism, worked with a view to private ends—a mechanism which not merely fails of its first purpose, but is a positive hindrance to it. Thus is it, too, with

social usages. We read of the Chinese that they have "ponderous ceremonies transmitted from time immemorial," which make social intercourse a burden. The court forms prescribed by monarchs for their own exaltation, have, in all times and places, ended in consuming the comfort of their lives. And so the artificial observances of the dining-room and saloon, in proportion as they are many and strict, extinguish that agreeable communion which they were originally intended to secure. The dislike with which people commonly speak of society that is "formal," and "stiff," and "ceremonious," implies the general recognition of this fact; and this recognition, logically developed, involves that all usages of behaviour which are not based on natural requirements, are injurious. That these conventions defeat their own ends is no new assertion. Swift, criticising the manners of his day, says—"Wise men are often more uneasy at the over-civility of these refiners than they could possibly be in the conversation of peasants and mechanics."

But it is not only in these details that the self-defeating action of our arrangements is traceable: it is traceable in the very substance and nature of them. Our social intercourse, as commonly managed, is a mere semblance of the reality sought. What is it that we want? Some sympathetic converse with our fellow-creatures: some converse that shall not be mere dead words, but the vehicle of living thoughts and feelings—converse in which the eyes and the face shall speak, and the tones of the voice be full of meaning—converse which shall make us feel no longer alone, but shall draw us closer to another, and double our own emotions by adding another's to them. Who is there that has not, from time to time, felt how cold and flat is all this talk about politics and science, and the new books and the new men, and how a genuine utterance of fellow-feeling outweighs the whole of it? Mark the words of Bacon:—"For a crowd is not company, and faces are but a gallery of pictures, and talk but a tinkling cymbal, where there is no love." If this be true, then it is only after acquaintance has grown into intimacy, and intimacy has ripened

into friendship, that the real communion which men need becomes possible. A rationally-formed circle must consist almost wholly of those on terms of familiarity and regard, with but one or two strangers. What folly, then, underlies the whole system of our grand dinners, our "at homes," our evening parties—assemblages made up of many who never met before, many others who just bow to each other, many others who though familiar feel mutual indifference, with just a few real friends lost in the general mass! You need but look round at the artificial expressions of face, to see at once how it is. All have their disguises on; and how can there be sympathy between masks? No wonder that in private every one exclaims against the stupidity of these gatherings. No wonder that hostesses get them up rather because they must than because they wish. No wonder that the invited go less from the expectation of pleasure than from fear of giving offence. The whole thing is a gigantic mistake—an organized disappointment.

And then note, lastly, that in this case, as in all others, when an organization has become effete and inoperative for its legitimate purpose, it is employed for quite other ones—quite opposite ones. What is the usual plea put in for giving and attending these tedious assemblies? "I admit that they are stupid and frivolous enough," replies every man to your criticisms; "but then, you know, one must keep up one's connections." And could you get from his wife a sincere answer, it would be—"Like you, I am sick of these frivolities; but then, we must get our daughters married." The one knows that there is a profession to push, a practice to gain, a business to extend: or parliamentary influence, or county patronage, or votes, or office, to be got: position, berths, favours, profit. The other's thoughts run upon husbands and settlements, wives and dowries. Worthless for their ostensible purpose of daily bringing human beings into pleasurable relations with each other, these cumbrous appliances of our social intercourse are now perseveringly kept in action with a

view to the pecuniary and matrimonial results which they indirectly produce.

Who then shall say that the reform of our system of observances is unimportant? When we see how this system induces fashionable extravagance, with its entailed bankruptcy and ruin—when we mark how greatly it limits the amount of social intercourse among the less wealthy classes—when we find that many who most need to be disciplined by mixing with the refined are driven away by it, and led into dangerous and often fatal courses—when we count up the many minor evils it inflicts, the extra work which its costliness entails on all professional and mercantile men, the damage to public taste in dress and decoration by the setting up of its absurdities as standards for imitation, the injury to health indicated in the faces of its devotees at the close of the London season, the mortality of milliners and the like, which its sudden exigencies yearly involve;—and when to all these we add its fatal sin, that it blights, withers up, and kills, that high enjoyment it professedly ministers to—that enjoyment which is a chief end of our hard struggling in life to obtain—shall we not conclude that to reform our system of etiquette and fashion, is an aim yielding to few in urgency?

There needs, then, a protestantism in social usages. Forms that have ceased to facilitate and have become obstructive—whether political, religious, or other—have ever to be swept away; and eventually are so swept away in all cases. Signs are not wanting that some change is at hand. A host of satirists, led on by Thackeray, have been for years engaged in bringing our sham-festivities, and our fashionable follies, into contempt; and in their candid moods, most men laugh at the frivolities with which they and the world in general are deluded. Ridicule has always been a revolutionary agent. That which is habitually assailed with sneers and sarcasms cannot long survive. Institutions that have lost their roots in men's respect and faith are doomed; and the day of their dissolution is not

far off. The time is approaching, then, when our system of social observances must pass through some crisis, out of which it will come purified and comparatively simple.

How this crisis will be brought about, no one can with any certainty say. Whether by the continuance and increase of individual protests, or whether by the union of many persons for the practice and propagation of some better system, the future alone can decide. The influence of dissentients acting without co-operation, seems, under the present state of things, inadequate. Standing severally alone, and having no well-defined views; frowned on by conformists, and expostulated with even by those who secretly sympathize with them; subject to petty persecutions, and unable to trace any benefit produced by their example; they are apt, one by one, to give up their attempts as hopeless. The young convention-breaker eventually finds that he pays too heavily for his nonconformity. Hating, for example, everything that bears about it any remnant of servility, he determines, in the ardour of his independence, that he will uncover to no one. But what he means simply as a general protest, he finds that ladies interpret into a personal disrespect. Though he sees that, from the days of chivalry downwards, these marks of supreme consideration paid to the other sex have been but a hypocritical counterpart to the actual subjection in which men have held them—a pretended submission to compensate for a real domination; and though he sees that when the true dignity of women is recognised, the mock dignities given to them will be abolished; yet he does not like to be thus misunderstood, and so hesitates in his practice. In other cases, again, his courage fails him. Such of his unconventionalities as can be attributed only to eccentricity, he has no qualms about: for, on the whole, he feels rather complimented than otherwise in being considered a disregarder of public opinion. But when they are liable to be put down to ignorance, to ill-breeding, or to poverty, he becomes a coward. However clearly the recent innovation of eating some kinds of fish with knife and fork proves the fork-and-bread

practice to have had little but caprice for its basis, yet he dares not wholly ignore that practice while fashion partially maintains it. Though he thinks that a silk handkerchief is quite as appropriate for drawing-room use as a white cambric one, he is not altogether at ease in acting out his opinion. Then, too, he begins to perceive that his resistance to prescription brings round disadvantageous results which he had not calculated upon. He had expected that it would save him from a great deal of social intercourse of a frivolous kind—that it would offend the fools, but not the sensible people; and so would serve as a self-acting test by which those worth knowing would be separated from those not worth knowing. But the fools prove to be so greatly in the majority that, by offending them, he closes against himself nearly all the avenues through which the sensible people are to be reached. Thus he finds, that his nonconformity is frequently misinterpreted; that there are but few directions in which he dares to carry it consistently out; that the annoyances and disadvantages which it brings upon him are greater than he anticipated; and that the chances of his doing any good are very remote. Hence he gradually loses resolution, and lapses, step by step, into the ordinary routine of observances.

Abortive as individual protests thus generally turn out, it may possibly be that nothing effectual will be done until there arises some organized resistance to this invisible despotism, by which our modes and habits are dictated. It may happen, that the government of Manners and Fashion will be rendered less tyrannical, as the political and religious governments have been, by some antagonistic union. Alike in Church and State, men's first emancipations from excess of restriction were achieved by numbers, bound together by a common creed or a common political faith. What remained undone while there were but individual schismatics or rebels, was effected when there came to be many acting in concert. It is tolerably clear that these earliest instalments of freedom could not have been obtained in any other way; for so long as the feeling of per-

sonal independence was weak and the rule strong, there could never have been a sufficient number of separate dissentients to produce the desired results. Only in these later times, during which the secular and spiritual controls have been growing less coercive, and the tendency towards individual liberty greater, has it become possible for smaller and smaller sects and parties to fight against established creeds and laws; until now men may safely stand even alone in their antagonism. The failure of individual nonconformity to customs, as above illustrated, suggests that an analogous series of changes may have to be gone through in this case also. It is true that the *lex non scripta* differs from the *lex scripta* in this, that, being unwritten, it is more readily altered; and that it has, from time to time, been quietly ameliorated. Nevertheless, we shall find that the analogy holds substantially good. For in this case, as in the others, the essential revolution is not the substituting of any one set of restraints for any other, but the limiting or abolishing the authority which prescribes restraints. Just as the fundamental change inaugurated by the Reformation, was not a superseding of one creed by another, but an ignoring of the arbiter who before dictated creeds—just as the fundamental change which Democracy long ago commenced, was not from this particular law to that, but from the despotism of one to the freedom of all; so, the parallel change yet to be wrought out in this supplementary government of which we are treating, is not the replacing of absurd usages by sensible ones, but the dethronement of that secret, irresponsible power which now imposes our usages, and the assertion of the right of all individuals to choose their own usages. In rules of living, a West-end clique is our Pope; and we are all papists, with but a mere sprinkling of heretics. On all who decisively rebel, comes down the penalty of excommunication, with its long catalogue of disagreeable and, indeed, serious consequences. The liberty of the subject asserted in our constitution, and ever on the increase, has yet to be wrested from this subtler tyranny. The right of private judgment,

which our ancestors wrung from the church, remains to be claimed from this dictator of our habits. Or, as before said, to free us from these idolatries and superstitious conformities, there has still to come a protestantism in social usages. Parallel, therefore, as is the change to be wrought out, it seems not improbable that it may be wrought out in an analogous way. That influence which solitary dissentients fail to gain, and that perseverance which they lack, may come into existence when they unite. That persecution which the world now visits upon them from mistaking their nonconformity for ignorance or disrespect, may diminish when it is seen to result from principle. The penalty which exclusion now entails may disappear when they become numerous enough to form visiting circles of their own. And when a successful stand has been made, and the brunt of the opposition has passed, that large amount of secret dislike to our observances which now pervades society, may manifest itself with sufficient power to effect the desired emancipation.

Whether such will be the process, time alone can decide. That community of origin, growth, supremacy, and decadence, which we have found among all kinds of government, suggests a community in modes of change also. On the other hand, Nature often performs substantially similar operations, in ways apparently different. Hence these details can never be foretold.

Meanwhile, let us glance at the conclusions that have been reached. On the one side, government, originally one, and afterwards subdivided for the better fulfilment of its function, must be considered as having ever been, in all its branches—political, religious, and ceremonial—beneficial; and, indeed, absolutely necessary. On the other side, government, under all its forms, must be regarded as subserving a temporary office, made needful by the unfitness of aboriginal humanity for social life; and the successive diminutions of its coerciveness in State, in Church, and in Custom, must be looked upon as steps towards its final disappearance. To complete the con-

ception, there requires to be borne in mind the third fact, that the genesis, the maintenance, and the decline of all governments, however named, are alike brought about by the humanity to be controlled: from which may be drawn the inference that, on the average, restrictions of every kind cannot last much longer than they are wanted, and cannot be destroyed much faster than they ought to be. Society, in all its developments, undergoes the process of exuviation. These old forms which it successively throws off, have all been once vitally united with it—have severally served as the protective envelopes within which a higher humanity was being evolved. They are cast aside only when they become hindrances—only when some inner and better envelope has been formed; and they bequeath to us all that there was in them of good. The periodical abolitions of tyrannical laws have left the administration of justice not only uninjured, but purified. Dead and buried creeds have not carried with them the essential morality they contained, which still exists, uncontaminated by the sloughs of superstition. And all that there is of justice and kindness and beauty, embodied in our cumbrous forms of etiquette, will live perennially when the forms themselves have been forgotten.

THE GENESIS OF SCIENCE.

THERE has ever prevailed among men a vague notion that scientific knowledge differs in nature from ordinary knowledge. By the Greeks, with whom Mathematics—literally *things learnt*—was alone considered as knowledge proper, the distinction must have been strongly felt; and it has ever since maintained itself in the general mind. Though, considering the contrast between the achievements of science and those of daily unmethodic thinking, it is not surprising that such a distinction has been assumed; yet it needs but to rise a little above the common point of view, to see that no such distinction can really exist: or that at best, it is but a superficial distinction. The same faculties are employed in both cases; and in both cases their mode of operation is fundamentally the same. If we say that science is organized knowledge, we are met by the truth that all knowledge is organized in a greater or less degree—that the commonest actions of the household and the field presuppose facts colligated, inferences drawn, results expected; and that the general success of these actions proves the data by which they were guided to have been correctly put together. If, again, we say that science is prevision—is a seeing beforehand—is a knowing in what times, places, combinations, or sequences, specified phenomena will be found; we are yet obliged to confess that the definition includes much that is utterly foreign to science in its ordinary acceptance.

For example, a child's knowledge of an apple. This, as far as it goes, consists in previsions. When a child sees a certain form and colours, it knows that if it puts out its hand it will have certain impressions of resistance, and roundness, and smoothness; and if it bites, a certain taste. And manifestly its general acquaintance with surrounding objects is of like nature—is made up of facts concerning them, so grouped as that any part of a group being perceived, the existence of the other facts included in it is foreseen. If, once more, we say that science is *exact* prevision, we still fail to establish the supposed difference. Not only do we find that much of what we call science is not exact, and that some of it, as physiology, can never become exact; but we find further, that many of the previsions constituting the common stock alike of wise and ignorant, *are* exact. That an unsupported body will fall; that a lighted candle will go out when immersed in water; that ice will melt when thrown on the fire—these, and many like predictions relating to the familiar properties of things, have as high a degree of accuracy as predictions are capable of. It is true that the results predicated are of a very general character; but it is none the less true that they are rigorously correct as far as they go: and this is all that is requisite to fulfil the definition. There is perfect accordance between the anticipated phenomena and the actual ones; and no more than this can be said of the highest achievements of the sciences specially characterised as exact.

Seeing thus that the assumed distinction between scientific knowledge and common knowledge is not logically justifiable; and yet feeling, as we must, that however impossible it may be to draw a line between them, the two are not practically identical; there arises the question—What is the relationship that exists between them? A partial answer to this question may be drawn from the illustrations just given. On reconsidering them, it will be observed that those portions of ordinary knowledge which are identical in character with scientific knowledge, comprehend only such combinations of phenomena as are

directly cognizable by the senses, and are of simple, invariable nature. That the smoke from a fire which she is lighting will ascend, and that the fire will presently boil water, are previsions which the servant-girl makes equally well with the most learned physicist; they are equally certain, equally exact with his; but they are previsions concerning phenomena in constant and direct relation—phenomena that follow visibly and immediately after their antecedents—phenomena of which the causation is neither remote nor obscure—phenomena which may be predicted by the simplest possible act of reasoning. If, now, we pass to the previsions constituting what is commonly known as science—that an eclipse of the moon will happen at a specified time; that when a barometer is taken to the top of a mountain of known height, the mercurial column will descend a stated number of inches; that the poles of a galvanic battery immersed in water will give off, the one an inflammable and the other an inflaming gas, in definite ratio—we perceive that the relations involved are not of a kind habitually presented to our senses; that they depend, some of them, upon special combinations of causes; and that in some of them the connection between antecedents and consequents is established only by an elaborate series of inferences. The broad distinction, therefore, between the two orders of knowledge, is not in their nature, but in their remoteness from perception. If we regard the cases in their most general aspect, we see that the labourer, who, on hearing certain notes in the adjacent hedge, can describe the particular form and colours of the bird making them; and the astronomer, who, having calculated a transit of Venus, can delineate the black spot entering on the sun's disc, as it will appear through the telescope, at a specified hour; do essentially the same thing. Each knows that on fulfilling the requisite conditions, he shall have a preconceived impression—that after a definite series of actions will come a group of sensations of a foreknown kind. The difference, then, is not in the fundamental character of the mental acts; or in the correctness of the previsions accom-

plished by them ; but in the complexity of the processes required to achieve the prevision. Much of our commonest knowledge is, as far as it goes, rigorously precise. Science does not increase this precision ; cannot transcend it. What then does it do ? It reduces other knowledge to the same degree of precision. That certainty which direct perception gives us respecting coexistences and sequences of the simplest and most accessible kind, science gives us respecting coexistences and sequences, complex in their dependencies or inaccessible to immediate observation. In brief, regarded from this point of view, science may be called *an extension of the perceptions by means of reasoning*.

On further considering the matter, however, it will perhaps be felt that this definition does not express the whole fact—that inseparable as science may be from common knowledge, and completely as we may fill up the gap between the simplest previsions of the child and the most recondite ones of the natural philosopher, by interposing a series of previsions in which the complexity of reasoning involved is greater and greater, there is yet a difference between the two beyond that which is here described. And this is true. But the difference is still not such as enables us to draw the assumed line of demarcation. It is a difference not between common knowledge and scientific knowledge ; but between the successive phases of science itself, or knowledge itself—whichever we choose to call it. In its earlier phases science attains only to *certainty* of foreknowledge ; in its later phases it further attains to *completeness*. We begin by discovering *a* relation : we end by discovering *the* relation. Our first achievement is to foretell the *kind* of phenomenon which will occur under specific conditions : our last achievement is to foretell not only the kind but the *amount*. Or, to reduce the proposition to its most definite form—undeveloped science is *qualitative* prevision : developed science is *quantitative* prevision.

This will at once be perceived to express the remaining distinction between the lower and the higher stages of positive knowledge. The prediction that a piece of lead will take more force to lift it than a piece of wood of equal size, exhibits certainty, but

not completeness, of foresight. The kind of effect in which the one body will exceed the other is foreseen ; but not the amount by which it will exceed. There is qualitative prevision only. On the other hand, the predictions that at a stated time two particular planets will be in conjunction ; that by means of a lever having arms in a given ratio, a known force will raise just so many pounds ; that to decompose a specified quantity of sulphate of iron by carbonate of soda will require so many grains—these predictions exhibit foreknowledge, not only of the nature of the effects to be produced, but of the magnitude, either of the effects themselves, of the agencies producing them, or of the distance in time or space at which they will be produced. There is not only qualitative but quantitative prevision. And this is the unexpressed difference which leads us to consider certain orders of knowledge as especially scientific when contrasted with knowledge in general. Are the phenomena *measurable* ? is the test which we unconsciously employ. Space is measurable : hence Geometry. Force and space are measurable : hence Statics. Time, force, and space are measurable : hence Dynamics. The invention of the barometer enabled men to extend the principles of mechanics to the atmosphere ; and Aerostatics existed. When a thermometer was devised there arose a science of heat, which was before impossible. Such of our sensations as we have not yet found modes of measuring do not originate sciences. We have no science of smells ; nor have we one of tastes. We have a science of the relations of sounds differing in pitch, because we have discovered a way to measure them ; but we have no science of sounds in respect to their loudness or their *timbre*, because we have got no measures of loudness and *timbre*. Obviously it is this reduction of the sensible phenomena it presents, to relations of magnitude, which gives to any division of knowledge its especially scientific character. Originally men's knowledge of weights and forces was in the same condition as their knowledge of smells and tastes is now—a knowledge not extending beyond that given by the unaided sensations ; and it remained so until weighing instruments and dynamometers were invented.

Before there were hour-glasses and clepsydras, most phenomena could be estimated as to their durations and intervals, with no greater precision than degrees of hardness can be estimated by the fingers. Until a thermometric scale was contrived, men's judgments respecting relative amounts of heat stood on the same footing with their present judgments respecting relative amounts of sound. And as in these initial stages, with no aids to observation, only the roughest comparisons of cases could be made, and only the most marked differences perceived; it is obvious that only the most simple laws of dependence could be ascertained—only those laws which being uncomplicated with others, and not disturbed in their manifestations, required no niceties of observation to disentangle them. Whence it appears not only that in proportion as knowledge becomes quantitative do its previsions become complete as well as certain, but that until its assumption of a quantitative character it is necessarily confined to the most elementary relations.

Moreover it is to be remarked that while, on the one hand, we can discover the laws of the greater proportion of phenomena only by investigating them quantitatively; on the other hand we can extend the range of our quantitative previsions only as fast as we detect the laws of the results we predict. For clearly the ability to specify the magnitude of a result inaccessible to direct measurement, implies knowledge of its mode of dependence on something which can be measured—implies that we know the particular fact dealt with to be an instance of some more general fact. Thus the extent to which our quantitative previsions have been carried in any direction, indicates the depth to which our knowledge reaches in that direction. And here, as another aspect of the same fact, we may further observe that as we pass from qualitative to quantitative prevision, we pass from inductive science to deductive science. Science while purely inductive is purely qualitative: when inaccurately quantitative it usually consists of part induction, part deduction: and it becomes accurately quantitative only when wholly deductive. We do not mean that the deductive and the quantitative are coexten-

sive; for there is manifestly much deduction that is qualitative only. We mean that all quantitative prevision is reached deductively; and that induction can achieve only qualitative prevision.

Still, however, it must not be supposed that these distinctions enable us to separate ordinary knowledge from science; much as they seem to do so. While they show in what consists the broad contrast between the extreme forms of the two, they yet lead us to recognise their essential identity; and once more prove the difference to be one of degree only. For, on the one hand, the commonest positive knowledge is to some extent quantitative; seeing that the amount of the foreseen result is known within certain wide limits. And, on the other hand, the highest quantitative prevision does not reach the exact truth, but only a very near approximation to it. Without clocks the savage knows that the day is longer in the summer than in the winter; without scales he knows that stone is heavier than flesh: that is, he can foresee respecting certain results that their amounts will exceed these, and be less than those—he knows *about* what they will be. And, with his most delicate instruments and most elaborate calculations, all that the man of science can do, is to reduce the difference between the foreseen and the actual results to an unimportant quantity. Moreover, it must be borne in mind not only that all the sciences are qualitative in their first stages,—not only that some of them, as Chemistry, have but recently reached the quantitative stage—but that the most advanced sciences have attained to their present power of determining quantities not present to the senses, or not directly measurable, by a slow process of improvement extending through thousands of years. So that science and the knowledge of the uncultured are alike in the nature of their previsions, widely as they differ in range; they possess a common imperfection, though this is immensely greater in the last than in the first; and the transition from the one to the other has been through a series of steps by which the imperfection has been rendered continually less, and the range continually wider.

These facts, that science and the positive knowledge of the uncultured cannot be separated in nature, and that the one is but a perfected and extended form of the other, must necessarily underlie the whole theory of science, its progress, and the relations of its parts to each other. There must be serious incompleteness in any history of the sciences, which, leaving out of view the first steps of their genesis, commences with them only when they assume definite forms. There must be grave defects, if not a general untruth, in a philosophy of the sciences considered in their interdependence and development, which neglects the inquiry how they came to be distinct sciences, and how they were severally evolved out of the chaos of primitive ideas. Not only a direct consideration of the matter, but all analogy, goes to show that in the earlier and simpler stages must be sought the key to all subsequent intricacies. The time was when the anatomy and physiology of the human being were studied by themselves—when the adult man was analyzed and the relations of parts and of functions investigated, without reference either to the relations exhibited in the embryo or to the homologous relations existing in other creatures. Now, however, it has become manifest that no true conceptions, no true generalizations, are possible under such conditions. Anatomists and physiologists now find that the real natures of organs and tissues can be ascertained only by tracing their early evolution; and that the affinities between existing genera can be satisfactorily made out only by examining the fossil genera to which they are allied. Well, is it not clear that the like must be true concerning all things that undergo development? Is not science a growth? Has not science, too, its embryology? And must not the neglect of its embryology lead to a misunderstanding of the principles of its evolution and of its existing organization?

There are *à priori* reasons, therefore, for doubting the truth of all philosophies of the sciences which tacitly proceed upon the common notion that scientific knowledge and ordinary knowledge are separate; instead of commencing, as they should, by affiliat-

ing the one upon the other, and showing how it gradually came to be distinguishable from the other. We may expect to find their generalizations essentially artificial; and we shall not be deceived. Some illustrations of this may here be fitly introduced, by way of preliminary to a brief sketch of the genesis of science from the point of view indicated. And we cannot more readily find such illustrations than by glancing at a few of the various *classifications* of the sciences that have from time to time been proposed. To consider all of them would take too much space: we must content ourselves with some of the latest.

Commencing with those which may be soonest disposed of, let us notice first the arrangement propounded by Oken. An abstract of it runs thus:—

Part I. MATHESIS.—*Pneumatogeny*: Primary Art, Primary Consciousness, God, Primary Rest, Time, Polarity, Motion, Man, Space, Point, Line, Surface, Globe, Rotation.—*Hylogeny*: Gravity, Matter, Ether, Heavenly Bodies, Light, Heat, Fire.

(He explains that MATHESIS is the doctrine of the whole; *Pneumatogeny* being the doctrine of immaterial totalities, and *Hylogeny* that of material totalities.)

Part II. ONTOLOGY.—*Cosmogony*: Rest, Centre, Motion, Line, Planets, Form, Planetary System, Comets.—*Stöchiogeny*: Condensation, Simple Matter, Elements, Air, Water, Earth.—*Stöchiology*: Functions of the Elements, &c. &c.—*Kingdoms of Nature*: Individuals.

(He says in explanation that 'ONTOLOGY teaches us the phenomena of matter. The first of these are the heavenly bodies comprehended by *Cosmogony*. These divide into elements—*Stöchiogeny*. The earth element divides into minerals—*Mineralogy*. These unite into one collective body—*Geogeny*. The whole in singulars is the living, or *Organic*, which again divides into plants and animals. *Biology*, therefore, divides into *Organogeny*, *Phytosophy*, *Zoosophy*.')

FIRST KINGDOM.—MINERALS. *Mineralogy*, *Geology*.

Part III. BIOLOGY.—*Organosophy*, *Phytogeny*, *Phyto-physiology*, *Phytology*, *Zoogeny*, *Physiology*, *Zoology*, *Psychology*.

A glance over this confused scheme shows that it is an attempt to classify knowledge, not after the order in which it has been, or may be, built up in the human consciousness; but after an assumed order of creation. It is a pseudo-scientific cosmogony, akin to those which men have enunciated from the earliest times downwards; and only a little more respectable. As such it will not be thought worthy of much consideration by those who, like ourselves, hold that experience is the sole origin of knowledge. Otherwise, it might have been needful to dwell on the incongruities of the arrangement—to ask how motion can be treated of before space? how there can be rotation without matter to rotate? how polarity can be dealt with without involving points and lines? But it will serve our present purpose just to point out a few of the extreme absurdities resulting from the doctrine which Oken seems to hold in common with Hegel, that “to philosophize on Nature is to re-think the great thought of Creation.” Here is a sample:—

“Mathematics is the universal science; so also is Physio-philosophy, although it is only a part, or rather but a condition of the universe; both are one, or mutually congruent.

“Mathematics is, however, a science of mere forms without substance. Physio-philosophy is, therefore, *mathematics endowed with substance*.

From the English point of view it is sufficiently amusing to find such a dogma not only gravely stated, but stated as an unquestionable truth. Here we see the experiences of quantitative relations which men have gathered from surrounding bodies and generalized (experiences which had been scarcely at all generalized at the beginning of the historic period)—we find these generalized experiences, these intellectual abstractions, elevated into concrete actualities, projected back into Nature, and considered as the internal frame-work of things—the skeleton by which matter is sustained. But this new form of the old realism, is by no means the most startling of the physio-philosophic principles. We presently read that,

“The highest mathematical idea, or the fundamental principle of all mathematics is the zero = 0.” * * *

“Zero is in itself nothing. Mathematics is based upon nothing, and, *consequently*, arises out of nothing.

“Out of nothing, *therefore*, it is possible for something to arise; for mathematics, consisting of propositions, is something, in relation to 0.”

By such “consequentlys” and “therefores” it is, that men philosophize when they “re-think the great thought of creation.” By dogmas that pretend to be reasons, nothing is made to generate mathematics; and by clothing mathematics with matter, we have the universe! If now we deny, as we *do* deny, that the highest mathematical idea is the zero—if, on the other hand, we assert, as we *do* assert, that the fundamental idea underlying all mathematics, is that of equality; the whole of Oken’s cosmogony disappears. And here, indeed, we may see illustrated, the distinctive peculiarity of the German method of procedure in these matters—the bastard *à priori* method, as it may be termed. The legitimate *à priori* method sets out with propositions of which the negation is inconceivable; the *à priori* method as illegitimately applied, sets out either with propositions of which the negation is *not* inconceivable, or with propositions like Oken’s, of which the *affirmation* is inconceivable.

It is needless to proceed further with the analysis; else might we detail the steps by which Oken arrives at the conclusions that “the planets are coagulated colours, for they are coagulated light; that the sphere is the expanded nothing;” that gravity is “a weighty nothing, a heavy essence, striving towards a centre;” that “the earth is the identical, water the indifferent, air the different; or the first the centre, the second the radius, the last the periphery of the general globe or of fire.” To comment on them would be nearly as absurd as are the propositions themselves. Let us pass on to another of the German systems of knowledge—that of Hegel.

The simple fact that Hegel puts Jacob Bøhme on a par with

Bacon, suffices alone to show that his stand-point is far remote from the one usually regarded as scientific : so far remote, indeed, that it is not easy to find any common basis on which to found a criticism. Those who hold that the mind is moulded into conformity with surrounding things by the agency of surrounding things, are necessarily at a loss how to deal with those, who, like Schelling and Hegel, assert that surrounding things are solidified mind—that Nature is “petrified intelligence.” However, let us briefly glance at Hegel’s classification. He divides philosophy into three parts :—

1. *Logic*, or the science of the idea in itself, the pure idea.
2. *The Philosophy of Nature*, or the science of the idea considered under its other form—of the idea as Nature.
3. *The Philosophy of the Mind*, or the science of the idea in its return to itself.

Of these, the second is divided into the natural sciences, commonly so called ; so that in its more detailed form the series runs thus :—Logic, Mechanics, Physics, Organic Physics, Psychology.

Now, if we believe with Hegel, first, that thought is the true essence of man ; second, that thought is the essence of the world ; and that, therefore, there is nothing but thought ; his classification, beginning with the science of pure thought, may be acceptable. But otherwise, it is an obvious objection to his arrangement, that thought implies things thought of—that there can be no logical forms without the substance of experience—that the science of ideas and the science of things must have a simultaneous origin. Hegel, however, anticipates this objection, and, in his obstinate idealism, replies, that the contrary is true ; that all contained in the forms, to become something, requires to be thought : and that logical forms are the foundations of all things.

It is not surprising that, starting from such premises, and reasoning after this fashion, Hegel finds his way to strange conclusions. Out of *space* and *time* he proceeds to build up

motion, matter, repulsion, attraction, weight, and inertia. He then goes on to logically evolve the solar system. In doing this he widely diverges from the Newtonian theory; reaches by syllogism the conviction that the planets are the most perfect celestial bodies; and, not being able to bring the stars within his theory, says that they are mere formal existences and not living matter, and that as compared with the solar system they are as little admirable as a cutaneous eruption or a swarm of flies.* Results so outrageous might be left as self-disproved, were it not that speculators of this class are not alarmed by any amount of incongruity with established beliefs. The only efficient mode of treating systems like this of Hegel, is to show that they are self-destructive—that by their first steps they ignore that authority on which all their subsequent steps depend. If Hegel professes, as he manifestly does, to develop his scheme by reasoning—if he presents successive inferences as *necessarily following* from certain premises; he implies the postulate that a belief which necessarily follows after certain antecedents is a true belief: and, did an opponent reply to one of his inferences, that, though it was impossible to think the opposite, yet the opposite was true, he would consider the reply irrational. The procedure, however, which he would thus condemn as destructive of all thinking whatever, is just the procedure exhibited in the enunciation of his own first principles. Mankind find themselves unable to conceive that there can be thought without things thought of. Hegel, however, asserts that there *can* be thought without things thought of. That ultimate test of a true proposition—the inability of the human mind to conceive the negation of it—which in all other cases he considers valid, he considers invalid where it suits his convenience to do so; and yet at the same time denies the right of an opponent to follow his example. If it is competent for

* It is somewhat curious that the author of "The Plurality of Worlds," with quite other aims, should have persuaded himself into similar conclusions.

him to posit dogmas, which are the direct negations of what human consciousness recognises; then is it also competent for his antagonists to stop him at every step in his argument by saying, that though the particular inference he is drawing seems to his mind, and to all minds, necessarily to follow from the premises, yet it is not true, but the contrary inference is true. Or, to state the dilemma in another form:—If he sets out with inconceivable propositions, then may he with equal propriety make all his succeeding propositions inconceivable ones—may at every step throughout his reasoning draw exactly the opposite conclusion to that which seems involved.

Hegel's mode of procedure being thus essentially suicidal, the Hegelian classification which depends upon it, falls to the ground. Let us consider next that of M. Comte.

As all his readers must admit, M. Comte presents us with a scheme of the sciences which, unlike the foregoing ones, demands respectful consideration. Widely as we differ from him, we cheerfully bear witness to the largeness of his views, the clearness of his reasoning, and the value of his speculations as contributing to intellectual progress. Did we believe a serial arrangement of the sciences to be possible, that of M. Comte would certainly be the one we should adopt. His fundamental propositions are thoroughly intelligible; and if not true, have a great semblance of truth. His successive steps are logically co-ordinated; and he supports his conclusions by a considerable amount of evidence—evidence which, so long as it is not critically examined, or not met by counter evidence, seems to substantiate his positions. But it only needs to assume that antagonistic attitude which *ought* to be assumed towards new doctrines, in the belief that, if true, they will prosper by conquering objectors—it needs but to test his leading doctrines either by other facts than those he cites, or by his own facts differently applied, to at once show that they will not stand. We will proceed thus to deal with the general principle on which he bases his hierarchy of the sciences.

In the second chapter of his *Cours de Philosophie Positive*, M. Comte says:—"Our problem is, then, to find the one *rational* order, amongst a host of possible systems." "This order is determined by the degree of simplicity, or, what comes to the same thing, of generality of their phenomena." And the arrangement he deduces runs thus:—*Mathematics, Astronomy, Physics, Chemistry, Physiology, Social Physics*. This he asserts to be "the true *filiation* of the sciences." He asserts further, that the principle of progression from a greater to a less degree of generality, "which gives this order to the whole body of science, arranges the parts of each science." And, finally, he asserts that the gradations thus established *à priori* among the sciences and the parts of each science, "is in essential conformity with the order which has spontaneously taken place among the branches of natural philosophy;" or, in other words—corresponds with the order of historic development.

Let us compare these assertions with the facts. That there may be perfect fairness, let us make no choice, but take as the field for our comparison, the succeeding section treating of the first science—Mathematics; and let us use none but M. Comte's own facts, and his own admissions. Confining ourselves to this one science, of course our comparisons must be between its several parts. M. Comte says, that the parts of each science must be arranged in the order of their decreasing generality; and that this order of decreasing generality agrees with the order of historic development. Our inquiry must be, then, whether the history of mathematics confirms this statement.

Carrying out his principle, M. Comte divides Mathematics into "Abstract Mathematics, or the Calculus (taking the word in its most extended sense) and Concrete Mathematics, which is composed of General Geometry and of Rational Mechanics." The subject-matter of the first of these is *number*; the subject-matter of the second includes *space, time, motion, force*. The one possesses the highest possible degree of generality; for all things whatever admit of enumeration. The others are less general; seeing that there are endless phenomena that are not cognizable

either by general geometry or rational mechanics. In conformity with the alleged law, therefore, the evolution of the calculus must throughout have preceded the evolution of the concrete sub-sciences. Now somewhat awkwardly for him, the first remark M. Comte makes bearing upon this point is, that "from an historical point of view, mathematical analysis *appears to have arisen out of* the contemplation of geometrical and mechanical facts." True, he goes on to say that, "it is not the less independent of these sciences logically speaking;" for that "analytical ideas are, above all others, universal, abstract, and simple; and geometrical conceptions are necessarily founded on them." We will not take advantage of this last passage to charge M. Comte with teaching, after the fashion of Hegel, that there can be thought without things thought of. We are content simply to compare the two assertions, that analysis arose out of the contemplation of geometrical and mechanical facts, and that geometrical conceptions are founded upon analytical ones. Literally interpreted they exactly cancel each other. Interpreted, however, in a liberal sense, they imply, what we believe to be demonstrable, that the two had a *simultaneous origin*. The passage is either nonsense, or it is an admission that abstract and concrete mathematics are coeval. Thus, at the very first step, the alleged congruity between the order of generality and the order of evolution, does not hold good.

But may it not be that though abstract and concrete mathematics took their rise at the same time, the one afterwards developed more rapidly than the other; and has ever since remained in advance of it? No: and again we call M. Comte himself as witness. Fortunately for his argument he has said nothing respecting the early stages of the concrete and abstract divisions after their divergence from a common root; otherwise the advent of Algebra long after the Greek geometry had reached a high development, would have been an inconvenient fact for him to deal with. But passing over this, and limiting ourselves to his own statements, we find, at the opening of the next chapter, the admission, that "the historical development of the abstract

portion of mathematical science has, since the time of Descartes, been for the most part *determined* by that of the concrete." Further on we read respecting algebraic functions that "most functions were concrete in their origin—even those which are at present the most purely abstract; and the ancients discovered only through geometrical definitions elementary algebraic properties of functions to which a numerical value was not attached till long afterwards, rendering abstract to us what was concrete to the old geometers." How do these statements tally with his doctrine? Again, having divided the calculus into algebraic and arithmetical, M. Comte admits, as perforce he must, that the algebraic is more general than the arithmetical; yet he will not say that algebra preceded arithmetic in point of time. And again, having divided the calculus of functions into the calculus of direct functions (common algebra) and the calculus of indirect functions (transcendental analysis), he is obliged to speak of this last as possessing a higher generality than the first; yet it is far more modern. Indeed, by implication, M. Comte himself confesses this incongruity; for he says:—"It might seem that the transcendental analysis ought to be studied before the ordinary, as it provides the equations which the other has to resolve; but though the transcendental is *logically independent of the ordinary*, it is best to follow the usual method of study, taking the ordinary first." In all these cases, then, as well as at the close of the section where he predicts that mathematicians will in time "create procedures of a *wider generality*," M. Comte makes admissions that are diametrically opposed to the alleged law.

In the succeeding chapters treating of the concrete department of mathematics, we find similar contradictions. M. Comte himself names the geometry of the ancients *special* geometry, and that of the moderns *general* geometry. He admits that while "the ancients studied geometry with reference to the *bodies* under notice, or specially; the moderns study it with reference to the *phenomena* to be considered, or generally." He admits that while "the ancients extracted all they could out of one line or

surface before passing to another," "the moderns, since Descartes, employ themselves on questions which relate to any figure whatever." These facts are the reverse of what, according to his theory, they should be. So, too, in mechanics. Before dividing it into statics and dynamics, M. Comte treats of the three laws of *motion*, and is obliged to do so; for statics, the more *general* of the two divisions, though it does not involve motion, is impossible as a science until the laws of motion are ascertained. Yet the laws of motion pertain to dynamics, the more *special* of the divisions. Further on he points out that after Archimedes, who discovered the law of equilibrium of the lever, statics made no progress until the establishment of dynamics enabled us to seek "the conditions of equilibrium through the laws of the composition of forces." And he adds—"At this day *this is the method universally employed*. At the first glance it does not appear the most rational—dynamics being more complicated than statics, and precedence being natural to the simpler. It would, in fact, be more philosophical to refer dynamics to statics, as has since been done.' Sundry discoveries are afterwards detailed, showing how completely the development of statics has been achieved by considering its problems dynamically; and before the close of the section M. Comte remarks that "before hydrostatics could be comprehended under statics, it was necessary that the abstract theory of equilibrium should be made so general as to apply directly to fluids as well as solids. This was accomplished when Lagrange supplied, as the basis of the whole of rational mechanics, the single principle of virtual velocities." In which statement we have two facts directly at variance with M. Comte's doctrine;—first, that the simpler science, statics, reached its present development only by the aid of the principle of virtual velocities, which belongs to the more complex science, dynamics; and that this "single principle" underlying all rational mechanics—this *most general form* which includes alike the relations of statical, hydrostatical, and dynamical forces—was reached so late as the time of Lagrange.

Thus it is *not* true that the historical succession of the divisions

of mathematics has corresponded with the order of decreasing generality. It is *not* true that abstract mathematics was evolved antecedently to, and independently of, concrete mathematics. It is *not* true that of the subdivisions of abstract mathematics, the more general came before the more special. And it is *not* true that concrete mathematics, in either of its two sections, began with the most abstract and advanced to the less abstract truths.

It may be well to mention, parenthetically, that, in defending his alleged law of progression from the general to the special, M. Comte somewhere comments upon the two meanings of the word *general*, and the resulting liability to confusion. Without now discussing whether the asserted distinction can be maintained in other cases, it is manifest that it does not exist here. In sundry of the instances above quoted, the endeavours made by M. Comte himself to disguise, or to explain away, the precedence of the special over the general, clearly indicate that the generality spoken of, is of the kind meant by his formula. And it needs but a brief consideration of the matter to show that, even did he attempt it, he could not distinguish this generality, which, as above proved, frequently comes last, from the generality which he says always comes first. For what is the nature of that mental process by which objects, dimensions, weights, times, and the rest, are found capable of having their relations expressed numerically? It is the formation of certain abstract conceptions of unity, duality, and multiplicity, which are applicable to all things alike. It is the invention of general symbols serving to express the numerical relations of entities, whatever be their special characters. And what is the nature of the mental process by which numbers are found capable of having their relations expressed algebraically? It is just the same. It is the formation of certain abstract conceptions of numerical functions which are the same whatever be the magnitudes of the numbers. It is the invention of general symbols serving to express the relations between numbers, as numbers express the relations between things. And the transcendental analysis stands to algebra in

the same position that algebra stands in to arithmetic. To briefly illustrate their respective powers ;—arithmetic can express in one formula the value of a *particular* tangent to a *particular* curve ; algebra can express in one formula the values of *all* tangents to a *particular* curve ; transcendental analysis can express in one formula the values of *all* tangents to *all* curves. Just as arithmetic deals with the common properties of lines, areas, bulks, forces, periods ; so does algebra deal with the common properties of the numbers which arithmetic presents ; so does transcendental analysis deal with the common properties of the equations exhibited by algebra. Thus, the generality of the higher branches of the calculus, when compared with the lower, is the same kind of generality as that of the lower branches when compared with geometry or mechanics. And on examination it will be found that the like relation exists in the various other cases above given.

Having shown that M. Comte's alleged law of progression does not hold among the several parts of the same science, let us see how it agrees with the facts when applied to separate sciences. "Astronomy," says M. Comte, at the opening of Book III., "was a positive science, in its geometrical aspect, from the earliest days of the school of Alexandria; but Physics, which we are now to consider, had no positive character at all till Galileo made his great discoveries on the fall of heavy bodies." On this, our comment is simply that it is a misrepresentation based upon an arbitrary misuse of words—a mere verbal artifice. By choosing to exclude from terrestrial physics those laws of magnitude, motion, and position, which he includes in celestial physics, M. Comte makes it appear that the one owes nothing to the other. Not only is this altogether unwarrantable, but it is radically inconsistent with his own scheme of divisions. At the outset he says—and as the point is important we quote from the original—"Pour la *physique inorganique* nous voyons d'abord, en nous conformant toujours à l'ordre de généralité et de dépendance des phénomènes, qu'elle doit être partagée en deux sections distinctes, suivant qu'elle considère

les phénomènes généraux de l'univers, ou, en particulier, ceux que présentent les corps terrestres. D'où la physique céleste, ou l'astronomie, soit géométrique, soit mécanique ; et la physique terrestre." Here then we have *inorganic physics* clearly divided into *celestial physics* and *terrestrial physics*—the phenomena presented by the universe, and the phenomena presented by earthly bodies. If now celestial bodies and terrestrial bodies exhibit sundry leading phenomena in common, as they do, how can the generalization of these common phenomena be considered as pertaining to the one class rather than to the other? If inorganic physics includes geometry (which M. Comte has made it do by comprehending *geometrical astronomy* in its sub-section—celestial physics); and if its sub-section—terrestrial physics, treats of things having geometrical properties; how can the laws of geometrical relations be excluded from terrestrial physics? Clearly if celestial physics includes the geometry of objects in the heavens, terrestrial physics includes the geometry of objects on the earth. And if terrestrial physics includes terrestrial geometry, while celestial physics includes celestial geometry, then the geometrical part of terrestrial physics precedes the geometrical part of celestial physics; seeing that geometry gained its first ideas from surrounding objects. Until men had learnt geometrical relations from bodies on the earth, it was impossible for them to understand the geometrical relations of bodies in the heavens. So, too, with celestial mechanics, which had terrestrial mechanics for its parent. The very conception of *force*, which underlies the whole of mechanical astronomy, is borrowed from our earthly experiences; and the leading laws of mechanical action as exhibited in scales, levers, projectiles, &c., had to be ascertained before the dynamics of the solar system could be entered upon. What were the laws made use of by Newton in working out his grand discovery? The law of falling bodies disclosed by Galileo; that of the composition of forces also disclosed by Galileo; and that of centrifugal force found out by Huyghens—all of them generalizations of terrestrial physics. Yet, with

facts like these before him, M. Comte places astronomy before physics in order of evolution! He does not compare the geometrical parts of the two together, and the mechanical parts of the two together; for this would by no means suit his hypothesis. But he compares the geometrical part of the one with the mechanical part of the other, and so gives a semblance of truth to his position. He is led away by a verbal delusion. Had he confined his attention to the things and disregarded the words, he would have seen that before mankind scientifically co-ordinated *any one class of phenomena* displayed in the heavens, they had previously co-ordinated *a parallel class of phenomena* displayed upon the surface of the earth.

Were it needful we could fill a score pages with the incongruities of M. Comte's scheme. But the foregoing samples will suffice. So far is his law of evolution of the sciences from being tenable, that, by following his example, and arbitrarily ignoring one class of facts, it would be possible to present, with great plausibility, just the opposite generalization to that which he enunciates. While he asserts that the rational order of the sciences, like the order of their historic development, "is determined by the degree of simplicity, or, what comes to the same thing, of generality of their phenomena;" it might contrariwise be asserted, that, commencing with the complex and the special, mankind have progressed step by step to a knowledge of greater simplicity and wider generality. So much evidence is there of this as to have drawn from Whewell, in his *History of the Inductive Sciences*, the general remark that "the reader has already seen repeatedly in the course of this history, complex and derivative principles presenting themselves to men's minds before simple and elementary ones." Even from M. Comte's own work, numerous facts, admissions, and arguments, might be picked out, tending to show this. We have already quoted his words in proof that both abstract and concrete mathematics have progressed towards a higher degree of generality, and that he looks forward to a higher generality still. Just to strengthen this adverse

hypothesis, let us take a further instance. From the *particular* case of the scales, the law of equilibrium of which was familiar to the earliest nations known, Archimedes advanced to the more *general* case of the unequal lever with unequal weights; the law of equilibrium of which *includes* that of the scales. By the help of Galileo's discovery concerning the composition of forces, D'Alembert "established, for the first time, the equations of equilibrium of *any* system of forces applied to the different points of a solid body"—equations which include all cases of levers and an infinity of cases besides. Clearly this is progress towards a higher generality—towards a knowledge more independent of special circumstances—towards a study of phenomena "the most disengaged from the incidents of particular cases;" which is M. Comte's definition of "the most simple phenomena." Does it not indeed follow from the familiarly admitted fact, that mental advance is from the concrete to the abstract, from the particular to the general, that the universal and therefore most simple truths are the last to be discovered? Is not the government of the solar system by a force varying inversely as the square of the distance, a simpler conception than any that preceded it? Should we ever succeed in reducing all orders of phenomena to some single law—say of atomic action, as M. Comte suggests—must not that law answer to his test of being *independent* of all others, and therefore most simple? And would not such a law generalize the phenomena of gravity, cohesion, atomic affinity, and electric repulsion, just as the laws of number generalize the quantitative phenomena of space, time and force?

The possibility of saying so much in support of an hypothesis the very reverse of M. Comte's, at once proves that his generalization is only a half-truth. The fact is, that neither proposition is correct by itself; and the actuality is expressed only by putting the two together. The progress of science is duplex: it is at once from the special to the general, and from the general to the special: it is analytical and synthetical at the same time.

M. Comte himself observes that the evolution of science has been accomplished by the division of labour; but he quite misstates the mode in which this division of labour has operated. As he describes it, it has simply been an arrangement of phenomena into classes, and the study of each class by itself. He does not recognise the constant effect of progress in each class upon *all* other classes; but only on the class succeeding it in his hierarchical scale. Or if he occasionally admits collateral influences and intercommunications, he does it so grudgingly, and so quickly puts the admissions out of sight and forgets them, as to leave the impression that, with but trifling exceptions, the sciences aid each other only in the order of their alleged succession. The fact is, however, that the division of labour in science, like the division of labour in society, and like the "physiological division of labour" in individual organisms, has been not only a specialization of functions, but a continuous helping of each division by all the others, and of all by each. Every particular class of inquirers has, as it were, secreted its own particular order of truths from the general mass of material which observation accumulates; and all other classes of inquirers have made use of these truths as fast as they were elaborated, with the effect of enabling them the better to elaborate each its own order of truths. It was thus in sundry of the cases we have quoted as at variance with M. Comte's doctrine. It was thus with the application of Huyghens's optical discovery to astronomical observation by Galileo. It was thus with the application of the isochronism of the pendulum to the making of instruments for measuring intervals, astronomical and other. It was thus when the discovery that the refraction and dispersion of light did not follow the same law of variation, affected both astronomy and physiology by giving us achromatic telescopes and microscopes. It was thus when Bradley's discovery of the aberration of light enabled him to make the first step towards ascertaining the motions of the stars. It was thus when Cavendish's torsion-balance experiment determined the specific gravity of the earth,

and so gave a datum for calculating the specific gravities of the sun and planets. It was thus when tables of atmospheric refraction enabled observers to write down the real places of the heavenly bodies instead of their apparent places. It was thus when the discovery of the different expansibilities of metals by heat, gave us the means of correcting our chronometrical measurements of astronomical periods. It was thus when the lines of the prismatic spectrum were used to distinguish the heavenly bodies that are of like nature with the sun from those which are not. It was thus when, as recently, an electro-telegraphic instrument was invented for the more accurate registration of meridional transits. It was thus when the difference in the rates of a clock at the equator, and nearer the poles, gave data for calculating the oblateness of the earth, and accounting for the precession of the equinoxes. It was thus—but it is needless to continue. Here, within our own limited knowledge of its history, we have named ten additional cases in which the single science of astronomy has owed its advance to sciences coming *after* it in M. Comte's series. Not only its secondary steps, but its greatest revolutions have been thus determined. Kepler could not have discovered his celebrated laws had it not been for Tycho Brahe's accurate observations; and it was only after some progress in physical and chemical science that the improved instruments with which those observations were made, became possible. The heliocentric theory of the solar system had to wait until the invention of the telescope before it could be finally established. Nay, even the grand discovery of all—the law of gravitation—depended for its proof upon an operation of physical science, the measurement of a degree on the Earth's surface. So completely indeed did it thus depend, that Newton *had actually abandoned his hypothesis* because the length of a degree, as then stated, brought out wrong results; and it was only after Picart's more exact measurement was published, that he returned to his calculations and proved his great generalization. Now this constant intercommunion which, for brevity's sake, we have illustrated in

the case of one science only, has been taking place with all the sciences. Throughout the whole course of their evolution there has been a continuous *consensus* of the sciences—a *consensus* exhibiting a general correspondence with the *consensus* of the faculties in each phase of mental development; the one being an objective registry of the subjective state of the other.

From our present point of view, then, it becomes obvious that the conception of a *serial* arrangement of the sciences is a vicious one. It is not simply that the schemes we have examined are untenable; but it is that the sciences cannot be rightly placed in any linear order whatever. It is not simply that, as M. Comte admits, a classification "will always involve something, if not arbitrary, at least artificial;" it is not, as he would have us believe, that, neglecting minor imperfections a classification may be substantially true; but it is that any grouping of the sciences in a succession gives a radically erroneous idea of their genesis and their dependencies. There is no "one *rational* order among a host of possible systems." There is no "true *filiation* of the sciences." The whole hypothesis is fundamentally false. Indeed, it needs but a glance at its origin to see at once how baseless it is. Why a *series*? What reason have we to suppose that the sciences admit of a *linear* arrangement? Where is our warrant for assuming that there is some *succession* in which they can be placed? There is no reason; no warrant. Whence then has arisen the supposition? To use M. Comte's own phraseology, we should say, it is a metaphysical conception. It adds another to the cases constantly occurring, of the human mind being made the measure of Nature. We are obliged to think in sequence; it is the law of our minds that we must consider subjects separately, one after another: *therefore* Nature must be serial—*therefore* the sciences must be classifiable in a succession. See here the birth of the notion, and the sole evidence of its truth. Men have been obliged when arranging in books their schemes of education and systems of knowledge, to choose *some* order or other. And

from inquiring what is the best order, have naturally fallen into the belief that there is an order which truly represents the facts—have persevered in seeking such an order; quite overlooking the previous question whether it is likely that Nature has consulted the convenience of book-making. For German philosophers, who hold that Nature is “petrified intelligence,” and that logical forms are the foundations of all things, it is a consistent hypothesis that as thought is serial, Nature is serial; but that M. Comte, who is so bitter an opponent of all anthropomorphism, even in its most evanescent shapes, should have committed the mistake of imposing upon the external world an arrangement which so obviously springs from a limitation of the human consciousness, is somewhat strange. And it is the more strange when we call to mind how, at the outset, M. Comte remarks that in the beginning “*toutes les sciences sont cultivées simultanément par les mêmes esprits* ;” that this is “*inévitabile et même indispensable* ;” and how he further remarks that the different sciences are “*comme les diverses branches d’un tronc unique*.” Were it not accounted for by the distorting influence of a cherished hypothesis, it would be scarcely possible to understand how, after recognising truths like these, M. Comte should have persisted in attempting to construct “*une échelle encyclopédique*.”

The metaphor which M. Comte has here so inconsistently used to express the relations of the sciences—branches of one trunk—is an approximation to the truth, though not the truth itself. It suggests the facts that the sciences had a common origin; that they have been developing simultaneously; and that they have been from time to time dividing and sub-dividing. But it does not suggest the yet more important fact, that the divisions and sub-divisions thus arising do not remain separate, but now and again re-unite in direct and indirect ways. They inosculate; they severally send off and receive connecting growths; and the intercommunion has been ever becoming more frequent, more intricate, more widely ramified. There has all along been higher specialization, that there might be a larger generalization; and a deeper analysis, that there might

be a better synthesis. Each larger generalization has lifted sundry specializations still higher ; and each better synthesis has prepared the way for still deeper analysis.

And here we may fitly enter upon the task awhile since indicated—a sketch of the Genesis of Science, regarded as a gradual outgrowth from common knowledge—an extension of the perceptions by the aid of the reason. We propose to treat it as a psychological process historically displayed ; tracing at the same time the advance from qualitative to quantitative prevision ; the progress from concrete facts to abstract facts, and the application of such abstract facts to the analysis of new orders of concrete facts ; the simultaneous advance in generalization and specialization ; the continually increasing subdivision and reunion of the sciences ; and their constantly improving *consensus*.

To trace out scientific evolution from its deepest roots would, of course, involve a complete analysis of the mind. For as science is a development of that common knowledge acquired by the unaided senses and uncultured reason, so is that common knowledge itself gradually built up out of the simplest perceptions. We must, therefore, begin somewhere abruptly ; and the most appropriate stage to take for our point of departure will be the adult mind of the savage.

Commencing thus, without a proper preliminary analysis, we are naturally somewhat at a loss how to present, in a satisfactory manner, those fundamental processes of thought out of which science ultimately originates. Perhaps our argument may be best initiated by the proposition, that all intelligent action whatever depends upon the discerning of distinctions among surrounding things. The condition under which only it is possible for any creature to obtain food and avoid danger is, that it shall be differently affected by different objects—that it shall be led to act in one way by one object, and in another way by another. In the lower orders of creatures this condition is fulfilled by means of an apparatus which acts automatically. In the higher orders the actions are partly automatic, partly conscious.

And in man they are almost wholly conscious. Throughout, however, there must necessarily exist a certain classification of things according to their properties—a classification which is either organically registered in the system, as in the inferior creation, or is formed by experience, as in ourselves. And it may be further remarked, that the extent to which this classification is carried, roughly indicates the height of intelligence—that, while the lowest organisms are able to do little more than discriminate organic from inorganic matter; while the generality of animals carry their classifications no further than to a limited number of plants or creatures serving for food, a limited number of beasts of prey, and a limited number of places and materials; the most degraded of the human race possess a knowledge of the distinctive natures of a great variety of substances, plants, animals, tools, persons, &c., not only as classes but as individuals.

What now is the mental process by which classification is effected? Manifestly it is a recognition of the *likeness* or *unlikeness* of things, either in respect of their sizes, colours, forms, weights, textures, tastes, &c., or in respect of their modes of action. By some special mark, sound, or motion, the savage identifies a certain four-legged creature he sees, as one that is good for food, and to be caught in a particular way; or as one that is dangerous; and acts accordingly. He has classed together all the creatures that are *alike* in this particular. And manifestly in choosing the wood out of which to form his bow, the plant with which to poison his arrows, the bone from which to make his fish-hooks, he identifies them through their chief sensible properties as belonging to the general classes, wood, plant, and bone, but distinguishes them as belonging to sub-classes by virtue of certain properties in which they are *unlike* the rest of the general classes they belong to; and so forms genera and species.

And here it becomes manifest that not only is classification carried on by grouping together in the mind things that are *like*; but that classes and sub-classes are formed and arranged according to the *degrees of unlikeness*. Things widely contrasted

are alone distinguished in the lower stages of mental evolution ; as may be any day observed in an infant. And gradually as the powers of discrimination increase, the widely contrasted classes at first distinguished, come to be each divided into sub-classes, differing from each other less than the classes differ ; and these sub-classes are again divided after the same manner. By the continuance of which process, things are gradually arranged into groups, the members of which are less and less *unlike* ; ending, finally, in groups whose members differ only as individuals, and not specifically. And thus there tends ultimately to arise the notion of *complete likeness*. For manifestly, it is impossible that groups should continue to be sub-divided in virtue of smaller and smaller differences, without there being a simultaneous approximation to the notion of *no difference*.

Let us next notice that the recognition of likeness and unlikeness, which underlies classification, and out of which continued classification evolves the idea of complete likeness—let us next notice that it also underlies the process of *naming*, and by consequence *language*. For all language consists, at the beginning, of symbols which are as *like* to the things symbolized as it is practicable to make them. The language of signs is a means of conveying ideas by mimicking the actions or peculiarities of the things referred to. Verbal language is also, at the beginning, a mode of suggesting objects or acts by imitating the sounds which the objects make, or with which the acts are accompanied. Originally these two languages were used simultaneously. It needs but to watch the gesticulations with which the savage accompanies his speech—to see a Bushman or a Kaffir dramatizing before an audience his mode of catching game—or to note the extreme paucity of words in all primitive vocabularies ; to infer that at first, attitudes, gestures, and sounds, were all combined to produce as good a *likeness* as possible of the things, animals, persons, or events described ; and that as the sounds came to be understood by themselves the gestures fell into disuse : leaving traces, however,

in the manners of the more excitable civilized races. But be this as it may, it suffices simply to observe, how many of the words current among barbarous peoples are like the sounds appertaining to the things signified; how many of our own oldest and simplest words have the same peculiarity; how children tend to invent imitative words; and how the sign-language spontaneously formed by deaf-mutes is invariably based upon imitative actions—to at once see that the notion of *likeness* is that from which the nomenclature of objects takes its rise. Were there space we might go on to point out how this law of likeness is traceable, not only in the origin but in the development of language; how in primitive tongues the plural is made by a duplication of the singular, which is a multiplication of the word to make it *like* the multiplicity of the things; how the use of metaphor—that prolific source of new words—is a suggesting of ideas that are *like* the ideas to be conveyed in some respect or other; and how, in the copious use of simile, fable, and allegory among uncivilized races, we see that complex conceptions, which there is yet no direct language for, are rendered, by presenting known conceptions more or less *like* them.

This view is further confirmed, and the predominance of this notion of likeness in primitive times further illustrated, by the fact that our system of presenting ideas to the eye originated after the same fashion. Writing and printing have descended from picture-language. The earliest mode of permanently registering a fact was by depicting it on a wall; that is—by exhibiting something as *like* to the thing to be remembered as it could be made. Gradually as the practice grew habitual and extensive, the most frequently repeated forms became fixed, and presently abbreviated; and, passing through the hieroglyphic and ideographic phases, the symbols lost all apparent relation to the things signified: just as the majority of our spoken words have done.

Observe again, that the same thing is true respecting the genesis of reasoning. The *likeness* that is perceived to exist

between cases, is the essence of all early reasoning and of much of our present reasoning. The savage, having by experience discovered a relation between a certain object and a certain act, infers that the *like* relation will be found in future cases. And the expressions we constantly use in our arguments—"analogy implies," "the cases are not *parallel*," "by *parity* of reasoning," "there is no *similarity*,"—show how constantly the idea of likeness underlies our ratiocinative processes. Still more clearly will this be seen on recognising the fact that there is a certain parallelism between reasoning and classification; that the two have a common root; and that neither can go on without the other. For on the one hand, it is a familiar truth that the attributing to a body in consequence of some of its properties, all those other properties in virtue of which it is referred to a particular class, is an act of inference. And, on the other hand, the forming of a generalization is the putting together in one class, all those cases which present like relations; while the drawing a deduction is essentially the perception that a particular case belongs to a certain class of cases previously generalized. So that as classification is a grouping together of *like things*; reasoning is a grouping together of *like relations* among things. Add to which, that while the perfection gradually achieved in classification consists in the formation of groups of *objects* which are *completely alike*; the perfection gradually achieved in reasoning consists in the formation of groups of *cases* which are *completely alike*.

Once more we may contemplate this dominant idea of likeness as exhibited in art. All art, civilized as well as savage, consists almost wholly in the making of objects *like* other objects; either as found in Nature, or as produced by previous art. If we trace back the varied art-products now existing, we find that at each stage the divergence from previous patterns is but small when compared with the agreement; and in the earliest art the persistency of imitation is yet more conspicuous. The old forms and ornaments and symbols were

held sacred, and perpetually copied. Indeed, the strong imitative tendency notoriously displayed by the lowest human races, ensures among them a constant reproducing of likenesses of things, forms, signs, sounds, actions and whatever else is imitable; and we may even suspect that this aboriginal peculiarity is in some way connected with the culture and development of this general conception, which we have found so deep and wide-spread in its applications.

And now let us go on to consider how, by a further unfolding of this same fundamental notion, there is a gradual formation of the first germs of science. This idea of likeness which underlies classification, nomenclature, language spoken and written, reasoning, and art; and which plays so important a part because all acts of intelligence are made possible only by distinguishing among surrounding things, or grouping them into like and unlike;—this idea we shall find to be the one of which science is the especial product. Already during the stage we have been describing, there has existed *qualitative* prevision in respect to the commoner phenomena with which savage life is familiar; and we have now to inquire how the elements of *quantitative* prevision are evolved. We shall find that they originate by the perfecting of this same idea of likeness; that they have their rise in that conception of *complete likeness* which, as we have seen, necessarily results from the continued process of classification.

For when the process of classification has been carried as far as it is possible for the uncivilized to carry it—when the animal kingdom has been grouped not merely into quadrupeds, birds, fishes, and insects, but each of these divided into kinds—when there come to be sub-classes, in each of which the members differ only as individuals, and not specifically; it is clear that there must occur a frequent observation of objects which differ so little as to be indistinguishable. Among several creatures which the savage has killed and carried home, it must often happen that some one, which he wished to identify, is so exactly like another that he cannot tell which

is which. Thus, then, there originates the notion of *equality*. The things which among ourselves are called *equal*—whether lines, angles, weights, temperatures, sounds or colours—are things which produce in us sensations that cannot be distinguished from each other. It is true that we now apply the word *equal* chiefly to the separate phenomena which objects exhibit, and not to groups of phenomena; but this limitation of the idea has evidently arisen by subsequent analysis. And that the notion of equality did thus originate, will, we think, become obvious on remembering that as there were no artificial objects from which it could have been abstracted, it must have been abstracted from natural objects; and that the various families of the animal kingdom chiefly furnish those natural objects which display the requisite exactitude of likeness.

The same order of experiences out of which this general idea of equality is evolved, gives birth at the same time to a more complex idea of equality; or, rather, the process just described generates an idea of equality which further experience separates into two ideas—*equality of things* and *equality of relations*. While organic, and more especially animal forms, occasionally exhibit this perfection of likeness out of which the notion of simple equality arises, they more frequently exhibit only that kind of likeness which we call *similarity*; and which is really compound equality. For the similarity of two creatures of the same species but of different sizes, is of the same nature as the similarity of two geometrical figures. In either case, any two parts of the one bear the same ratio to one another, as the homologous parts of the other. Given in any species, the proportions found to exist among the bones, and we may, and zoologists do, predict from any one, the dimensions of the rest; just as, when knowing the proportions subsisting among the parts of a geometrical figure, we may, from the length of one, calculate the others. And if, in the case of similar geometrical figures, the similarity can be established only by proving exactness of proportion among the homologous parts; if we express this relation between two

parts in the one, and the corresponding parts in the other, by the formula A is to B as a is to b ; if we otherwise write this, A to $B = a$ to b ; if, consequently, the fact we prove is that the relation of A to B *equals* the relation of a to b ; then it is manifest that the fundamental conception of similarity is *equality of relations*. With this explanation we shall be understood when we say that the notion of equality of relations is the basis of all exact reasoning. Already it has been shown that reasoning in general is a recognition of *likeness* of relations; and here we further find that while the notion of likeness of things ultimately evolves the idea of simple equality, the notion of likeness of relations evolves the idea of equality of relations: of which the one is the concrete germ of exact science, while the other is its abstract germ. Those who cannot understand how the recognition of similarity in creatures of the same kind, can have any alliance with reasoning, will get over the difficulty on remembering that the phenomena among which equality of relations is thus perceived, are phenomena of the same order and are present to the senses at the same time; while those among which developed reason perceives relations, are generally neither of the same order, nor simultaneously present. And if further, they will call to mind how Cuvier and Owen, from a single part of a creature, as a tooth, construct the rest by a process of reasoning based on this equality of relations, they will see that the two things are intimately connected, remote as they at first seem. But we anticipate. What it concerns us here to observe is, that from familiarity with organic forms there simultaneously arose the ideas of *simple equality*, and *equality of relations*.

At the same time, too, and out of the same mental processes, came the first distinct ideas of *number*. In the earliest stages, the presentation of several like objects produced merely an indefinite conception of multiplicity; as it still does among Australians, and Bushmen, and Damaras, when the number presented exceeds three or four. With such a fact before us we

may safely infer that the first clear numerical conception was that of duality as contrasted with unity. And this notion of duality must necessarily have grown up side by side with those of likeness and equality; seeing that it is impossible to recognise the likeness of two things without also perceiving that there are two. From the very beginning the conception of number must have been, as it is still, associated with the likeness or equality of the things numbered. If we analyze it, we find that simple enumeration is a registration of repeated impressions of any kind. That these may be capable of enumeration it is needful that they be more or less alike; and before any *absolutely true* numerical results can be reached, it is requisite that the units be *absolutely equal*. The only way in which we can establish a numerical relationship between things that do not yield us like impressions, is to divide them into parts that *do* yield us like impressions. Two unlike magnitudes of extension, force, time, weight, or what not, can have their relative amounts estimated, only by means of some small unit that is contained many times in both; and even if we finally write down the greater one as a unit and the other as a fraction of it, we state, in the denominator of the fraction, the number of parts into which the unit must be divided to be comparable with the fraction. It is, indeed, true, that by an evidently modern process of abstraction, we occasionally apply numbers to unequal units, as the furniture at a sale or the various animals on a farm, simply as so many separate entities; but no true result can be brought out by calculation with units of this order. And, indeed, it is the distinctive peculiarity of the calculus in general, that it proceeds on the hypothesis of that absolute equality of its abstract units, which no real units possess; and that the exactness of its results holds only in virtue of this hypothesis. The first ideas of number must necessarily then have been derived from like or equal magnitudes as seen chiefly in organic objects; and as the like magnitudes most frequently observed were magnitudes of extension, it follows that geometry and arithmetic had a simultaneous origin.

Not only are the first distinct ideas of number co-ordinate with ideas of likeness and equality, but the first efforts at numeration display the same relationship. On reading the accounts of various savage tribes, we find that the method of counting by the fingers, still followed by many children, is the aboriginal method. Neglecting the several cases in which the ability to enumerate does not reach even to the number of fingers on one hand, there are many cases in which it does not extend beyond ten—the limit of the simple finger notation. The fact that in so many instances, remote, and seemingly unrelated nations, have adopted *ten* as their basic number; together with the fact that in the remaining instances the basic number is either *five* (the fingers of one hand) or *twenty* (the fingers and toes); almost of themselves show that the fingers were the original units of numeration. The still surviving use of the word *digit*, as the general name for a figure in arithmetic, is significant; and it is even said that our word *ten* (Sax. *tyn*; Dutch, *tien*; German, *zehn*) means in its primitive expanded form *two hands*. So that, originally, to say there were ten things, was to say there were two hands of them. From all which evidence it is tolerably clear that the earliest mode of conveying the idea of any number of things, was by holding up as many fingers as there were things; that is—using a symbol which was *equal*, in respect of multiplicity, to the group symbolized. For which inference there is, indeed, strong confirmation in the recent statement that our own soldiers are even now spontaneously adopting this device in their dealings with the Turks. And here it should be remarked that in this re-combination of the notion of equality with that of multiplicity, by which the first steps in numeration are effected, we may see one of the earliest of those inosculationations between the diverging branches of science, which are afterwards of perpetual occurrence.

Indeed, as this observation suggests, it will be well, before tracing the mode in which exact science finally emerges from the merely approximate judgments of the senses, and showing the non-serial evolution of its divisions, to note the non-serial cha-

acter of those preliminary processes of which all after development is a continuation. On re-considering them it will be seen that not only are they divergent growths from a common root,—not only are they simultaneous in their progress; but that they are mutual aids; and that none can advance without the rest. That completeness of classification for which the unfolding of the perceptions paves the way, is impossible without a corresponding progress in language, by which greater varieties of objects are thinkable and expressible. On the one hand it is impossible to carry classification far without names by which to designate the classes; and on the other hand it is impossible to make language faster than things are classified. Again, the multiplication of classes and the consequent narrowing of each class, itself involves a greater likeness among the things classed together; and the consequent approach towards the notion of complete likeness itself allows classification to be carried higher. Moreover, classification necessarily advances *pari passu* with rationality—the classification of *things* with the classification of *relations*. For things that belong to the same class are, by implication, things of which the properties and modes of behaviour—the co-existences and sequences—are more or less the same; and the recognition of this sameness of co-existences and sequences is reasoning. Whence it follows that the advance of classification is necessarily proportionate to the advance of generalizations. Yet further, the notion of *likeness*, both in things and relations, simultaneously evolves by one process of culture the ideas of *equality* of things and *equality* of relations; which are the respective bases of exact concrete reasoning and exact abstract reasoning—Mathematics and Logic. And once more, this idea of equality, in the very process of being formed, necessarily gives origin to two series of relations—those of magnitude and those of number: from which arise geometry and the calculus. Thus the process throughout is one of perpetual subdivision and perpetual intercommunication of the divisions. From the very first there has been that *consensus* of different kinds of knowledge, answering to the *consensus* of the

intellectual faculties, which, as already said, must exist among the sciences.

Let us now go on to observe how, out of the notions of *equality* and *number*, as arrived at in the manner described, there gradually arose the elements of quantitative prevision.

Equality, once having come to be definitely conceived, was readily applicable to other phenomena than those of magnitude. Being predicable of all things producing indistinguishable impressions, there naturally grew up ideas of equality in weights, sounds, colours, &c. ; and indeed it can scarcely be doubted that the occasional experience of equal weights, sounds, and colours, had a share in developing the abstract conception of equality—that the ideas of equality in sizes, relations, forces, resistances, and sensible properties in general, were evolved during the same period. But however this may be, it is clear that as fast as the notion of equality gained definiteness, so fast did that lowest kind of quantitative prevision which is achieved without any instrumental aid, become possible. The ability to estimate, however roughly, the amount of a foreseen result, implies the conception that it will be *equal to* a certain imagined quantity ; and the correctness of the estimate will manifestly depend upon the accuracy at which the perceptions of sensible equality have arrived. A savage with a piece of stone in his hand, and another piece lying before him of greater bulk but of the same kind (a fact which he infers from the *equality* of the two in colour and texture) knows about what effort he must put forth to raise this other piece ; and he judges accurately in proportion to the accuracy with which he perceives that the one is twice, three times, four times, &c. as large as the other ; that is—in proportion to the precision of his ideas of equality and number. And here let us not omit to notice that even in these vaguest of quantitative previsions, the conception of *equality of relations* is also involved. For it is only in virtue of an undefined perception that the relation between bulk and weight in the one stone is *equal* to the relation between bulk and weight in the other, that even the roughest approximation can be made.

But how came the transition from those uncertain perceptions of equality which the unaided senses give, to the certain ones with which science deals? It came by placing the things compared in juxtaposition. Equality being predicated of things which give us indistinguishable impressions, and no accurate comparison of impressions being possible unless they occur in immediate succession, it results that exactness of equality is ascertainable in proportion to the closeness of the compared things. Hence the fact that when we wish to judge of two shades of colour whether they are alike or not, we place them side by side; hence the fact that we cannot, with any precision, say which of two allied sounds is the louder, or the higher in pitch, unless we hear the one immediately after the other; hence the fact that to estimate the ratio of weights, we take one in each hand, that we may compare their pressures by rapidly alternating in thought from the one to the other; hence the fact, that in a piece of music, we can continue to make equal beats when the first beat has been given, but cannot ensure commencing with the same length of beat on a future occasion; and hence, lastly, the fact, that of all magnitudes, those of *linear extension* are those of which the equality is most accurately ascertainable, and those to which by consequence all others have to be reduced. For it is the peculiarity of linear extension that it alone allows its magnitudes to be placed in *absolute* juxtaposition, or, rather, in coincident position; it alone can test the equality of two magnitudes by observing whether they will coalesce, as two equal mathematical lines do, when placed between the same points; it alone can test *equality* by trying whether it will become *identity*. Hence, then, the fact, that all exact science is reducible, by an ultimate analysis, to results measured in equal units of linear extension.

Still it remains to be noticed in what manner this determination of equality by comparison of linear magnitudes originated. Once more may we perceive that surrounding natural objects supplied the needful lessons. From the beginning there must have been a constant experience of like things placed side by

side—men standing and walking together ; animals from the same herd ; fish from the same shoal. And the ceaseless repetition of these experiences could not fail to suggest the observation, that the nearer together any objects were, the more visible became any inequality between them. Hence the obvious device of putting in apposition, things of which it was desired to ascertain the relative magnitudes. Hence the idea of *measure*. And here we suddenly come upon a group of facts which afford a solid basis to the remainder of our argument ; while they also furnish strong evidence in support of the foregoing speculations. Those who look sceptically on this attempted rehabilitation of the earliest epochs of mental development, and who more especially think that the derivation of so many primary notions from organic forms is somewhat strained, will perhaps see more probability in the several hypotheses that have been ventured, on discovering that all measures of *extension* and *force* originated from the lengths and weights of organic bodies ; and all measures of *time* from the periodic phenomena of either organic or inorganic bodies.

Thus, among linear measures, the cubit of the Hebrews was the *length of the forearm* from the elbow to the end of the middle finger ; and the smaller scriptural dimensions are expressed in *hand-breadths* and *spans*. The Egyptian cubit, which was similarly derived, was divided into digits, which were *finger-breadths* ; and each finger-breadth was more definitely expressed as being equal to four *grains of barley* placed breadthwise. Other ancient measures were the *orgyia* or *stretch of the arms*, the *pace*, and the *palm*. So persistent has been the use of these natural units of length in the East, that even now some of the Arabs mete out cloth by the forearm. So, too, is it with European measures. The *foot* prevails as a dimension throughout Europe, and has done since the time of the Romans, by whom, also, it was used : its lengths in different places varying not much more than men's feet vary. The heights of horses are still expressed in *hands*. The inch is the length of the terminal joint of *the thumb* ; as is clearly shown in France, where *pouce*

means both thumb and inch. Then we have the inch divided into three *barley-corns*. So completely, indeed, have these organic dimensions served as the substrata of all mensuration, that it is only by means of them that we can form any estimate of some of the ancient distances. For example, the length of a degree on the Earth's surface, as determined by the Arabian astronomers shortly after the death of Haroun-al-Raschid, was fifty-six of their miles. We know nothing of their mile further than that it was 4000 cubits; and whether these were sacred cubits or common cubits, would remain doubtful, but that the length of the cubit is given as twenty-seven inches, and each inch defined as the thickness of six barley-grains. Thus one of the earliest measurements of a degree comes down to us in barley-grains. Not only did organic lengths furnish those approximate measures which satisfied men's needs in ruder ages, but they furnished also the standard measures required in later times. One instance occurs in our own history. To remedy the irregularities then prevailing, Henry I. commanded that the ulna, or ancient ell, which answers to the modern yard, should be made of the exact length of *his own arm*.

Measures of weight again had a like derivation. Seeds seem commonly to have supplied the unit. The original of the carat used for weighing in India is *a small bean*. Our own systems, both troy and avoirdupois, are derived primarily from wheat-corns. Our smallest weight, the grain, is *a grain of wheat*. This is not a speculation; it is an historically registered fact. Henry III. enacted that an ounce should be the weight of 640 dry grains of wheat from the middle of the ear. And as all the other weights are multiples or sub-multiples of this, it follows that the grain of wheat is the basis of our scale. So natural is it to use organic bodies as weights, before artificial weights have been established, or where they are not to be had, that in some of the remoter parts of Ireland the people are said to be in the habit, even now, of putting a man into the scales to serve as a measure for heavy commodities.

Similarly with time. Astronomical periodicity, and the periodi-

city of animal and vegetable life, are simultaneously used in the first stages of progress for estimating epochs. The simplest unit of time, the day, nature supplies ready made. The next simplest period, the mooneth or month, is also thrust upon men's notice by the conspicuous changes constituting a lunation. For larger divisions than these, the phenomena of the seasons, and the chief events from time to time occurring, have been used by early and uncivilized races. Among the Egyptians the rising of the Nile served as a mark. The New Zealanders were found to begin their year from the reappearance of the Pleiades above the sea. One of the uses ascribed to birds, by the Greeks, was to indicate the seasons by their migrations. Barrow describes the aboriginal Hottentot as denoting periods by the number of moons before or after the ripening of one of his chief articles of food. He further states that the Kaffir chronology is kept by the moon, and is registered by notches on sticks—the death of a favourite chief, or the gaining of a victory, serving for a new era. By which last fact, we are at once reminded that in early history, events are commonly recorded as occurring in certain reigns, and in certain years of certain reigns: a proceeding which practically made a king's reign a measure of duration. And, as further illustrating the tendency to divide time by natural phenomena and natural events, it may be noticed that even by our own peasantry the definite divisions of months and years are but little used; and that they habitually refer to occurrences as "before sheep-shearing," or "after harvest," or "about the time when the squire died." It is manifest, therefore, that the more or less equal periods perceived in Nature gave the first units of measure for time; as did Nature's more or less equal lengths and weights give the first units of measure for space and force.

It remains only to observe, as further illustrating the evolution of quantitative ideas after this manner, that measures of value were similarly derived. Barter, in one form or other, is found among all but the very lowest human races. It is obviously based upon the notion of *equality of worth*. And as

it gradually merges into trade by the introduction of some kind of currency, we find that the *measures of worth*, constituting this currency, are organic bodies; in some cases *cowries*, in others *cocoa-nuts*, in others *cattle*, in others *pigs*; among the American Indians peltry or *skins*, and in Iceland *dried fish*.

Notions of exact equality and of measure having been reached, there came to be definite ideas of relative magnitudes as being multiples one of another; whence the practice of measurement by direct apposition of a measure. The determination of linear extensions by this process can scarcely be called science, though it is a step towards it; but the determination of lengths of time by an analogous process may be considered as one of the earliest samples of quantitative prevision. For when it is first ascertained that the moon completes the cycle of her changes in about thirty days—a fact known to most uncivilized tribes that can count beyond the number of their fingers—it is manifest that it becomes possible to say in what number of days any specified phase of the moon will recur; and it is also manifest that this prevision is effected by an apposition of two times, after the same manner that linear space is measured by the apposition of two lines. For to express the moon's period in days, is to say how many of these units of measure are contained in the period to be measured—is to ascertain the distance between two points in time by means of a *scale of days*, just as we ascertain the distance between two points in space by a scale of feet or inches: and in each case the scale coincides with the thing measured—mentally in the one; visibly in the other. So that in this simplest, and perhaps earliest case of quantitative prevision, the phenomena are not only thrust daily upon men's notice, but Nature is, as it were, perpetually repeating that process of measurement by observing which the prevision is effected. And thus there may be significance in the remark which some have made, that alike in Hebrew, Greek, and Latin, there is an affinity between the word meaning moon, and that meaning measure.

This fact, that in very early stages of social progress it is

known that the moon goes through her changes in about thirty days, and that in about twelve moons the seasons return—this fact that chronological astronomy assumes a certain scientific character even before geometry does ; while it is partly due to the circumstance that the astronomical divisions, day, month, and year, are ready made for us, is partly due to the further circumstances that agricultural and other operations were at first regulated astronomically, and that from the supposed divine nature of the heavenly bodies their motions determined the periodical religious festivals. As instances of the one we have the observation of the Egyptians, that the rising of the Nile corresponded with the heliacal rising of Sirius ; the directions given by Hesiod for reaping and ploughing, according to the positions of the Pleiades ; and his maxim that “ fifty days after the turning of the sun is a seasonable time for beginning a voyage.” As instances of the other, we have the naming of the days after the sun, moon, and planets ; the early attempts among Eastern nations to regulate the calendar so that the gods might not be offended by the displacement of their sacrifices ; and the fixing of the great annual festival of the Peruvians by the position of the sun. In all which facts we see that, at first, science was simply an appliance of religion and industry.

After the discoveries that a lunation occupies nearly thirty days, and that some twelve lunations occupy a year—discoveries of which there is no historical account, but which may be inferred as the earliest, from the fact that existing uncivilized races have made them—we come to the first known astronomical records, which are those of eclipses. The Chaldeans were able to predict these. “ This they did, probably,” says Dr. Whewell in his useful history, from which most of the materials we are about to use will be drawn, “ by means of their cycle of 223 months, or about eighteen years ; for, at the end of this time, the eclipses of the moon begin to return, at the same intervals and in the same order as at the beginning.” Now this method of calculating eclipses by means of a recurring cycle,—the *Saros* as they called it—is a more complex case of prevision by means of coincidence of

measures. For by what observations must the Chaldeans have discovered this cycle? Obviously, as Delambre infers, by inspecting their registers; by comparing the successive intervals; by finding that some of the intervals were alike; by seeing that these equal intervals were eighteen years apart; by discovering that *all* the intervals that were eighteen years apart were equal; by ascertaining that the intervals formed a series which repeated itself, so that if one of the cycles of intervals were superposed on another the divisions would fit. This once perceived, and it manifestly became possible to use the cycle as a scale of time by which to measure out future periods. Seeing thus that the process of so predicting eclipses, is in essence the same as that of predicting the moon's monthly changes by observing the number of days after which they repeat—seeing that the two differ only in the extent and irregularity of the intervals, it is not difficult to understand how such an amount of knowledge should so early have been reached. And we shall be less surprised, on remembering that the only things involved in these previsions were *time* and *number*; and that the time was in a manner self-numbered.

Still, the ability to predict events recurring only after so long a period as eighteen years, implies a considerable advance in civilization—a considerable development of general knowledge; and we have now to inquire what progress in other sciences accompanied, and was necessary to, these astronomical previsions. In the first place, there must clearly have been a tolerably efficient system of calculation. Mere finger-counting, mere head-reckoning, even with the aid of a regular decimal notation, could not have sufficed for numbering the days in a year; much less the years, months, and days between eclipses. Consequently there must have been a mode of registering numbers; probably even a system of numerals. The earliest numerical records, if we may judge by the practices of the less civilized races now existing, were probably kept by notches cut on sticks, or strokes marked on walls; much as public-house scores are kept now. And there seems reason to believe that the first numerals used were simply groups of straight strokes, as some of the still-

extant Roman ones are ; leading us to suspect that these groups of strokes were used to represent groups of fingers, as the groups of fingers had been used to represent groups of objects—a supposition quite in conformity with the aboriginal system of picture writing and its subsequent modifications. Be this so or not, however, it is manifest that before the Chaldeans discovered their *Saros*, there must have been both a set of written symbols serving for an extensive numeration, and a familiarity with the simpler rules of arithmetic.

Not only must abstract mathematics have made some progress, but concrete mathematics also. It is scarcely possible that the buildings belonging to this era should have been laid out and erected without any knowledge of geometry. At any rate, there must have existed that elementary geometry which deals with direct measurement—with the apposition of lines ; and it seems that only after the discovery of those simple proceedings, by which right angles are drawn, and relative positions fixed, could so regular an architecture be executed. In the case of the other division of concrete mathematics—mechanics, we have definite evidence of progress. We know that the lever and the inclined plane were employed during this period : implying that there was a qualitative prevision of their effects, though not a quantitative one. But we know more. We read of weights in the earliest records ; and we find weights in ruins of the highest antiquity. Weights imply scales, of which we have also mention ; and scales involve the primary theorem of mechanics in its least complicated form—involve not a qualitative but a quantitative prevision of mechanical effects. And here we may notice how mechanics, in common with the other exact sciences, took its rise from the simplest application of the idea of *equality*. For the mechanical proposition which the scales involve, is, that if a lever with *equal* arms, have *equal* weights suspended from them, the weights will remain at *equal* altitudes. And we may further notice, how, in this first step of rational mechanics, we see illustrated that truth awhile since referred to, that as magnitudes of linear extension are the only ones of which the equality is exactly ascertainable, the equalities of other

magnitudes have at the outset to be determined by means of them. For the equality of the weights which balance each other in scales, wholly depends upon the equality of the arms: we can know that the weights are equal only by proving that the arms are equal. And when by this means we have obtained a system of weights,—a set of equal units of force, then does a science of mechanics become possible. Whence, indeed, it follows, that rational mechanics could not possibly have any other starting-point than the scales.

Let us further remember, that during this same period there was a limited knowledge of chemistry. The many arts which we know to have been carried on must have been impossible without a generalized experience of the modes in which certain bodies affect each other under special conditions. In metallurgy, which was extensively practised, this is abundantly illustrated. And we even have evidence that in some cases the knowledge possessed was, in a sense, quantitative. For, as we find by analysis that the hard alloy of which the Egyptians made their cutting tools, was composed of copper and tin in fixed proportions, there must have been an established prevision that such an alloy was to be obtained only by mixing them in these proportions. It is true, this was but a simple empirical generalization; but so was the generalization respecting the recurrence of eclipses; so are the first generalizations of every science.

Respecting the simultaneous advance of the sciences during this early epoch, it only remains to remark that even the most complex of them must have made some progress—perhaps even a greater relative progress than any of the rest. For under what conditions only were the foregoing developments possible? There first required an established and organized social system. A long continued registry of eclipses; the building of palaces; the use of scales; the practice of metallurgy—alike imply a fixed and populous nation. The existence of such a nation not only presupposes laws, and some administration of justice, which we know existed, but it presupposes successful laws—laws conforming in some degree to the conditions of social stability—laws enacted because it was seen that the actions forbidden by them

were dangerous to the State. We do not by any means say that all, or even the greater part, of the laws were of this nature; but we do say, that the fundamental ones were. It cannot be denied that the laws affecting life and property were such. It cannot be denied that, however little these were enforced between class and class, they were to a considerable extent enforced between members of the same class. It can scarcely be questioned, that the administration of them between members of the same class was seen by rulers to be necessary for keeping their subjects together. And knowing, as we do, that, other things equal, nations prosper in proportion to the justness of their arrangements, we may fairly infer that the very cause of the advance of these earliest nations out of aboriginal barbarism, was the greater recognition among them of the claims to life and property. But supposition aside, it is clear that the habitual recognition of these claims in their laws, implied some prevision of social phenomena. Even thus early there was a certain amount of social science. Nay, it may even be shown that there was a vague recognition of that fundamental principle on which all the true social science is based—the equal rights of all to the free exercise of their faculties. That same idea of *equality*, which, as we have seen, underlies all other science, underlies also morals and sociology. The conception of justice, which is the primary one in morals; and the administration of justice, which is the vital condition of social existence; are impossible, without the recognition of a certain likeness in men's claims, in virtue of their common humanity. *Equity* literally means *equalness*; and if it be admitted that there were even the vaguest ideas of equity in these primitive eras, it must be admitted that there was some appreciation of the equalness of men's liberties to pursue the objects of life—some appreciation, therefore, of the essential principle of national equilibrium.

Thus in this initial stage of the positive sciences, before geometry had yet done more than evolve a few empirical rules—before mechanics had passed beyond its first theorem—before astronomy had advanced from its merely chronological phase

into the geometrical; the most involved of the sciences had reached a certain degree of development—a development without which no progress in other sciences was possible.

Only noting as we pass, how, thus early, we may see that the progress of exact science was not only towards an increasing number of previsions, but towards previsions more accurately quantitative—how, in astronomy, the recurring period of the moon's motions was by and by more correctly ascertained to be nineteen years, or two hundred and thirty-five lunations; how Callipus further corrected this Metonic cycle, by leaving out a day at the end of every seventy-six years; and how these successive advances implied a longer continued registry of observations, and the co-ordination of a greater number of facts—let us go on to inquire how geometrical astronomy took its rise. The first astronomical instrument was the gnomon. This was not only early in use in the East, but it was found also among the Mexicans; the sole astronomical observations of the Peruvians were made by it; and we read that 1100 B.C., the Chinese found that, at a certain place, the length of the sun's shadow, at the summer solstice, was to the height of the gnomon, as one and a half to eight. Here again it is observable, not only that the instrument is found ready made, but that Nature is perpetually performing the process of measurement. Any fixed, erect object—a column, a dead palm, a pole, the angle of a building—serves for a gnomon; and it needs but to notice the changing position of the shadow it daily throws, to make the first step in geometrical astronomy. How small this first step was, may be seen in the fact that the only things ascertained at the outset were the periods of the summer and winter solstices, which corresponded with the least and greatest lengths of the mid-day shadow; and to fix which, it was needful merely to mark the point to which each day's shadow reached. And now let it not be overlooked that in the observing at what time during the next year this extreme limit of the shadow was again reached, and in the inference that the sun had then arrived at the same turning point in his annual course,

we have one of the simplest instances of that combined use of *equal magnitudes* and *equal relations*, by which all exact science, all quantitative prevision, is reached. For the relation observed was between the length of the sun's shadow and his position in the heavens; and the inference drawn was that when, next year, the extremity of his shadow came to the same point, he occupied the same place. That is, the ideas involved were, the equality of the shadows, and the equality of the relations between shadow and sun in successive years. As in the case of the scales, the equality of relations here recognised is of the simplest order. It is not as those habitually dealt with in the higher kinds of scientific reasoning, which answer to the general type—the relation between two and three equals the relation between six and nine; but it follows the type—the relation between two and three, equals the relation between two and three; it is a case of not simply *equal* relations, but *coinciding* relations. And here, indeed, we may see beautifully illustrated how the idea of equal relations takes its rise after the same manner that that of equal magnitudes does. As already shown, the idea of equal magnitudes arose from the observed coincidence of two lengths placed together; and in this case we have not only two coincident lengths of shadows, but two coincident relations between sun and shadows.

From the use of the gnomon there naturally grew up the conception of angular measurements; and with the advance of geometrical conceptions there came the hemisphere of Berosus, the equinoctial armil, the solstitial armil, and the quadrant of Ptolemy—all of them employing shadows as indices of the sun's position, but in combination with angular divisions. It is obviously out of the question for us here to trace these details of progress. It must suffice to remark that in all of them we may see that notion of equality of relations of a more complex kind, which is best illustrated in the astrolabe, an instrument which consisted "of circular rims, moveable one within the other, or about poles, and contained circles which were to be brought into the position of the ecliptic, and of a plane passing

through the sun and the poles of the ecliptic"—an instrument, therefore, which represented, as by a model, the relative positions of certain imaginary lines and planes in the heavens; which was adjusted by putting these representative lines and planes into parallelism and coincidence with the celestial ones; and which depended for its use upon the perception that the relations between these representative lines and planes were *equal* to the relations between those represented. Were there space, we might go on to point out how the conception of the heavens as a revolving hollow sphere, the discovery of the globular form of the earth, the explanation of the moon's phases, and indeed all the successive steps taken, involved this same mental process. But we must content ourselves with referring to the theory of eccentrics and epicycles, as a further marked illustration of it. As first suggested, and as proved by Hipparchus to afford an explanation of the leading irregularities in the celestial motions, this theory involved the perception that the progressions, retrogressions, and variations of velocity seen in the heavenly bodies, might be reconciled with their assumed uniform movement in circles, by supposing that the earth was not in the centre of their orbits; or by supposing that they revolved in circles whose centres revolved round the earth; or by both. The discovery that this would account for the appearances, was the discovery that in certain geometrical diagrams the relations were such, that the uniform motion of a point would, when looked at from a particular position, present analogous irregularities; and the calculations of Hipparchus involved the belief that the relations subsisting among these geometrical curves were *equal* to the relations subsisting among the celestial orbits.

Leaving here these details of astronomical progress, and the philosophy of it, let us observe how the relatively concrete science of geometrical astronomy, having been thus far helped forward by the development of geometry in general, reacted upon geometry, caused it also to advance, and was again assisted by it. Hipparchus, before making his solar and lunar tables, had to discover rules for calculating the relations between the sides and

angles of triangles—*trigonometry*, a subdivision of pure mathematics. Further, the reduction of the doctrine of the sphere to the quantitative form needed for astronomical purposes, required the formation of a *spherical trigonometry*, which was also achieved by Hipparchus. Thus both plane and spherical trigonometry, which are parts of the highly abstract and simple science of extension, remained undeveloped until the less abstract and more complex science of the celestial motions had need of them. The fact admitted by M. Comte, that since Descartes the progress of the abstract division of mathematics has been determined by that of the concrete division, is paralleled by the still more significant fact that even thus early the progress of mathematics was determined by that of astronomy. And here, indeed, we may see exemplified the truth, which the subsequent history of science frequently illustrates, that before any more abstract division makes a further advance, some more concrete division must suggest the necessity for that advance—must present the new order of questions to be solved. Before astronomy presented Hipparchus with the problem of solar tables, there was nothing to raise the question of the relations between lines and angles; the subject-matter of trigonometry had not been conceived. And as there must be subject-matter before there can be investigation, it follows that the progress of the concrete divisions is as necessary to that of the abstract, as the progress of the abstract to that of the concrete.

Just incidentally noticing the circumstance that the epoch we are describing witnessed the evolution of algebra, a comparatively abstract division of mathematics, by the union of its less abstract divisions, geometry and arithmetic—a fact proved by the earliest extant samples of algebra, which are half algebraic, half geometric—we go on to observe that during the era in which mathematics and astronomy were thus advancing, rational mechanics made its second step; and something was done towards giving a quantitative form to hydrostatics, optics, and harmonics. In each case we shall see as before, how the idea of equality underlies all quantitative prevision; and in what simple forms this idea is first applied.

As already shown, the first theorem established in mechanics was, that equal weights suspended from a lever with equal arms would remain in equilibrium. Archimedes discovered that a lever with unequal arms was in equilibrium when one weight was to its arm as the other arm to its weight; that is—when the numerical relation between one weight and its arm was *equal* to the numerical relation between the other arm and its weight.

The first advance made in hydrostatics, which we also owe to Archimedes, was the discovery that fluids press *equally* in all directions; and from this followed the solution of the problem of floating bodies: namely, that they are in equilibrium when the upward and downward pressures are *equal*.

In optics, again, the Greeks found that the angle of incidence is *equal* to the angle of reflection; and their knowledge reached no further than to such simple deductions from this as their geometry sufficed for. In harmonics they ascertained the fact that three strings of *equal* lengths would yield the octave, fifth and fourth, when strained by weights having certain definite ratios; and they did not progress much beyond this. In the one of which cases we see geometry used in elucidation of the laws of light; and in the other, geometry and arithmetic made to measure the phenomena of sound.

Did space permit, it would be desirable here to describe the state of the less advanced sciences—to point out how, while a few had thus reached the first stages of quantitative prevision, the rest were progressing in qualitative prevision—how some small generalizations were made respecting evaporation, and heat, and electricity, and magnetism, which, empirical as they were, did not in that respect differ from the first generalizations of every science—how the Greek physicians had made advances in physiology and pathology, which, considering the great imperfection of our present knowledge, are by no means to be despised—how zoology had been so far systematized by Aristotle, as, to some extent, enabled him from the presence of certain organs to predict the presence of others—how in Aristotle's *Politics*, there is some progress towards a scientific concep-

tion of social phenomena, and sundry previsions respecting them—and how in the state of the Greek societies, as well as in the writings of Greek philosophers, we may recognise not only an increasing clearness in that conception of equity on which the social science is based, but also some appreciation of the fact that social stability depends upon the maintenance of equitable regulations. We might dwell at length upon the causes which retarded the development of some of the sciences, as for example, chemistry: showing that relative complexity had nothing to do with it—that the oxidation of a piece of iron is a simpler phenomenon than the recurrence of eclipses, and the discovery of carbonic acid less difficult than that of the precession of the equinoxes—but that the relatively slow advance of chemical knowledge was due, partly to the fact that its phenomena were not daily thrust on men's notice as those of astronomy were; partly to the fact that Nature does not habitually supply the means, and suggest the modes of investigation, as in the sciences dealing with time, extension, and force; partly to the fact that the great majority of the materials with which chemistry deals, instead of being ready to hand, are made known only by the arts in their slow growth; and partly to the fact that even when known, their chemical properties are not self-exhibited, but have to be sought out by experiment.

Merely indicating all these considerations, however, let us go on to contemplate the progress and mutual influence of the sciences in modern days; only parenthetically noticing how, on the revival of the scientific spirit, the successive stages achieved exhibit the dominance of the same law hitherto traced—how the primary idea in dynamics, a uniform force, was defined by Galileo to be a force which generates *equal* velocities in *equal* successive times—how the uniform action of gravity was first experimentally determined by showing that the time elapsing before a body thrown up, stopped, was *equal* to the time it took to fall—how the first fact in compound motion which Galileo ascertained was, that a body projected horizontally will have a uniform motion onwards and a uniformly accelerated motion

downwards; that is, will describe *equal* horizontal spaces in *equal* times, compounded with *equal* vertical increments in *equal* times—how his discovery respecting the pendulum was, that its oscillations occupy *equal* intervals of time whatever their lengths—how the principle of virtual velocities which he established is, that in any machine the weights that balance each other, are reciprocally as their virtual velocities; that is, the relation of one set of weights to their velocities *equals* the relation of the other set of velocities to their weights;—and how thus his achievements consisted in showing the equalities of certain magnitudes and relations, whose equalities had not been previously recognised.

When mechanics had reached the point to which Galileo brought it—when the simple laws of force had been disentangled from the friction and atmospheric resistance by which all their earthly manifestations are disguised—when progressing knowledge of *physics* had given a due insight into these disturbing causes—when, by an effort of abstraction, it was perceived that all motion would be uniform and rectilinear unless interfered with by external forces—and when the various consequences of this perception had been worked out; then it became possible, by the union of geometry and mechanics, to initiate physical astronomy. Geometry and mechanics having diverged from a common root in men's sensible experiences; having, with occasional inosculation, been separately developed, the one partly in connexion with astronomy, the other solely by analyzing terrestrial movements; now join in the investigations of Newton to create a true theory of the celestial motions. And here, also, we have to notice the important fact that, in the very process of being brought jointly to bear upon astronomical problems, they are themselves raised to a higher phase of development. For it was in dealing with the questions raised by celestial dynamics that the then incipient infinitesimal calculus was unfolded by Newton and his continental successors; and it was from inquiries into the mechanics of the solar system that the general theorems of mechanics contained in the "*Principia*"—many of them of purely terrestrial

application—took their rise. Thus, as in the case of Hipparchus, the presentation of a new order of concrete facts to be analyzed, led to the discovery of new abstract facts; and these abstract facts having been laid hold of, gave means of access to endless groups of concrete facts before incapable of quantitative treatment.

Meanwhile, physics had been carrying further that progress without which, as just shown, rational mechanics could not be disentangled. In hydrostatics, Stevinus had extended and applied the discovery of Archimedes. Torricelli had proved atmospheric pressure, “by showing that this pressure sustained different liquids at heights inversely proportional to their densities;” and Pascal “established the necessary diminution of this pressure at increasing heights in the atmosphere”: discoveries which in part reduced this branch of science to a quantitative form. Something had been done by Daniel Bernouilli towards the dynamics of fluids. The thermometer had been invented; and a number of small generalizations reached by it. Huyghens and Newton had made considerable progress in optics; Newton had approximately calculated the rate of transmission of sound; and the continental mathematicians had succeeded in determining some of the laws of sonorous vibrations. Magnetism and electricity had been considerably advanced by Gilbert. Chemistry had got as far as the mutual neutralization of acids and alkalies. And Leonardo da Vinci had advanced in geology to the conception of the deposition of marine strata as the origin of fossils. Our present purpose does not require that we should give particulars. All that it here concerns us to do is to illustrate the *consensus* subsisting in this stage of growth, and afterwards. Let us look at a few cases.

The theoretic law of the velocity of sound enunciated by Newton on purely mechanical considerations, was found wrong by one-sixth. The error remained unaccounted for until the time of Laplace, who, suspecting that the heat disengaged by the compression of the undulating strata of the air, gave additional elasticity, and so produced the difference, made the needful calculations and found he was right. Thus acoustics was arrested

until thermology overtook and aided it. When Boyle and Marriot had discovered the relation between the density of gases and the pressures they are subject to; and when it thus became possible to calculate the rate of decreasing density in the upper parts of the atmosphere; it also became possible to make approximate tables of the atmospheric refraction of light. Thus optics, and with it astronomy, advanced with barology. After the discovery of atmospheric pressure had led to the invention of the air-pump by Otto Guericke; and after it had become known that evaporation increases in rapidity as atmospheric pressure decreases; it became possible for Leslie, by evaporation in a vacuum, to produce the greatest cold known; and so to extend our knowledge of thermology by showing that there is no zero within reach of our researches. When Fourier had determined the laws of conduction of heat, and when the Earth's temperature had been found to increase below the surface one degree in every forty yards, there were data for inferring the past condition of our globe; the vast period it has taken to cool down to its present state; and the immense age of the solar system—a purely astronomical consideration. Chemistry having advanced sufficiently to supply the needful materials, and a physiological experiment having furnished the requisite hint, there came the discovery of galvanic electricity. Galvanism reacting on chemistry disclosed the metallic bases of the alkalies, and inaugurated the electro-chemical theory; in the hands of Oersted and Ampère it led to the laws of magnetic action; and by its aid Faraday has detected significant facts relative to the constitution of light. Brewster's discoveries respecting double refraction and dipolarization proved the essential truth of the classification of crystalline forms according to the number of axes, by showing that the molecular constitution depends upon the axes. In these and in numerous other cases, the mutual influence of the sciences has been quite independent of any supposed hierarchical order. Often, too, their inter-actions are more complex than as thus instanced—involve more sciences than two. One illustration of this must suffice. We quote it in full from the *History of the Inductive*

Sciences. In Book XI., chap II., on "The Progress of the Electrical Theory," Dr. Whewell writes:—

"Thus at that period, mathematics was behind experiment, and a problem was proposed, in which theoretical numerical results were wanted for comparison with observation, but could not be accurately obtained; as was the case in astronomy also, till the time of the approximate solution of the problem of three bodies, and the consequent formation of the tables of the moon and planets, on the theory of universal gravitation. After some time, electrical theory was relieved from this reproach, mainly in consequence of the progress which astronomy had occasioned in pure mathematics. About 1801 there appeared in the *Bulletin des Science*, an exact solution of the problem of the distribution of electric fluid on a spheroid, obtained by Biot, by the application of the peculiar methods which Laplace had invented for the problem of the figure of the planets. And, in 1811, M. Poisson applied Laplace's artifices to the case of two spheres acting upon one another in contact, a case to which many of Coulomb's experiments were referrible; and the agreement of the results of theory and observation, thus extricated from Coulomb's numbers obtained above forty years previously, was very striking and convincing."

Not only do the sciences affect each other after this direct manner, but they affect each other indirectly. Where there is no dependence, there is yet analogy—*equality of relations*; and the discovery of the relations subsisting among one set of phenomena, constantly suggests a search for the same relations among another set. Thus the established fact, that the force of gravitation varies inversely as the square of the distance, being recognised as a necessary characteristic of all influences proceeding from a centre, raised the suspicion that heat and light follow the same law; which proved to be the case—a suspicion and a confirmation which were repeated in respect to the electric and magnetic forces. Thus again the discovery of the polarization of light led to experiments which ended in the discovery of the polarization of heat—a discovery that could never have been made without the antecedent one. Thus, too, the known refrangibility of light and heat lately produced the inquiry whether sound also is not refrangible; which on trial it turns out to be. In some cases, indeed, it is only by the aid of conceptions derived from one class of phenomena that hypotheses respecting other classes can be formed. The theory, at one

time favoured, that evaporation is a solution of water in air, was an assumption that the relation between water and air is *like* the relation between salt and water; and could never have been conceived if the relation between salt and water had not been previously known. Similarly the received theory of evaporation—that it is a diffusion of the particles of the evaporating fluid in virtue of their atomic repulsion—could not have been entertained without a foregoing experience of magnetic and electric repulsions. So complete in recent days has become this *consensus* among the sciences, caused either by the natural entanglement of their phenomena, or by analogies in the relations of their phenomena, that scarcely any considerable discovery concerning one order of facts now takes place, without very shortly leading to discoveries concerning other orders.

To produce a tolerably complete conception of this process of scientific evolution, it would be needful to go back to the beginning, and trace in detail the growth of classifications and nomenclatures; and to show how, as subsidiary to science, they have acted upon it, and it has reacted upon them. We can only now remark that, on the one hand, classifications and nomenclatures have aided science by continually subdividing the subject-matter of research, and giving fixity and diffusion to the truths disclosed; and that on the other hand, they have caught from it that increasing quantitateness, and that progress from considerations touching single phenomena to considerations touching the relations among many phenomena, which we have been describing. Of this last influence a few illustrations must be given. In chemistry it is seen in the facts, that the dividing of matter into the four elements was ostensibly based upon the single property of weight; that the first truly chemical division into acid and alkaline bodies, grouped together bodies which had not simply one property in common, but in which one property was constantly related to many others; and that the classification now current, places together in the groups *supporters of combustion, metallic and non-metallic bases, acids, salts, &c.*, bodies which are often quite unlike in sensible qualities, but

which are like in the majority of their *relations* to other bodies. In mineralogy again, the first classifications were based upon differences in aspect, texture, and other physical attributes. Berzelius made two attempts at a classification based solely on chemical constitution. That now current, recognises as far as possible the *relations* between physical and chemical characters. In botany the earliest classes formed were *trees, shrubs, and herbs* : magnitude being the basis of distinction. Dioscorides divided vegetables into *aromatic, alimentary, medicinal, and vinous* : a division of chemical character. Cæsalpinus classified them by the seeds, and seed-vessels, which he preferred because of the *relations* found to subsist between the character of the fructification and the general character of the other parts. While the "natural system" since developed, carrying out the doctrine of Linnæus, that "the natural orders must be formed by attention not to one or two, but to *all* the parts of plants," bases its divisions on like peculiarities which are found to be *constantly related* to the greatest number of other like peculiarities. And similarly in zoology, the successive classifications, from having been originally determined by external and often subordinate characters not indicative of the essential nature, have been gradually more and more determined by those internal and fundamental differences, which have uniform *relations* to the greatest number of other differences. Nor shall we be surprised at this analogy between the modes of progress of positive science and classification, when we bear in mind that both proceed by making generalizations; that both enable us to make previsions differing only in their precision; and that while the one deals with equal properties and relations, the other deals with properties and relations that approximate towards equality in variable degrees.

Without further argument, it will, we think, be sufficiently clear that the sciences are none of them separately evolved—*are none of them independent either logically or historically*; but that all of them have, in a greater or less degree, required aid and reciprocated it. Indeed, it needs but to throw aside hypo-

theses, and contemplate the mixed character of surrounding phenomena, to at once see that these notions of division and succession in the kinds of knowledge are none of them actually true, but are simply scientific fictions : good, if regarded merely as aids to study ; bad, if regarded as representing realities in Nature. Consider them critically, and no facts whatever are presented to our senses uncombined with other facts—no facts whatever but are in some degree disguised by accompanying facts : disguised in such a manner that all must be partially understood before any one can be understood. If it be said, as by M. Comte, that gravitating force should be treated of before other forces, seeing that all things are subject to it, it may on like grounds be said that heat should be first dealt with ; seeing that thermal forces are everywhere in action ; that the ability of any portion of matter to manifest visible gravitative phenomena depends on its state of aggregation, which is determined by heat ; that only by the aid of thermology can we explain those apparent exceptions to the gravitating tendency which are presented by steam and smoke, and so establish its universality ; and that, indeed, the very existence of the solar system in a solid form is just as much a question of heat as it is one of gravitation. Take other cases :—All phenomena recognised by the eyes, through which only are the data of exact science ascertainable, are complicated with optical phenomena ; and cannot be exhaustively known until optical principles are known. The burning of a candle cannot be explained without involving chemistry, mechanics, thermology. Every wind that blows is determined by influences partly solar, partly lunar, partly hygrometric ; and implies considerations of fluid equilibrium and physical geography. The direction, dip, and variations of the magnetic needle, are facts half terrestrial, half celestial—are caused by earthly forces which have cycles of change corresponding with astronomical periods. The flowing of the gulf-stream and the annual migration of icebergs towards the equator, depending as they do on the balancing of the centripetal and centrifugal forces acting on the ocean, involve in their ex-

planation the Earth's rotation and spheroidal form, the laws of hydrostatics, the relative densities of cold and warm water, and the doctrines of evaporation. It is no doubt true, as M. Comte says, that "our position in the solar system, and the motions, form, size, and equilibrium of the mass of our world among the planets, must be known before we can understand the phenomena going on at its surface." But, fatally for his hypothesis, it is also true that we must understand a great part of the phenomena going on at its surface before we can know its position, &c., in the solar system. It is not simply that, as we have already shown, those geometrical and mechanical principles by which celestial appearances are explained, were first generalized from terrestrial experiences; but it is that the very obtainment of correct data, on which to base astronomical generalizations, implies advanced terrestrial physics. Until after optics had made considerable advance, the Copernican system remained but a speculation. A single modern observation on a star has to undergo a careful analysis by the combined aid of various sciences—has to be *digested by the organism of the sciences*; which have severally to assimilate their respective parts of the observation, before the essential fact it contains is available for the further development of astronomy. It has to be corrected not only for nutation of the earth's axis and for precession of the equinoxes, but for aberration and for refraction: and the formation of the tables by which refraction is calculated, presupposes knowledge of the law of decreasing density in the upper atmospheric strata; of the law of decreasing temperature, and the influence of this on the density; and of hygrometric laws as also affecting density. So that, to get materials for further advance, astronomy requires not only the indirect aid of the sciences which have presided over the making of its improved instruments, but the direct aid of an advanced optics, of barology, of thermology, of hygrometry; and if we remember that these delicate observations are in some cases registered electrically, and that they are further corrected for the "personal equation"—the time elapsing between seeing and registering,

which varies with different observers—we may even add electricity and psychology. If, then, so apparently simple a thing as ascertaining the position of a star is complicated with so many phenomena, it is clear that this notion of the independence of the sciences, or certain of them, will not hold. Whether objectively independent or not, they cannot be subjectively so—they cannot have independence as presented to our consciousness; and this is the only kind of independence with which we are concerned. And here, before leaving these illustrations, and especially this last one, let us not omit to notice how clearly they exhibit that increasingly active *consensus* of the sciences which characterizes their advancing development. Besides finding that in these later times a discovery in one science commonly causes progress in others; besides finding that a great part of the questions with which modern science deals are so mixed as to require the co-operation of many sciences for their solution; we find in this last case that, to make a single good observation in the purest of the natural sciences, requires the combined assistance of half a dozen other sciences.

Perhaps the clearest comprehension of the interconnected growth of the sciences may be obtained by contemplating that of the arts, to which it is strictly analogous, and with which it is inseparably bound up. Most intelligent persons must have been, at one time or other, struck with the vast array of antecedents pre-supposed by one of our processes of manufacture. Let him trace the production of a printed cotton, and consider all that is implied by it. There are the many successive improvements through which the power-looms reached their present perfection; there is the steam-engine that drives them, having its long history from Papin downwards; there are the lathes in which its cylinder was bored, and the string of ancestral lathes from which those lathes proceeded; there is the steam-hammer under which its crank shaft was welded; there are the puddling-furnaces, the blast-furnaces, the coal-mines and the iron-mines needful for producing the raw material; there are the slowly improved appliances by which the factory was built, and lighted,

and ventilated; there are the printing engine, and the dye-house, and the colour-laboratory with its stock of materials from all parts of the world, implying cochineal-culture, log-wood-cutting, indigo-growing; there are the implements used by the producers of cotton, the gins by which it is cleaned, the elaborate machines by which it is spun; there are the vessels in which cotton is imported, with the building-slips, the rope-yards, the sail-cloth factories, the anchor-forges, needful for making them; and besides all these directly necessary antecedents, each of them involving many others, there are the institutions which have developed the requisite intelligence, the printing and publishing arrangements which have spread the necessary information, the social organization which has rendered possible such a complex co-operation of agencies. Further analysis would show that the many arts thus concerned in the economical production of a child's frock, have each of them been brought to its present efficiency by slow steps which the other arts have aided; and that from the beginning this reciprocity has been ever on the increase. It needs but on the one hand to consider how utterly impossible it is for the savage, even with ore and coal ready, to produce so simple a thing as an iron hatchet; and then to consider, on the other hand, that it would have been impracticable among ourselves, even a century ago, to raise the tubes of the Britannia bridge from lack of the hydraulic press; to at once see how mutually dependent are the arts, and how all must advance that each may advance. Well, the sciences are involved with each other in just the same manner. They are, in fact, inextricably woven into this same complex web of the arts; and are only conventionally independent of it. Originally the two were one. How to fix the religious festivals; when to sow; how to weigh commodities; and in what manner to measure ground; were the purely practical questions out of which arose astronomy, mechanics, geometry. Since then there has been a perpetual inosculation of the sciences and the arts. Science has been supplying art with truer generalizations and more completely

quantitative previsions. Art has been supplying science with better materials, and more perfect instruments. And all along the interdependence has been growing closer, not only between art and science, but among the arts themselves, and among the sciences themselves. How completely the analogy holds throughout, becomes yet clearer when we recognise the fact that *the sciences are arts to each other*. If, as occurs in almost every case, the fact to be analyzed by any science, has first to be prepared—to be disentangled from disturbing facts by the afore discovered methods of other sciences; the other sciences so used, stand in the position of arts. If, in solving a dynamical problem, a parallelogram is drawn, of which the sides and diagonal represent forces, and by putting magnitudes of extension for magnitudes of force a measurable relation is established between quantities not else to be dealt with; it may be fairly said that geometry plays towards mechanics much the same part that the fire of the founder plays towards the metal he is going to cast. If, in analyzing the phenomena of the coloured rings surrounding the point of contact between two lenses, a Newton ascertains by calculation the amount of certain interposed spaces, far too minute for actual measurement; he employs the science of number for essentially the same purpose as that for which the watchmaker employs tools. If, before writing down his observation on a star, the astronomer has to separate from it all the errors resulting from atmospheric and optical laws, it is manifest that the refraction-tables, and logarithm-books, and formulæ, which he successively uses, serve him much as retorts, and filters, and cupels serve the assayer who wishes to separate the pure gold from all accompanying ingredients. So close, indeed, is the relationship, that it is impossible to say where science begins and art ends. All the instruments of the natural philosopher are the products of art; the adjusting one of them for use is an art; there is art in making an observation with one of them; it requires art properly to treat the facts ascertained; nay, even the employing established generalizations to open the way to new gene-

ralizations, may be considered as art. In each of these cases previously organized knowledge becomes the implement by which new knowledge is got at: and whether that previously organized knowledge is embodied in a tangible apparatus or in a formula, matters not in so far as its essential relation to the new knowledge is concerned. If, as no one will deny, art is applied knowledge, then such portion of a scientific investigation as consists of applied knowledge is art. So that we may even say that as soon as any prevision in science passes out of its originally passive state, and is employed for reaching other previsions, it passes from theory into practice—becomes science in action—becomes art. And when we thus see how purely conventional is the ordinary distinction, how impossible it is to make any real separation—when we see not only that science and art were originally one; that the arts have perpetually assisted each other; that there has been a constant reciprocation of aid between the sciences and arts; but that the sciences act as arts to each other, and that the established part of each science becomes an art to the growing part—when we recognise the closeness of these associations, we shall the more clearly perceive that as the connexion of the arts with each other has been ever becoming more intimate; as the help given by sciences to arts and by arts to sciences, has been age by age increasing; so the interdependence of the sciences themselves has been ever growing greater, their mutual relations more involved, their *consensus* more active.

In here ending our sketch of the Genesis of Science, we are conscious of having done the subject but scant justice. Two difficulties have stood in our way: one, the having to touch on so many points in such small space; the other, the necessity of treating in serial arrangement a process which is not serial—a difficulty which must ever attend all attempts to delineate processes of development, whatever their special nature. Add to which, that to present in anything like completeness and proportion, even the outlines of so vast and complex a history,

demands years of study. Nevertheless, we believe that the evidence which has been assigned suffices to substantiate the leading propositions with which we set out. Inquiry into the first stages of science confirms the conclusion which we drew from the analysis of science as now existing, that it is not distinct from common knowledge, but an outgrowth from it—an extension of the perception by means of the reason. That which we further found by analysis to form the more specific characteristic of scientific previsions, as contrasted with the previsions of uncultured intelligence—their quantitateness—we also see to have been the characteristic alike of the initial steps in science, and of all the steps succeeding them. The facts and admissions cited in disproof of the assertion that the sciences follow one another, both logically and historically, in the order of their decreasing generality, have been enforced by the sundry instances we have met with, in which the more general or abstract sciences have been advanced only at the instigation of the more special or concrete—instances serving to show that a more general science as much owes its progress to the presentation of new problems by a more special science, as the more special science owes its progress to the solutions which the more general science is thus led to attempt—instances therefore illustrating the position that scientific advance is as much from the special to the general as from the general to the special. Quite in harmony with this position we find to be the admissions that the sciences are as branches of one trunk, and that they were at first cultivated simultaneously: and this harmony becomes the more marked on finding, as we have done, not only that the sciences have a common root, but that science in general has a common root with language, classification, reasoning, art; that throughout civilization these have advanced together, acting and reacting upon each other just as the separate sciences have done; and that thus the development of intelligence in all its divisions and subdivisions has conformed to this same law which we have shown that the sciences conform to. From all which we may perceive that the sciences can with no greater propriety be arranged in a suc-

cession, than language, classification, reasoning, art, and science, can be arranged in a succession; that, however needful a succession may be for the convenience of books and catalogues, it must be recognised merely as a convention; and that so far from its being the function of a philosophy of the sciences to establish a hierarchy, it is its function to show that the linear arrangements required for literary purposes, have none of them any basis either in Nature or History.

There is one further remark we must not omit—a remark touching the importance of the question that has been discussed. Unfortunately it commonly happens that topics of this abstract nature are slighted as of no practical moment; and, we doubt not, that many will think it of very little consequence what theory respecting the genesis of science may be entertained. But the value of truths is often great, in proportion as their generality is wide. Remote as they seem from practical application, the highest generalizations are not unfrequently the most potent in their effects, in virtue of their influence on all those subordinate generalizations which regulate practice. And it must be so here. Whenever established, a correct theory of the historical development of the sciences must have an immense effect upon education; and, through education, upon civilization. Greatly as we differ from him in other respects, we agree with M. Comte in the belief that, rightly conducted, the education of the individual must have a certain correspondence with the evolution of the race. No one can contemplate the facts we have cited in illustration of the early stages of science, without recognising the *necessity* of the processes through which those stages were reached—a necessity which, in respect to the leading truths, may likewise be traced in all after stages. This necessity, originating in the very nature of the phenomena to be analyzed and the faculties to be employed, more or less fully applies to the mind of the child as to that of the savage. We say more or less fully, because the correspondence is not special but general only. Were the *environment* the same in both

cases, the correspondence would be complete. But though the surrounding material out of which science is to be organized, is, in many cases, the same to the juvenile mind and the aboriginal mind, it is not so throughout; as, for instance, in the case of chemistry, the phenomena of which are accessible to the one, but were inaccessible to the other. Hence, in proportion as the environment differs, the course of evolution must differ. After admitting sundry exceptions, however, there remains a substantial parallelism; and, if so, it becomes of great moment to ascertain what really has been the process of scientific evolution. The establishment of an erroneous theory must be disastrous in its educational results; while the establishment of a true one must eventually be fertile in school-reforms and consequent social benefits.

THE PHILOSOPHY OF STYLE.

COMMENTING on the seeming incongruity between his father's argumentative powers and his ignorance of formal logic, Tristram Shandy says:—"It was a matter of just wonder with my worthy tutor, and two or three fellows of that learned society, that a man who knew not so much as the names of his tools, should be able to work after that fashion with them." Sterne's intended implication that a knowledge of the principles of reasoning neither makes, nor is essential to, a good reasoner, is doubtless true. Thus, too, is it with grammar. As Dr. Latham, condemning the usual school-drill in Lindley Murray, rightly remarks:—"Gross vulgarity is a fault to be prevented; but the proper prevention is to be got from habit—not rules." Similarly, there can be little question that good composition is far less dependent upon acquaintance with its laws, than upon practice and natural aptitude. A clear head, a quick imagination, and a sensitive ear, will go far towards making all rhetorical precepts needless. He who daily hears and reads well-framed sentences, will naturally more or less tend to use similar ones. And where there exists any mental idiosyncrasy—where there is a deficient verbal memory, or an inadequate sense of logical dependence, or but little perception of order, or a lack of constructive ingenuity; no amount of instruction will remedy the defect. Nevertheless, *some* practical result may be expected from a familiarity with the principles of style. The endeavour to conform to laws may tell, though slowly. And if in no other way, yet, as facilitating revision, a knowledge of the thing

to be achieved—a clear idea of what constitutes a beauty, and what a blemish—cannot fail to be of service.

No general theory of expression seems yet to have been enunciated. The maxims contained in works on composition and rhetoric, are presented in an unorganized form. Standing as isolated dogmas—as empirical generalizations, they are neither so clearly apprehended, nor so much respected, as they would be were they deduced from some simple first principle. We are told that “brevity is the soul of wit.” We hear styles condemned as verbose or involved. Blair says that every needless part of a sentence “interrupts the description and clogs the image ;” and again, that “long sentences fatigue the reader’s attention.” It is remarked by Lord Kaimes, that “to give the utmost force to a period, it ought, if possible, to be closed with the word that makes the greatest figure.” That parentheses should be avoided, and that Saxon words should be used in preference to those of Latin origin, are established precepts. But, however influential the truths thus dogmatically embodied, they would be much more influential if reduced to something like scientific ordination. In this, as in other cases, conviction will be greatly strengthened when we understand the *why*. And we may be sure that a comprehension of the general principle from which the rules of composition result, will not only bring them home to us with greater force, but will discover to us other rules of like origin.

On seeking for some clue to the law underlying these current maxims, we may see shadowed forth in many of them, the importance of economizing the reader’s or hearer’s attention. To so present ideas that they may be apprehended with the least possible mental effort, is the desideratum towards which most of the rules above quoted point. When we condemn writing that is wordy, or confused, or intricate—when we praise this style as easy, and blame that as fatiguing, we consciously or unconsciously assume this desideratum as our standard of judgment. Regarding language as an apparatus of symbols for the convey-

ance of thought, we may say that, as in a mechanical apparatus, the more simple and the better arranged its parts, the greater will be the effect produced. In either case, whatever force is absorbed by the machine is deducted from the result. A reader or listener has at each moment but a limited amount of mental power available. To recognise and interpret the symbols presented to him, requires part of this power ; to arrange and combine the images suggested requires a further part ; and only that part which remains can be used for realizing the thought conveyed. Hence, the more time and attention it takes to receive and understand each sentence, the less time and attention can be given to the contained idea ; and the less vividly will that idea be conceived. How truly language must be regarded as a hindrance to thought, though the necessary instrument of it, we shall clearly perceive on remembering the comparative force with which simple ideas are communicated by signs. To say, "Leave the room," is less expressive than to point to the door. Placing a finger on the lips is more forcible than whispering, "Do not speak." A beck of the hand is better than, "Come here." No phrase can convey the idea of surprise so vividly as opening the eyes and raising the eyebrows. A shrug of the shoulders would lose much by translation into words. Again, it may be remarked that when oral language is employed, the strongest effects are produced by interjections, which condense entire sentences into syllables. And in other cases, where custom allows us to express thoughts by single words, as in *Beware, Heigho, Fudge*, much force would be lost by expanding them into specific propositions. Hence, carrying out the metaphor that language is the vehicle of thought, there seems reason to think that in all cases the friction and inertia of the vehicle deduct from its efficiency ; and that in composition, the chief, if not the sole thing to be done, is, to reduce this friction and inertia to the smallest possible amount. Let us then inquire whether economy of the recipient's attention is not the secret of effect, alike in the right choice and collocation of words, in the best arrangement of clauses in a sentence, in the proper order of

its principal and subordinate propositions, in the judicious use of simile, metaphor, and other figures of speech, and even in the rhythmical sequence of syllables.

The greater forcibleness of Saxon English, or rather non-Latin English, first claims our attention. The several special reasons assignable for this may all be reduced to the general reason—economy. The most important of them is early association. A child's vocabulary is almost wholly Saxon. He says, *I have*, not *I possess*—*I wish*, not *I desire*; he does not *reflect*, he *thinks*; he does not beg for *amusement*, but for *play*; he calls things *nice* or *nasty*, not *pleasant* or *disagreeable*. The synonymes which he learns in after years, never become so closely, so organically connected with the ideas signified, as do these original words used in childhood; and hence the association remains less strong. But in what does a strong association between a word and an idea differ from a weak one? Simply in the greater ease and rapidity of the suggestive action. It can be in nothing else. Both of two words, if they be strictly synonymous, eventually call up the same image. The expression—It is *acid*, must in the end give rise to the same thought as—It is *sour*; but because the term *acid* was learnt later in life, and has not been so often followed by the thought symbolized, it does not so readily arouse that thought as the term *sour*. If we remember how slowly and with what labour the appropriate ideas follow unfamiliar words in another language, and how increasing familiarity with such words brings greater rapidity and ease of comprehension; and if we consider that the same process must have gone on with the words of our mother tongue from childhood upwards, we shall clearly see that the earliest learnt and oftenest used words, will, other things equal, call up images with less loss of time and energy than their later learnt synonymes.

The further superiority possessed by Saxon English in its comparative brevity, obviously comes under the same generalization. If it be an advantage to express an idea in the smallest number of words, then will it be an advantage to express it in

the smallest number of syllables. If circuitous phrases and needless expletives distract the attention and diminish the strength of the impression produced, then do surplus articulations do so. A certain effort, though commonly an inappreciable one, must be required to recognise every vowel and consonant. If, as all know, it is tiresome to listen to an indistinct speaker, or read a badly written manuscript; and if, as we cannot doubt, the fatigue is a cumulative result of the attention needed to catch successive syllables; it follows that attention is in such cases absorbed by each syllable. And if this be true when the syllables are difficult of recognition, it will also be true, though in a less degree, when the recognition of them is easy. Hence, the shortness of Saxon words becomes a reason for their greater force. One qualification, however, must not be overlooked. A word which in itself embodies the most important part of the idea to be conveyed, especially when that idea is an emotional one, may often with advantage be a polysyllabic word. Thus it seems more forcible to say, "It is *magnificent*," than "It is *grand*." The word *vast* is not so powerful a one as *stupendous*. Calling a thing *nasty* is not so effective as calling it *disgusting*. There seem to be several causes for this exceptional superiority of certain long words. We may ascribe it partly to the fact that a voluminous, mouth-filling epithet is, by its very size, suggestive of largeness or strength; witness the immense pomposity of sesquipedalian verbiage: and when great power or intensity has to be suggested, this association of ideas aids the effect. A further cause may be that a word of several syllables admits of more emphatic articulation; and as emphatic articulation is a sign of emotion, the unusual impressiveness of the thing named is implied by it. Yet another cause is that a long word (of which the latter syllables are generally inferred as soon as the first are spoken) allows the hearer's consciousness a longer time to dwell upon the quality predicated; and where, as in the above cases, it is to this predicated quality that the entire attention is called, an advantage results from keeping it before the mind for an appreciable time. The reasons which we have given for preferring

short words evidently do not hold here. So that to make our generalization quite correct we must say, that while in certain sentences expressing strong feeling, the word which more especially implies that feeling may often with advantage be a many-syllabled or Latin one; in the immense majority of cases, each word serving but as a step to the idea embodied by the whole sentence, should, if possible, be a one-syllabled or Saxon one.

Once more, that frequent cause of strength in Saxon and other primitive words—their imitative character, may be similarly resolved into the more general cause. Both those directly imitative, as *splash, bang, whiz, roar, &c.*, and those analogically imitative, as *rough, smooth, keen, blunt, thin, hard, crag, &c.*, have a greater or less likeness to the things symbolized; and by making on the senses impressions allied to the ideas to be called up, they save part of the effort needed to call up such ideas, and leave more attention for the ideas themselves.

The economy of the recipient's mental energy, into which are thus resolvable the several causes of the strength of Saxon English, may equally be traced in the superiority of specific over generic words. That concrete terms produce more vivid impressions than abstract ones, and should, when possible, be used instead, is a current maxim of composition. As Dr. Campbell says, "The more general the terms are, the picture is the fainter; the more special they are, the brighter." We should avoid such a sentence as:

— In proportion as the manners, customs, and amusements of a nation are cruel and barbarous, the regulations of their penal code will be severe.

And in place of it we should write:

— In proportion as men delight in battles, bull-fights, and combats of gladiators, will they punish by hanging, burning, and the rack.

This superiority of specific expressions is clearly due to a saving of the effort required to translate words into thoughts. As we do not think in generals but in particulars—as, whenever

any class of things is referred to, we represent it to ourselves by calling to mind individual members of it; it follows that when an abstract word is used, the hearer or reader has to choose from his stock of images, one or more, by which he may figure to himself the genus mentioned. In doing this, some delay must arise—some force be expended; and if, by employing a specific term, an appropriate image can be at once suggested, an economy is achieved, and a more vivid impression produced.

Turning now from the choice of words to their sequence, we shall find the same general principle hold good. We have *à priori* reasons for believing that in every sentence there is some one order of words more effective than any other; and that this order is the one which presents the elements of the proposition in the succession in which they may be most readily put together. As in a narrative, the events should be stated in such sequence that the mind may not have to go backwards and forwards in order to rightly connect them; as in a group of sentences, the arrangement should be such, that each of them may be understood as it comes, without waiting for subsequent ones; so in every sentence, the sequence of words should be that which suggests the constituents of the thought in the order most convenient for the building up that thought. Duly to enforce this truth, and to prepare the way for applications of it, we must briefly inquire into the mental act by which the meaning of a series of words is apprehended.

We cannot more simply do this than by considering the proper collocation of the substantive and adjective. Is it better to place the adjective before the substantive, or the substantive before the adjective? Ought we to say with the French—*un cheval noir*; or to say as we do—a black horse? Probably, most persons of culture would decide that one order is as good as the other. Alive to the bias produced by habit, they would ascribe to that the preference they feel for our own form of expression. They would expect those educated in the use of the opposite form to have an equal preference for that. And thus they would conclude that neither of these instinctive judg-

ments is of any worth. There is, however, a philosophical ground for deciding in favour of the English custom. If "a horse black" be the arrangement, immediately on the utterance of the word "horse," there arises, or tends to arise, in the mind, a picture answering to that word; and as there has been nothing to indicate what *kind* of horse, any image of a horse suggests itself. Very likely, however, the image will be that of a brown horse: brown horses being the most familiar. The result is that when the word "black" is added, a check is given to the process of thought. Either the picture of a brown horse already present to the imagination has to be suppressed, and the picture of a black one summoned in its place; or else, if the picture of a brown horse be yet unformed, the tendency to form it has to be stopped. Whichever is the case, a certain amount of hindrance results. But if, on the other hand, "a black horse" be the expression used, no such mistake can be made. The word "black," indicating an abstract quality, arouses no definite idea. It simply prepares the mind for conceiving some object of that colour; and the attention is kept suspended until that object is known. If, then, by the precedence of the adjective, the idea is conveyed without liability to error, whereas the precedence of the substantive is apt to produce a misconception; it follows that the one gives the mind less trouble than the other, and is therefore more forcible.

Possibly it will be objected that the adjective and substantive come so close together, that practically they may be considered as uttered at the same moment; and that on hearing the phrase, "a horse black," there is not time to imagine a wrongly coloured horse before the word "black" follows to prevent it. It must be owned that it is not easy to decide by introspection whether this is so or not. But there are facts collaterally implying that it is not. Our ability to anticipate the words yet unspoken is one of them. If the ideas of the hearer kept considerably behind the expressions of the speaker, as the objection assumes, he could hardly foresee the end of a sentence by the

time it was half delivered: yet this constantly happens. Were the supposition true, the mind, instead of anticipating, would be continually falling more and more in arrear. If the meanings of words are not realised as fast as the words are uttered, then the loss of time over each word must entail such an accumulation of delays as to leave a hearer entirely behind. But whether the force of these replies be or be not admitted, it will scarcely be denied that the right formation of a picture will be facilitated by presenting its elements in the order in which they are wanted; even though the mind should do nothing until it has received them all.

What is here said respecting the succession of the adjective and substantive is obviously applicable, by change of terms, to the adverb and verb. And without further explanation, it will be manifest, that in the use of prepositions and other particles, most languages spontaneously conform with more or less completeness to this law.

On applying a like analysis to the larger divisions of a sentence, we find not only that the same principle holds good, but that the advantage of respecting it becomes marked. In the arrangement of predicate and subject, for example, we are at once shown that as the predicate determines the aspect under which the subject is to be conceived, it should be placed first; and the striking effect produced by so placing it becomes comprehensible. Take the often-quoted contrast between—"Great is Diana of the Ephesians," and—"Diana of the Ephesians is great." When the first arrangement is used, the utterance of the word "great" arouses those vague associations of an impressive nature with which it has been habitually connected; the imagination is prepared to clothe with high attributes whatever follows; and when the words, "Diana of the Ephesians" are heard, all the appropriate imagery which can, on the instant, be summoned, is used in the formation of the picture: the mind being thus led directly, and without error, to the intended impression. When, on the contrary, the reverse order is followed, the idea, "Diana of the Ephesians,"

is conceived with no special reference to greatness ; and when the words, "is great," are added, the conception has to be remodelled : whence arises a loss of mental energy, and a corresponding diminution of effect. The following verse from Coleridge's "Ancient Mariner," though somewhat irregular in structure, well illustrates the same truth.

*"Alone, alone, all, all alone,
Alone on a wide wide sea!
And never a saint took pity on
My soul in agony."*

Of course the principle equally applies when the predicate is a verb or a participle. And as effect is gained by placing first all words indicating the quality, conduct, or condition of the subject, it follows that the copula also should have precedence. It is true, that the general habit of our language resists this arrangement of predicate, copula, and subject ; but we may readily find instances of the additional force gained by conforming to it. Thus in the line from "Julius Cæsar"—

"Then burst this mighty heart,"

priority is given to a word embodying both predicate and copula. In a passage contained in "The Battle of Flodden Field," the like order is systematically employed with great effect:

*"The Border slogan rent the sky!
A Home! a Gordon! was the cry;
Loud were the clanging blows;
Advanced,—forced back,—now low, now high,
The pennon sunk and rose;
As bends the bark's mast in the gale
When rent are rigging, shrouds, and sail,
It wavered 'mid the foes."*

Pursuing the principle yet further, it is obvious that for producing the greatest effect, not only should the main divisions of a sentence observe this sequence, but the subdivisions of these should be similarly arranged. In nearly all cases, the predicate is accompanied by some limit or qualification called its complement. Commonly, also, the circumstances of the

subject, which form its complement, have to be specified. And as these qualifications and circumstances must determine the mode in which the acts and things they belong to are conceived, precedence should be given to them. Lord Kaimes notices the fact that this order is preferable; though without giving the reason. He says:—"When a circumstance is placed at the beginning of the period, or near the beginning, the transition from it to the principal subject is agreeable: is like ascending or going upward." A sentence arranged in illustration of this will be desirable. Here is one:

—Whatever it may be in theory, it is clear that in practice the French idea of liberty is—the right of every man to be master of the rest.

In this case, were the first two clauses, up to the word "practice" inclusive, which qualify the subject, to be placed at the end instead of the beginning, much of the force would be lost; as thus:

—The French idea of liberty is—the right of every man to be master of the rest; in practice at least, if not in theory.

Similarly with respect to the conditions under which any fact is predicated. Observe in the following example the effect of putting them last:

—How immense would be the stimulus to progress, were the honour now given to wealth and title given exclusively to high achievements and intrinsic worth!

And then observe the superior effect of putting them first:

—Were the honour now given to wealth and title given exclusively to high achievements and intrinsic worth, how immense would be the stimulus to progress!

The effect of giving priority to the complement of the predicate, as well as the predicate itself, is finely displayed in the opening of "Hyperion:—"

*" Deep in the shady sadness of a vale
Far sunken from the healthy breath of morn,
Far from the fiery noon and eve's one star
Sat grey-haired Saturn, quiet as a stone."*

Here it will be observed, not only that the predicate "sat" precedes the subject "Saturn," and that the three lines in italics, constituting the complement of the predicate, come before it; but that in the structure of that complement also, the same order is followed: each line being so arranged that the qualifying words are placed before the words suggesting concrete images.

The right succession of the principal and subordinate propositions in a sentence manifestly depends on the same law. Regard for economy of the recipient's attention, which, as we find, determines the best order for the subject, copula, predicate, and their complements, dictates that the subordinate proposition shall precede the principal one, when the sentence includes two. Containing, as the subordinate proposition does, some qualifying or explanatory idea, its priority prevents misconception of the principal one; and therefore saves the mental effort needed to correct such misconception. This will be seen in the annexed example.

—The secrecy once maintained in respect to the parliamentary debates, is still thought needful in diplomacy; and in virtue of this secret diplomacy, England may any day be unawares betrayed by its ministers into a war costing a hundred thousand lives, and hundreds of millions of treasure: yet the English pique themselves on being a self-governed people.

The two subordinate propositions, ending with the semi-colon and colon respectively, almost wholly determine the meaning of the principal proposition with which it concludes; and the effect would be lost were they placed last instead of first.

The general principle of right arrangement in sentences, which we have traced in its application to the leading divisions of them, equally determines the proper order of their minor divisions. In every sentence of any complexity the complement to the subject contains several clauses, and that to the predicate several others; and these may be arranged in greater

or less conformity to the law of easy apprehension. Of course with these, as with the larger members, the succession should be from the less specific to the more specific—from the abstract to the concrete.

Now however we must notice a further condition to be fulfilled in the proper construction of a sentence ; but still a condition dictated by the same general principle with the other : the condition, namely, that the words and expressions most nearly related in thought shall be brought the closest together. Evidently the single words, the minor clauses, and the leading divisions of every proposition, severally qualify each other. The longer the time that elapses between the mention of any qualifying member and the member qualified, the longer must the mind be exerted in carrying forward the qualifying member ready for use. And the more numerous the qualifications to be simultaneously remembered and rightly applied, the greater will be the mental power expended, and the smaller the effect produced. Hence, other things equal, force will be gained by so arranging the members of a sentence that these suspensions shall at any moment be the fewest in number ; and shall also be of the shortest duration. The following is an instance of defective combination.

— A modern newspaper-statement, though probably true, would be laughed at, if quoted in a book as testimony ; but the letter of a court gossip is thought good historical evidence, if written some centuries ago.

A re-arrangement of this, in accordance with the principle indicated above, will be found to increase the effect. Thus :

— Though probably true, a modern newspaper-statement quoted in a book as testimony, would be laughed at ; but the letter of a court gossip, if written some centuries ago, is thought good historical evidence.

By making this change, some of the suspensions are avoided and others shortened ; while there is less liability to produce premature conceptions. The passage quoted below from "Paradise Lost" affords a fine instance of a sentence well

arranged; alike in the priority of the subordinate members, in the avoidance of long and numerous suspensions, and in the correspondence between the order of the clauses and the sequence of the phenomena described, which, by the way, is a further prerequisite to easy comprehension, and therefore to effect.

“ As when a prowling wolf,
Whom hunger drives to seek new haunt for prey,
Watching where shepherds pen their flocks at eve
In huddled cotes amid the field secure,
Leaps o'er the fence with ease into the fold :
Or as a thief bent to unhoard the cash
Of some rich burgher, whose substantial doors,
Cross-barr'd, and bolted fast, fear no assault,
In at the window climbs, or o'er the tiles :
So clomb the first grand thief into God's fold ;
So since into his church lewd hirelings climb.”

The habitual use of sentences in which all or most of the descriptive and limiting elements precede those described and limited, gives rise to what is called the inverted style: a title which is, however, by no means confined to this structure, but is often used where the order of the words is simply unusual. A more appropriate title would be the *direct style*, as contrasted with the other, or *indirect style*: the peculiarity of the one being, that it conveys each thought into the mind step by step with little liability to error; and of the other, that it gets the right thought conceived by a series of approximations.

The superiority of the direct over the indirect form of sentence, implied by the several conclusions that have been drawn, must not, however, be affirmed without reservation. Though, up to a certain point, it is well for the qualifying clauses of a period to precede those qualified; yet, as carrying forward each qualifying clause costs some mental effort, it follows that when the number of them and the time they are carried become great, we reach a limit beyond which more is lost than is gained. Other things equal, the arrangement should be such that no concrete image shall be suggested until the materials out of which it is to be made have been presented. And yet,

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as lately pointed out, other things equal, the fewer the materials to be held at once, and the shorter the distance they have to be borne, the better. Hence in some cases it becomes a question whether most mental effort will be entailed by the many and long suspensions, or by the correction of successive misconceptions.

This question may sometimes be decided by considering the capacity of the persons addressed. A greater grasp of mind is required for the ready comprehension of thoughts expressed in the direct manner, where the sentences are anywise intricate. To recollect a number of preliminaries stated in elucidation of a coming idea, and to apply them all to the formation of it when suggested, demands a good memory and considerable power of concentration. To one possessing these, the direct method will mostly seem the best; while to one deficient in them it will seem the worst. Just as it may cost a strong man less effort to carry a hundred-weight from place to place at once, than by a stone at a time; so, to an active mind it may be easier to bear along all the qualifications of an idea and at once rightly form it when named, than to first imperfectly conceive such idea, and then carry back to it, one by one, the details and limitations afterwards mentioned. While conversely, as for a boy the only possible mode of transferring a hundred-weight, is that of taking it in portions; so, for a weak mind, the only possible mode of forming a compound conception may be that of building it up by carrying separately its several parts.

That the indirect method—the method of conveying the meaning by a series of approximations—is best fitted for the uncultivated, may indeed be inferred from their habitual use of it. The form of expression adopted by the savage, as in—“Water, give me,” is the simplest type of the approximative arrangement. In pleonasms, which are comparatively prevalent among the uneducated, the same essential structure is seen; as, for instance in—“The men, they were there.” Again, the old possessive case—“The king, his crown,” conforms to the like

order of thought. Moreover, the fact that the indirect mode is called the natural one, implies that it is the one spontaneously employed by the common people: that is—the one easiest for undisciplined minds.

There are many cases however in which neither the direct nor the indirect structure is the best; but where an intermediate structure is preferable to both. When the number of circumstances and qualifications to be included in the sentence is great, the most judicious course is neither to enumerate them all before introducing the idea to which they belong, nor to put this idea first and let it be remodelled to agree with the particulars afterwards mentioned; but to do a little of each. Take a case. It is desirable to avoid so extremely indirect an arrangement as the following:—

— “ We came to our journey’s end, at last, with no small difficulty, after much fatigue, through deep roads, and bad weather.”

Yet to transform this into an entirely direct sentence would not produce a satisfactory effect; as witness:—

— At last, with no small difficulty, after much fatigue, through deep roads, and bad weather, we came to our journey’s end.

Dr. Whately, from whom we quote the first of these two arrangements, proposes this construction:

— “ At last, after much fatigue, through deep roads and bad weather, we came, with no small difficulty, to our journey’s end.”

Here it will be observed that by introducing the words “ we came ” a little earlier in the sentence, the labour of carrying forward so many particulars is diminished, and the subsequent qualification “ with no small difficulty ” entails an addition to the thought that is very easily made. But a further improvement may be produced by introducing the words “ we came ” still earlier; especially if at the same time the qualifications be rearranged in conformity with the principle already explained, that the more abstract elements of the thought should come

before the more concrete. Observe the better effect obtained by making these two changes :

— At last, with no small difficulty, and after much fatigue, we came, through deep roads and bad weather, to our journey's end.

This reads with comparative smoothness ; that is—with less hindrance from suspensions and reconstructions of thought—with less mental effort.

Before dismissing this branch of our subject, it should be further remarked, that even when addressing the most vigorous intellects, the direct style is unfit for communicating ideas of a complex or abstract character. So long as the mind has not much to do, it may be well able to grasp all the preparatory clauses of a sentence, and to use them effectively ; but if some subtlety in the argument absorb the attention—if every faculty be strained in endeavouring to catch the speaker's or writer's drift, it may happen that the mind, unable to carry on both processes at once, will break down, and allow the elements of the thought to lapse into confusion.

Turning now to consider figures of speech, we may equally discern the same general law of effect. Underlying all the rules given for the choice and right use of them, we shall find the same fundamental requirement—economy of attention. It is indeed chiefly because they so well subserve this requirement, that figures of speech are employed. To bring the mind more easily to the desired conception, is in many cases solely, and in all cases mainly, their object.

Let us begin with the figure called *Synechdoche*. The advantage sometimes gained by putting a part for the whole, is due to the more convenient, or more accurate, presentation of the idea. If, instead of saying "a fleet of ten ships," we say "a fleet of ten *sail*," the picture of a group of vessels at sea is more readily suggested ; and is so because the sails constitute the most conspicuous parts of vessels so circumstanced : whereas the word *ships* would very likely remind us of vessels in dock.

Again, to say, "All *hands* to the pumps," is better than to say, "All *men* to the pumps;" as it suggests the men in the special attitude intended, and so saves effort. Bringing "*grey hairs* with sorrow to the grave," is another expression, the effect of which has the same cause.

The occasional increase of force produced by Metonymy may be similarly accounted for. "The low morality of *the bar*," is a phrase both more brief and significant than the literal one it stands for. A belief in the ultimate supremacy of intelligence over brute force, is conveyed in a more concrete, and therefore more realizable form, if we substitute *the pen* and *the sword* for the two abstract terms. To say, "Beware of drinking!" is less effective than to say, "Beware of *the bottle!*" and is so, clearly because it calls up a less specific image.

The Simile is in many cases used chiefly with a view to ornament; but whenever it increases the *force* of a passage, it does so by being an economy. Here is an instance.

—— The illusion that great men and great events came oftener in early times than now, is partly due to historical perspective. As in a range of equidistant columns, the furthest off look the closest; so, the conspicuous objects of the past seem more thickly clustered the more remote they are.

To construct by a process of literal explanation, the thought thus conveyed, would take many sentences; and the first elements of the picture would become faint while the imagination was busy in adding the others. But by the help of a comparison all effort is saved; the picture is instantly realized, and its full effect produced.

Of the position of the Simile,* it needs only to remark, that what has been said respecting the order of the adjective and substantive, predicate and subject, principal and subordinate propo-

* Properly the term "simile" is applicable only to the entire figure, inclusive of the two things compared and the comparison drawn between them. But as there exists no name for the illustrative member of the figure, there seems no alternative but to employ "simile" to express this also. The context will in each case show in which sense the word is used.

sitions, &c., is applicable here. As whatever qualifies should precede whatever is qualified, force will generally be gained by placing the simile before the object to which it is applied. That this arrangement is the best, may be seen in the following passage from the "Lady of the Lake:"—

"As wreath of snow, on mountain breast,
Slides from the rock that gave it rest,
Poor Ellen glided from her stay,
And at the monarch's feet she lay."

Inverting these couplets will be found to diminish the effect considerably. There are cases, however, even where the simile is a simple one, in which it may with advantage be placed last; as in these lines from Alexander Smith's "Life Drama:"—

"I see the future stretch
All dark and barren as a rainy sea."

The reason for this seems to be, that so abstract an idea as that attaching to the word "future," does not present itself to the mind in any definite form; and hence the subsequent arrival at the simile entails no reconstruction of the thought.

Such however are not the only cases in which this order is the most forcible. As the advantage of putting the simile before the object depends on its being carried forward in the mind to assist in forming an image of the object; it must happen that if, from length or complexity, it cannot be so carried forward, the advantage is not gained. The annexed sonnet, by Coleridge, is defective from this cause.

"As when a child, on some long winter's night,
Affrighted, clinging to its grandam's knees,
With eager wond'ring and perturb'd delight
Listens strange tales of fearful dark decrees,
Mutter'd to wretch by necromantic spell;
Or of those hags who at the witching time
Of murky midnight, ride the air sublime,
And mingle foul embrace with fiends of hell;
Cold horror drinks its blood! Anon the tear
More gentle starts, to hear the beldame tell
Of pretty babes, that lov'd each other dear,
Murder'd by cruel uncle's mandate fell:
Ev'n such the shiv'ring joys thy tounes impart,
Ev'n so, thou, Siddons, meltest my sad heart."

Here, from the lapse of time and accumulation of circumstances, the first part of the comparison is forgotten before its application is reached; and requires re-reading. Had the main idea been first mentioned, less effort would have been required to retain it, and to modify the conception of it into harmony with the comparison, than to remember the comparison, and refer back to its successive features for help in forming the final image.

The superiority of the Metaphor to the Simile is ascribed by Dr. Whately to the fact that "all men are more gratified at catching the resemblance for themselves, than in having it pointed out to them." But after what has been said, the great economy it achieves will seem the more probable cause. Lear's exclamation—

"Ingratitude! thou marble-hearted fiend,"

would lose part of its effect were it changed into—

"Ingratitude! thou fiend with heart like marble;"

and the loss would result partly from the position of the simile and partly from the extra number of words required. When the comparison is an involved one, the greater force of the metaphor, consequent on its greater brevity, becomes much more conspicuous. If, drawing an analogy between mental and physical phenomena, we say,

— As, in passing through the crystal, beams of white light are decomposed into the colours of the rainbow; so, in traversing the soul of the poet, the colourless rays of truth are transformed into brightly-tinted poetry;—

it is clear that in receiving the double set of words expressing the two halves of the comparison, and in carrying the one half to the other, considerable attention is absorbed. Most of this is saved, however, by putting the comparison in a metaphorical form, thus:

— The white light of truth, in traversing the many-sided transparent soul of the poet, is refracted into iris-hued poetry.

How much is conveyed in a few words by the help of the Metaphor, and how vivid the effect consequently produced, may

be abundantly exemplified. From "A Life Drama" may be quoted the phrase,

" I spear'd him with a jest,"

as a fine instance among the many which that poem contains. A passage in the "Prometheus Unbound," of Shelley, displays the power of the metaphor to great advantage.

" Methought among the lawns together
We wandered, underneath the young gray dawn,
And multitudes of dense white fleecy clouds
Were wandering in thick flocks along the mountains
Shepherded by the slow unwilling wind."

This last expression is remarkable for the distinctness with which it realizes the features of the scene: bringing the mind, as it were, by a bound to the desired conception.

But a limit is put to the advantageous use of the Metaphor, by the condition that it must be sufficiently simple to be understood from a hint. Evidently, if there be any obscurity in the meaning or application of it, no economy of attention will be gained; but rather the reverse. Hence, when the comparison is complex, it is usual to have recourse to the Simile. There is, however, a species of figure, sometimes classed under Allegory, but which might, perhaps, be better called Compound Metaphor, that enables us to retain the brevity of the metaphorical form even where the analogy is intricate. This is done by indicating the application of the figure at the outset, and then leaving the mind to continue the parallel. Emerson has employed it with great effect in the first of his "Lectures on the Times".

" The main interest which any aspects of the Times can have for us, is the great spirit which gazes through them, the light which they can shed on the wonderful questions, What are we? and Whither do we tend? We do not wish to be deceived. Here we drift, like white sail across the wild ocean, now bright on the wave, now darkling in the trough of the sea; but from what port did we sail? Who knows? Or to what port are we bound? Who knows? There is no one to tell us but such poor weather-tossed mariners as ourselves, whom we speak as we pass, or who have hoisted some signal, or floated to us some letter in a bottle from afar. But what know they more than we? They also found themselves on this wondrous sea. No; from the older sailors nothing. Over all their speaking-trumpets the gray sea and the loud winds answer—Not in us; not in Time."

The division of the Simile from the Metaphor is by no means a definite one. Between the one extreme in which the two elements of the comparison are detailed at full length and the analogy pointed out, and the other extreme in which the comparison is implied instead of stated, come intermediate forms, in which the comparison is partly stated and partly implied. For instance :

— Astonished at the performances of the English plough, the Hindoos paint it, set it up, and worship it ; thus turning a tool into an idol : linguists do the same with language.

There is an evident advantage in leaving the reader or hearer to complete the figure. And generally these intermediate forms are good in proportion as they do this ; provided the mode of completing it be obvious.

Passing over much that may be said of like purport upon Hyperbole, Personification, Apostrophe, &c., let us close our remarks upon construction by a typical example. The general principle which has been enunciated is, that, other things equal, the force of all verbal forms and arrangements is great, in proportion as the time and mental effort they demand from the recipient is small. The corollaries from this general principle have been severally illustrated ; and it has been shown that the relative goodness of any two modes of expressing an idea, may be determined by observing which requires the shortest process of thought for its comprehension. But though conformity in particular points has been exemplified, no cases of complete conformity have yet been quoted. It is indeed difficult to find them ; for the English idiom does not commonly permit the order which theory dictates. A few, however, occur in Ossian. Here is one :—

“ As autumn's dark storms pour from two echoing hills, so towards each other approached the heroes. As two dark streams from high rocks meet and mix, and roar on the plain : loud, rough, and dark in battle meet Lochlin and Inisfail. * * * As the troubled noise of the ocean when roll the waves on high ; as the last peal of the thunder of heaven ; such is the noise of the battle.”

Except in the position of the verb in the first two similes, the

theoretically best arrangement is fully carried out in each of these sentences. The simile comes before the qualified image, the adjectives before the substantives, the predicate and copula before the subject, and their respective complements before them. That the passage is open to the charge of being bombastic proves nothing; or rather, proves our case. For what is bombastic but a force of expression too great for the magnitude of the ideas embodied? All that may rightly be inferred is, that only in very rare cases, and then only to produce a climax, should *all* the conditions of effective expression be fulfilled.

Passing on to a more complex application of the doctrine with which we set out, it must now be remarked, that not only in the structure of sentences, and the use of figures of speech, may economy of the recipient's mental energy be assigned as the cause of force; but that in the choice and arrangement of the minor images, out of which some large thought is to be built up, we may trace the same condition to effect. To select from the sentiment, scene, or event described, those typical elements which carry many others along with them; and so, by saying a few things but suggesting many, to abridge the description; is the secret of producing a vivid impression. An extract from Tennyson's "Mariana" will well illustrate this.

" All day within the dreamy house,
The door upon the hinges creaked,
The blue fly sung i' the pane; the mouse
Behind the mouldering wainscot shrieked,
Or from the crevice peered about."

The several circumstances here specified bring with them many appropriate associations. Our attention is rarely drawn by the buzzing of a fly in the window, save when everything is still. While the inmates are moving about the house, mice usually keep silence; and it is only when extreme quietness reigns that they peep from their retreats. Hence each of the facts mentioned, presupposing numerous others, calls up these with more or less distinctness; and revives the feeling of dull

solitude with which they are connected in our experience. Were all these facts detailed instead of suggested, the attention would be so frittered away that little impression of dreariness would be produced. Similarly in other cases. Whatever the nature of the thought to be conveyed, this skilful selection of a few particulars which imply the rest, is the key to success. In the choice of component ideas, as in the choice of expressions, the aim must be to convey the greatest quantity of thoughts with the smallest quantity of words.

The same principle may in some cases be advantageously carried yet further, by indirectly suggesting some entirely distinct thought in addition to the one expressed. Thus if we say,

— The head of a good classic is as full of ancient myths, as that of a servant-girl of ghost stories ;

it is manifest that besides the fact asserted, there is an implied opinion respecting the small value of classical knowledge : and as this implied opinion is recognised much sooner than it can be put into words, there is gain in omitting it. In other cases, again, great effect is produced by an overt omission ; provided the nature of the idea left out is obvious. A good instance of this occurs in " Heroes and Hero-worship." After describing the way in which Burns was sacrificed to the idle curiosity of Lion-hunters—people who came not out of sympathy but merely to *see* him—people who sought a little amusement, and who got their amusement while " the Hero's life went for it!" Carlyle suggests a parallel thus :—

" Richter says, in the Island of Sumatra there is a kind of ' Light-chafers,' large Fire-flies, which people stick upon spits, and illuminate the ways with at night. Persons of condition can thus travel with a pleasant radiance, which they much admire. Great honour to the Fire-flies! But—!—"

Before inquiring whether the law of effect, thus far traced, explains the superiority of poetry to prose, it will be needful to notice some supplementary causes of force in expression, that have not yet been mentioned. These are not, properly speak-

ing, additional causes; but rather secondary ones, originating from those already specified—reflex results of them. In the first place, then, we may remark that mental excitement spontaneously prompts the use of those forms of speech which have been pointed out as the most effective. “Out with him!” “Away with him!” are the natural utterances of angry citizens at a disturbed meeting. A voyager, describing a terrible storm he had witnessed, would rise to some such climax as—“Crack went the ropes, and down came the mast.” Astonishment may be heard expressed in the phrase—“Never was there such a sight!” All of which sentences are, it will be observed, constructed after the direct type. Again, every one knows that excited persons are given to figures of speech. The vituperation of the vulgar abounds with them: often, indeed, consists of little else. “Beast,” “brute,” “gallows rogue,” “cut-throat villain,” these, and other like metaphors and metaphorical epithets, at once call to mind a street quarrel. Further, it may be noticed that extreme brevity is another characteristic of passionate language. The sentences are generally incomplete; the particles are omitted; and frequently important words are left to be gathered from the context. Great admiration does not vent itself in a precise proposition, as—“It is beautiful;” but in the simple exclamation,—“Beautiful!” He who, when reading a lawyer’s letter, should say, “Vile rascal!” would be thought angry; while, “He is a vile rascal,” would imply comparative coolness. Thus we see that alike in the order of the words, in the frequent use of figures, and in extreme conciseness, the natural utterances of excitement conform to the theoretical conditions of forcible expression.

Hence, then, the higher forms of speech acquire a secondary strength from association. Having, in actual life, habitually heard them in connection with vivid mental impressions; and having been accustomed to meet with them in the most powerful writing; they come to have in themselves a species of force. The emotions that have from time to time been produced by the strong thoughts wrapped up in these forms, are partially aroused

by the forms themselves. They create a certain degree of animation; they induce a preparatory sympathy; and when the striking ideas looked for are reached, they are the more vividly realized.

The continuous use of these modes of expression that are alike forcible in themselves and forcible from their associations, produces the peculiarly impressive species of composition which we call poetry. Poetry, we shall find, habitually adopts those symbols of thought, and those methods of using them, which instinct and analysis agree in choosing as most effective; and becomes poetry by virtue of doing this. On turning back to the various specimens that have been quoted, it will be seen that the direct or inverted form of sentence predominates in them; and that to a degree quite inadmissible in prose. And not only in the frequency, but in what is termed the violence of the inversions, will this distinction be remarked. In the abundant use of figures, again, we may recognise the same truth. Metaphors, similes, hyperboles, and personifications, are the poet's colours, which he has liberty to employ almost without limit. We characterize as "poetical" the prose which uses these appliances of language with any frequency; and condemn it as "over florid" or "affected" long before they occur with the profusion allowed in verse. Further, let it be remarked that in brevity—the other requisite of forcible expression which theory points out, and emotion spontaneously fulfils—poetical phraseology similarly differs from ordinary phraseology. Imperfect periods are frequent; elisions are perpetual; and many of the minor words, which would be deemed essential in prose, are dispensed with.

Thus poetry, regarded as a vehicle of thought, is especially impressive partly because it obeys all the laws of effective speech, and partly because in so doing it imitates the natural utterances of excitement. While the matter embodied is idealized emotion, the vehicle is the idealized language of emotion. As the musical composer catches the cadences in which our feelings of joy and sympathy, grief and despair, vent them-

selves, and out of these germs evolves melodies suggesting higher phases of these feelings; so, the poet develops from the typical expressions in which men utter passion and sentiment, those choice forms of verbal combination in which concentrated passion and sentiment may be fitly presented.

There is one peculiarity of poetry conducing much to its effect—the peculiarity which is indeed usually thought its characteristic one—still remaining to be considered: we mean its rhythmical structure. This, improbable though it seems, will be found to come under the same generalization with the others. Like each of them, it is an idealization of the natural language of strong emotion, which is known to be more or less metrical if the emotion be not too violent; and like each of them it is an economy of the reader's or hearer's attention. In the peculiar tone and manner we adopt in uttering versified language, may be discerned its relationship to the feelings; and the pleasure which its measured movement gives us, is ascribable to the comparative ease with which words metrically arranged can be recognised. This last position will scarcely be at once admitted; but a little explanation will show its reasonableness. For if, as we have seen, there is an expenditure of mental energy in the mere act of listening to verbal articulations, or in that silent repetition of them which goes on in reading—if the perceptive faculties must be in active exercise to identify every syllable—then, any mode of so combining words as to present a regular recurrence of certain traits which the mind can anticipate, will diminish that strain upon the attention required by the total irregularity of prose. Just as the body, in receiving a series of varying concussions, must keep the muscles ready to meet the most violent of them, as not knowing when such may come; so, the mind in receiving unarranged articulations, must keep its perceptive active enough to recognise the least easily caught sounds. And as, if the concussions recur in a definite order, the body may husband its forces by adjusting the resistance needful for each concussion; so, if the syllables be rhythmically arranged, the mind may economize its energies by anti-

icipating the attention required for each syllable. Far-fetched though this idea will perhaps be thought, a little introspection will countenance it. That we *do* take advantage of metrical language to adjust our perceptive faculties to the force of the expected articulations, is clear from the fact that we are balked by halting versification. Much as at the bottom of a flight of stairs, a step more or less than we counted upon gives us a shock; so, too, does a misplaced accent or a supernumerary syllable. In the one case, we *know* that there is an erroneous pre-adjustment; and we can scarcely doubt that there is one in the other. But if we habitually pre-adjust our perceptions to the measured movement of verse, the physical analogy above given renders it probable that by so doing we economize attention; and hence that metrical language is more effective than prose, because it enables us to do this.

Were there space, it might be worth while to inquire whether the pleasure we take in rhyme, and also that which we take in euphony, are not partly ascribable to the same general cause.

A few paragraphs only, can be devoted to a second division of our subject that here presents itself. To pursue in detail the laws of effect, as applying to the larger features of composition, would carry us beyond our limits. But we may briefly indicate a further aspect of the general principle hitherto traced out, and hint a few of its wider applications.

Thus far, then, we have considered only those causes of force in language which depend upon economy of the mental *energies*: we have now to glance at those which depend upon economy of the mental *sensibilities*. Questionable though this division may be as a psychological one, it will yet serve roughly to indicate the remaining field of investigation. It will suggest that besides considering the extent to which any faculty or group of faculties is tasked in receiving a form of words and realizing its contained idea, we have to consider the state in which this faculty or group of faculties is left; and how the reception of subsequent sentences and images will be influenced

by that state. Without going at length into so wide a topic as the exercise of faculties and its reactive effects, it will be sufficient here to call to mind that every faculty (when in a state of normal activity) is most capable at the outset; and that the change in its condition, which ends in what we term exhaustion, begins simultaneously with its exercise. This generalization, with which we are all familiar in our bodily experiences, and which our daily language recognises as true of the mind as a whole, is equally true of each mental power, from the simplest of the senses to the most complex of the sentiments. If we hold a flower to the nose for long, we become insensible to its scent. We say of a very brilliant flash of lightning that it blinds us; which means that our eyes have for a time lost their ability to appreciate light. After eating a quantity of honey, we are apt to think our tea is without sugar. The phrase "a deafening roar," implies that men find a very loud sound temporarily incapacitates them for hearing faint ones. To a hand which has for some time carried a heavy body, small bodies afterwards lifted seem to have lost their weight. Now, the truth at once recognised in these, its extreme manifestations, may be traced throughout. It may be shown that alike in the reflective faculties, in the imagination, in the perceptions of the beautiful, the ludicrous, the sublime, in the sentiments, the instincts, in all the mental powers, however we may classify them—action exhausts; and that in proportion as the action is violent, the subsequent prostration is great.

Equally, throughout the whole nature, may be traced the law that exercised faculties are ever tending to resume their original state. Not only after continued rest, do they regain their full power—not only do brief cessations partially reinvigorate them; but even while they are in action, the resulting exhaustion is ever being neutralized. The two processes of waste and repair go on together. Hence with faculties habitually exercised—as the senses of all persons, or the muscles of any one who is strong—it happens that, during moderate activity, the repair is so nearly equal to the waste, that the

diminution of power is scarcely appreciable; and it is only when the activity has been long continued, or has been very violent, that the repair becomes so far in arrear of the waste as to produce a perceptible prostration. In all cases, however, when, by the action of a faculty, waste has been incurred, *some* lapse of time must take place before full efficiency can be re-acquired; and this time must be long in proportion as the waste has been great.

Keeping in mind these general truths, we shall be in a condition to understand certain causes of effect in composition now to be considered. Every perception received, and every conception realized, entailing some amount of waste—or, as Liebig would say, some change of matter in the brain; and the efficiency of the faculties subject to this waste being thereby temporarily, though often but momentarily, diminished; the resulting partial inability must affect the acts of perception and conception that immediately succeed. And hence we may expect that the vividness with which images are realized will, in many cases, depend on the order of their presentation: even when one order is as convenient to the understanding as the other. There are sundry facts which alike illustrate this, and are explained by it. Climax is one of them. The marked effect obtained by placing last the most striking of any series of images, and the weakness—often the ludicrous weakness—produced by reversing this arrangement, depends on the general law indicated. As immediately after looking at the sun we cannot perceive the light of a fire, while by looking at the fire first and the sun afterwards we can perceive both; so, after receiving a brilliant, or weighty, or terrible thought, we cannot appreciate a less brilliant, less weighty, or less terrible one, while, by reversing the order, we can appreciate each. In Antithesis, again, we may recognize the same general truth. The opposition of two thoughts that are the reverse of each other in some prominent trait, insures an impressive effect; and does this by giving a momentary relaxation to the faculties addressed. If, after a series of images of an ordinary character, appealing

in a moderate degree to the sentiment of reverence, or approbation, or beauty, the mind has presented to it a very insignificant, a very unworthy, or a very ugly image; the faculty of reverence, or approbation, or beauty, as the case may be, having for the time nothing to do, tends to resume its full power; and will immediately afterwards appreciate a vast, admirable, or beautiful image better than it would otherwise do. Conversely, where the idea of absurdity due to extreme insignificance is to be produced, it may be greatly intensified by placing it after something highly impressive: especially if the form of phrase implies that something still more impressive is coming. A good illustration of the effect gained by thus presenting a petty idea to a consciousness that has not yet recovered from the shock of an exciting one, occurs in a sketch by Balzac. His hero writes to a mistress who has cooled towards him, the following letter:—

“Madame,—Votre conduite m'étonne autant qu'elle m'afflige. Non contente de me déchirer le cœur par vos dédains, vous avez l'indélicatesse de me retenir une brosse à dents, que mes moyens ne me permettent pas de remplacer, mes propriétés étant grevées d'hypothèques.

“Adieu, trop belle et trop ingrate amie! Pussions-nous nous revoir dans un monde meilleur!

“CHARLES-ÉDOUARD.”

Thus we see that the phenomena of Climax, Antithesis, and Anticlimax, alike result from this general principle. Improbable as these momentary variations in susceptibility may seem, we cannot doubt their occurrence when we contemplate the analogous variations in the susceptibility of the senses. Referring once more to phenomena of vision, every one knows that a patch of black on a white ground looks blacker, and a patch of white on a black ground looks whiter, than elsewhere. As the blackness and the whiteness must really be the same, the only assignable cause for this, is a difference in their actions upon us, dependent upon the different states of our faculties. It is simply a visual antithesis.

But this extension of the general principle of economy—this further condition to effective composition, that the sensitiveness of the faculties must be continuously husbanded—includes much more than has been yet hinted. It implies not only that certain arrangements and certain juxtapositions of connected ideas are best; but that some modes of dividing and presenting a subject will be more striking than others; and that, too, irrespective of its logical cohesion. It shows why we must progress from the less interesting to the more interesting; and why not only the composition as a whole, but each of its successive portions, should tend towards a climax. At the same time, it forbids long continuity of the same kind of thought, or repeated production of like effects. It warns us against the error committed both by Pope in his poems and by Bacon in his essays—the error, namely, of constantly employing forcible forms of expression: and it points out that as the easiest posture by and by becomes fatiguing, and is with pleasure exchanged for one less easy; so, the most perfectly-constructed sentences will soon weary, and relief will be given by using those of an inferior kind. Further, we may infer from it not only that should we avoid generally combining our words in one manner, however good, or working out our figures and illustrations in one way, however telling; but that we should avoid anything like uniform adherence, even to the wider conditions of effect. We should not make every section of our subject progress in interest; we should not always rise to a climax. As we saw that, in single sentences, it is but rarely allowable to fulfil all the conditions to strength; so, in the larger sections of a composition we must not often conform entirely to the law indicated. We must subordinate the component effects to the total effect.

In deciding how practically to carry out the principles of artistic composition, we may derive help by bearing in mind a fact already pointed out—the fitness of certain verbal arrangements for certain kinds of thought. That constant variety in the mode of presenting ideas which the theory demands, will in a great degree result from a skilful adaptation of the form to the matter. We saw how the direct or inverted sentence

is spontaneously used by excited people; and how their language is also characterized by figures of speech and by extreme brevity. Hence these may with advantage predominate in emotional passages; and may increase as the emotion rises. On the other hand, for complex ideas, the indirect sentence seems the best vehicle. In conversation, the excitement produced by the near approach to a desired conclusion, will often show itself in a series of short, sharp sentences; while, in impressing a view already enunciated, we generally make our periods voluminous by piling thought upon thought. These natural modes of procedure may serve as guides in writing. Keen observation and skilful analysis would, in like manner, detect further peculiarities of expression produced by other attitudes of mind; and by paying due attention to all such traits, a writer possessed of sufficient versatility might make some approach to a completely-organized work.

This species of composition which the law of effect points out as the perfect one, is the one which high genius tends naturally to produce. As we found that the kinds of sentence which are theoretically best, are those generally employed by superior minds, and by inferior minds when excitement has raised them; so, we shall find that the ideal form for a poem, essay, or fiction, is that which the ideal writer would evolve spontaneously. One in whom the powers of expression fully responded to the state of feeling, would unconsciously use that variety in the mode of presenting his thoughts, which Art demands. This constant employment of one species of phraseology, which all have now to strive against, implies an undeveloped faculty of language. To have a specific style is to be poor in speech. If we remember that in the far past, men had only nouns and verbs to convey their ideas with, and that from then to now the growth has been towards a greater number of implements of thought, and consequently towards a greater complexity and variety in their combinations; we may infer that we are now, in our use of sentences, much what the primitive man was in his use of words; and that a continuance of the process that has hitherto gone on, must produce increasing heterogeneity in

our modes of expression. As now, in a fine nature, the play of the features, the tones of the voice and its cadences, vary in harmony with every thought uttered ; so, in one possessed of a fully-developed power of speech, the mould in which each combination of words is cast will similarly vary with, and be appropriate to, the sentiment. That a perfectly-endowed man must unconsciously write in all styles, we may infer from considering how styles originate. Why is Johnson pompous, Goldsmith simple ? Why is one author abrupt, another rhythmical, another concise ? Evidently in each case the habitual mode of utterance must depend upon the habitual balance of the nature. The predominant feelings have by use trained the intellect to represent them. But while long, though unconscious, discipline has made it do this efficiently, it remains, from lack of practice, incapable of doing the same for the less active feelings ; and when these are excited, the usual verbal forms undergo but slight modifications. Let the powers of speech be fully developed, however—let the ability of the intellect to utter the emotions be complete ; and this fixity of style will disappear. The perfect writer will express himself as Junius, when in the Junius frame of mind ; when he feels as Lamb felt, will use a like familiar speech ; and will fall into the ruggedness of Carlyle when in a Carlylean mood. Now he will be rhythmical and now irregular ; here his language will be plain and there ornate ; sometimes his sentences will be balanced and at other times unsymmetrical ; for a while there will be considerable sameness, and then again great variety. His mode of expression naturally responding to his state of feeling, there will flow from his pen a composition changing to the same degree that the aspects of his subject change. He will thus without effort conform to what we have seen to be the laws of effect. And while his work presents to the reader that variety needful to prevent continuous exertion of the same faculties, it will also answer to the description of all highly-organized products both of man and of nature : it will be, not a series of like parts simply placed in juxtaposition, but one whole made up of unlike parts that are mutually dependent.

TRANSCENDENTAL PHYSIOLOGY.

IN Mathematics, the Transcendental Analysis is one which, passing beyond those particular relations of numbers dealt with by arithmetic, and passing beyond those general numerical relations which form the subject-matter of ordinary algebra, concerns itself with the still higher generalities underlying these general relations. The title Transcendental Anatomy is used to distinguish that division of biological science which treats, not of the structure of individual organisms, but of the general principles of structure common to vast and varied groups of organisms,—the unity of plan discernible throughout multitudinous genera and orders which are widely different in appearance. And here, under the head of Transcendental Physiology, we purpose putting together sundry laws of development and function which apply, not to particular kinds or classes of organisms, but to all organisms: laws, some of which have not, we believe, been hitherto enunciated.

By way of unobtrusively introducing the general reader to this highest class of biological truths, let us begin by briefly noticing one or two with which he is already familiar. Take first, the relation between the activity of an organ and its growth. This is a universal relation. It holds, not only of a bone, a muscle, a nerve, an organ of sense, a mental faculty; but of every gland, every viscus, every element of the body. It is seen, not in man only, but in each animal in which we have adequate opportunity of tracing it; and not in animals only, but in plants. Always providing that the performance of function is not so excessive as to produce disorder, or exceed the repairing powers either of the

system at large or of the particular agencies by which nutriment is brought to the organ,—always providing this, it is a law of organized bodies, that, other things equal, development varies as function. On this law are based all maxims and methods of right education, intellectual, moral, and physical; and when statesmen are wise enough to see it, this law will be found to underlie all right legislation.

Another of these truths which are co-extensive with the organic creation, is that of hereditary transmission. It is not, as commonly supposed, that hereditary transmission is exemplified merely in the perpetuation of the family peculiarities seen either in immediate or remote progenitors. Nor does the law of hereditary transmission comprehend only such more general facts as that modified plants or animals become the parents of permanent varieties; and that new kinds of wheat or potatoes, new breeds of sheep or cattle, new races of men, have been thus originated. These are but minor exemplifications of the law. Understood in its entirety, the law is, that each plant or animal produces others of like kind with itself: the likeness of kind consisting not so much in the repetition of individual traits as in the assumption of the same generic structure. This truth has become by daily illustration so familiar as almost to have lost its significance. That wheat produces wheat,—that existing oxen are descended from ancestral oxen,—that every unfolding organism ultimately takes the form of the class, order, genus, and species from which it sprang; is a fact which, by force of repetition, has assumed in our minds almost the character of a necessity. It is in this, however, that the law of hereditary transmission is principally displayed; the phenomena commonly referred to it being quite subordinate manifestations. And the law, as thus understood, is universal. Not forgetting the apparent, but only apparent, exceptions presented by the strange class of phenomena known as “alternate generation,” the truth that like produces like is common to all races of organisms.

Let us take next a universal physiological law of a less conspicuous kind; and one of but recent establishment. To the

ordinary observer, it seems that the multiplication of organisms proceeds in a variety of ways. He sees that the young of the higher animals are born with a general likeness to their parents; that birds lay eggs, which they foster and hatch; that fish deposit spawn and leave it. Among plants, he finds that while in some cases new individuals grow from seeds only, in others, as in that of the potato, they also grow from tubers; that by certain plants layers are sent out, take root, and develop new individuals; and that many plants are produced from cuttings and buds. Further, in the mould that makes its appearance on stale food, and the infusoria that soon swarm in water exposed to air and light, he sees a mode of generation which, seeming, as it does, inexplicable, he is apt to consider "spontaneous." The reader of popular science thinks the modes of reproduction still more various. He discovers that whole tribes of creatures multiply by gemmation—by a development from the body of the parent of buds, which, after unfolding into the parental form, separate and lead independent lives. He learns that among the microscopic forms of both animal and vegetable life, the ordinary mode of multiplication is by spontaneous fission—by a splitting-up of the original individual into two or more individuals, which by and by severally repeat the process. Still more remarkable are the cases in which, as in the *Aphis*, an egg gives rise to an imperfect female, from which other imperfect females are born viviparously, grow, and in their turns bear other imperfect females; and so on for eight, ten, or more generations, until finally, perfect males and females are viviparously produced. But now under all these, and many more, modified modes of multiplication, the advanced physiologist finds that there is at bottom complete uniformity. The starting-point, not only of every higher animal or plant, but of every clan of organisms which by fission or gemmation have sprung from a single organism, is always a spore, seed, or ovum. The millions of infusoria or of aphides which, by subdivision or gemmation, have proceeded from one individual; the countless plants that have been successively propagated from one original plant by cuttings or tubers; are, in common with

the highest creature, primarily descended from a fertilised germ. And in all cases—in the humblest alga as in the oak, in the protozoon as in the mammal—this fertilised germ results from the union of the contents of two cells. Whether, as in the lowest forms of life, these two cells are of seemingly identical nature; or whether, as in higher forms, they are distinguishable into sperm-cell and germ-cell; it remains throughout true that from their combination results the mass out of which is evolved a new organism or new series of organisms. That this law is without exception we are not prepared to say; for in the case of the *Aphis* certain experiments seem to imply that under special conditions the descendants of an original individual may continue multiplying for ever, without further fecundation; and it may be so in other cases. But we know of no case in Nature where it *actually is* so; for although there are certain plants whose seeds have never yet been seen, it is more probable that our observations are in fault than that these plants are exceptions. And until we find undoubted exceptions the above-stated induction must stand. Here, then, we have another of the truths of Transcendental Physiology: a truth which, so far as we know, *transcends* all distinctions of genus, order, class, kingdom, and applies to every living thing whatever.

Yet another generalisation of like universality is that which formulates the process of organic development. To the uninitiated this seems variable. No obvious parallelism exists between the unfolding of a plant and the unfolding of an animal. There is no manifest similarity between the development of a mammal, which proceeds without break from its first to its last phase, and that of an insect, which is divided into strongly-marked stages—egg, larva, pupa, imago. Nevertheless it is now an established fact, that all organisms are evolved after one general method. At the outset the germ of every plant or animal is homogeneous; and every advance towards maturity is an advance towards greater heterogeneity. Every organized thing commences as an almost structureless mass, and progresses towards its ultimate complexity by the establishment of

distinctions upon distinctions,—by the divergence of tissues from tissues and organs from organs. Here, then, we have yet another biological law of transcendental generality.

Having thus indicated the scope of Transcendental Physiology by presenting its leading truths, we have prepared the way for the considerations that are to follow.

And first, returning to the last of the great generalisations above given, let us inquire more nearly how this change from the homogeneous to the heterogeneous is carried on. Usually it is said to result from successive differentiations. This, however, we conceive to be an incomplete account of the process. As every physiologist knows, there occurs, during the evolution of an organism, not only separation of parts, but coalescence of parts. There is not only segregation, but aggregation. The heart, at first a large, long, pulsating blood-vessel, by and by twists upon itself and becomes integrated. The layer of bile-cells constituting the rudimentary liver, do not simply diverge from the surface of the intestine on which they at first lie; but they simultaneously consolidate into a definite organ. And the gradual concentration seen in these and other cases forms a part of the developmental process: a part which, though more or less recognised by Milne-Edwards and others, does not seem to have been included as an essential element in the conception of the developmental process.

This progressive integration, which is seen alike in tracing up the several stages passed through by every embryo, and in ascending from the lower organic forms to the higher, may be most conveniently studied under several heads. Let us consider first what may be called *longitudinal integration*.

The lower *Annulosa*—worms, myriapods, &c.—are characterised by the great number of segments of which they consist, reaching in some cases to several hundreds; but as we advance to the higher *Annulosa*—centipedes, crustaceans, insects, spiders,—we find this number greatly reduced, down to twenty-two, thirteen, and even fewer; and accompanying this there is a shorten-

ing or integration of the whole body, reaching its extreme in the crab and the spider. Similarly if we watch the development of an individual crustacean or insect. The thorax of a lobster, which, in the adult, forms, with the head, one compact box containing the viscera, is made up by the union of a number of segments which in the embryo were separable. The thirteen distinct divisions seen in the body of a caterpillar, become further integrated in the butterfly: several segments are consolidated to form the thorax, and the abdominal segments are more aggregated than they originally were. The like truth is seen when we pass to the internal organs. In the inferior annulose forms, and in the larvæ of the higher ones, the alimentary canal consists either of a tube that is uniform from end to end, or else bulges into a succession of stomachs, one to each segment; but in the developed forms there is a single well-defined stomach. In the nervous, vascular, and respiratory systems a parallel concentration may be traced. Again, in the development of the *Vertebrata* we have sundry examples of longitudinal integration. The coalescence of several vertebræ to form the skull is one instance of it. It is further illustrated in the *os coccygis*, which results from the fusion of a number of caudal vertebræ. And in the consolidation of the sacral vertebræ of a bird it is also well exemplified.

That which we may distinguish as *transverse integration*, is clearly illustrated among the *Annulosa* in the development of the nervous system. Leaving out those most degraded forms which do not present distinct ganglia, it is to be observed that the lower annulose animals, in common with the larvæ of the higher, are severally characterized by a double chain of ganglia running from end to end of the body; while in the more perfectly formed annulose animals this double chain becomes more or less completely united into a single chain. Mr. Newport has described the course of this concentration as exhibited in insects; and by Rathke it has been traced in the crustaceans. In the early stages of the *Astacus fluviatilis*, or common cray-fish, there is a pair of separate ganglia to each ring. Of the fourteen

pairs belonging to the head and thorax, the three pairs in advance of the mouth consolidate into one mass to form the brain, or cephalic ganglion. Meanwhile out of the remainder, the first six pairs severally unite in the median line, while the rest remain more or less separate. Of these six double ganglia thus formed, the anterior four coalesce into one mass; the remaining two coalesce into another mass; and then these two masses coalesce into one. Here we see longitudinal and transverse integration going on simultaneously; and in the highest crustaceans they are both carried still further. The *Vertebrata* clearly exhibit this transverse integration in the development of the generative system. The lowest of the mammalia—the *Monotremata*—in common with birds, to which they are in many respects allied, have oviducts which towards their lower extremities are dilated into cavities, severally performing in an imperfect way the function of a uterus. “In the *Marsupialia* there is a closer approximation of the two lateral sets of organs on the median line; for the oviducts converge towards one another and meet (without coalescing) on the median line; so that their uterine dilatations are in contact with each other, forming a true ‘double uterus.’ As we ascend the series of ‘placental’ mammals, we find the lateral coalescence becoming more and more complete. In many of the *Rodentia* the uterus still remains completely divided into two lateral halves; whilst in others these coalesce at their lower portions, forming a rudiment of the true ‘body’ of the uterus in the human subject. This part increases at the expense of the lateral ‘cornua’ in the higher herbivora and carnivora; but even in the lower quadrumana the uterus is somewhat cleft at its summit.”* And this process of transverse integration, which is still more striking when observed in all its details, is accompanied by parallel though less important changes in the opposite sex. Once more; in the increasing commissural connection of the cerebral hemispheres, which,

* Carpenter's Prin. of Comp. Phys. p. 617.

though separate in the lower vertebrata, become gradually more united in the higher, we have another instance. And further ones of a different order, but of like general implication, are supplied by the vascular system.

Now it seems to us that the various forms of integration here exemplified, which are commonly set down as so many independent phenomena, ought to be generalized, and included in the formula describing the process of development. The fact that in an adult crab, numerous pairs of ganglia originally separate have become fused into a single mass, is a fact only second in significance to the differentiation of its alimentary canal into stomach and intestine. That in the higher *Annulosa*, a single heart replaces the string of rudimentary hearts constituting the dorsal blood-vessel in the lower *Annulosa*, (reaching in one species to the number of one hundred and sixty,) is a truth as much needing to be comprised in the history of evolution, as is the formation of a respiratory surface by an involution of the skin. A right conception of the genesis of a vertebral column, includes not only the differentiations from which result the *chorda dorsalis* and the vertebral segments imbedded in it; but quite as much, or more, it includes the coalescence of numerous vertebral processes with their respective vertebral bodies. The changes in virtue of which several things become one, demand recognition equally with those in virtue of which one thing becomes several. Evidently, then, the current statement which ascribes the developmental progress to differentiations alone, is incomplete. Adequately to express the facts, we must say that the transition from the homogeneous to the heterogeneous is carried on by differentiations and subordinate integrations.

It may not be amiss here to ask—What is the meaning of these integrations? The evidence seems to show that it is in some way dependent upon community of function. The eight segments which coalesce to make the head of a centipede, have the common purpose of protecting the cephalic ganglia, and affording a solid fulcrum for the jaws, &c.; as also have the

many bones which unite to form a vertebral skull. In the consolidation of the several pieces which constitute a mammalian pelvis, and in the ankylosis of from ten to nineteen vertebræ in the sacrum of a bird, we have kindred instances of the integration of parts which transfer the weight of the body to the legs. The more or less complete fusion of the tibia with the fibula and the radius with the ulna in the unguled mammals, whose habits do not require any rotation of the limbs, is a fact of like meaning. And all the instances lately given—the concentration of ganglia; the replacement of many pulsating blood-sacs by fewer, and finally by one; the fusion of two uteri into a single uterus—have the same implication. Whether, as in some cases, the integration is a mere consequence of the continued growth which eventually brings into contact adjacent parts performing similar duties; or whether, as in other cases, there is an actual approximation of these parts before their union; or whether, as in yet other cases, the integration is of that indirect kind which arises when, out of a number of like organs, one, or a group, discharges an ever-increasing share of the common function, and so grows while the rest dwindle and disappear;—the general fact remains the same, that there is a tendency to the unification of parts having similar duties.

The tendency, however, has limiting conditions; the recognition of which will explain some apparent exceptions. Let us take instances. In the human fœtus, as in the lower vertebrata, the eyes are placed one on each side of the head. In the process of evolution they become relatively nearer, and at birth are in front; though they are still, in the European infant as in the adult savage, proportionately further apart than they afterwards become. But this approximation shows no signs of further increase. Two reasons for this suggest themselves. Inasmuch as the eyes, being directed to the same object, have a common function, they tend to become one; but inasmuch as they are directed to different sides of the same object, and so have different functions, they tend to remain two; and possibly their ultimate positions depend on the balance

of these opposing tendencies. A more probable explanation however seems to be, that the interposed structures do not admit of any nearer approach : for the orbits of the eyes to be brought closer together, would imply a decrease in the size of the olfactory chambers ; and as these are probably not larger than is demanded by their present functional activity, no decrease can take place. Again, if we trace up the external organs of smell through fishes,* reptiles, ungulate mammals and unguiculate mammals, to man, we perceive a general tendency to coalescence in the median line ; and on comparing the savage with the civilized, or the infant with the adult, we see this approach of the nostrils carried furthest in the most perfect of the species. But since the septum which divides them has the function both of an evaporating surface for the lachrymal secretion, and a ramifying surface for a nerve ancillary to that of smell, it does not disappear entirely : the integration remains incomplete. These and other like instances do not however militate against the hypothesis. They merely show that the tendency is sometimes antagonized by other tendencies. Bearing in mind which qualification, we may say, that as differentiation of parts is connected with difference of function, so there appears to be a connection between integration of parts and sameness of function.

Intimately related to the general truth that the evolution of all organisms is carried on by combined differentiations and integrations, is another general truth, which physiologists appear not to have recognised. When we look at the organic creation in its *ensemble*, we may observe that, on passing from lower to higher forms, we pass to forms which are not only characterised by a greater differentiation of parts, but are at the same time more completely differentiated from the

* With the exception, perhaps, of the Myxinoid fishes, in which what is considered as the nasal orifice is single, and on the median line. But seeing how unusual is the position of this orifice, it seems questionable whether it is the true homologue of the nostrils.

surrounding medium. This truth may be contemplated under various aspects.

In the first place, it is illustrated in *structure*. The advance from the homogeneous to the heterogeneous itself involves an increasing distinction from the inorganic world. In the lowest *Protozoa*, as that structureless speck of jelly the *Amœba*, we have a homogeneity approaching to that of air, water, or earth; and the ascent to organisms of greater and greater complexity of structure, is an ascent to organisms that are in that respect more strongly contrasted with the structureless environment.

In *form* again we see the same fact. A general characteristic of inorganic matter is its indefiniteness of form, and this is also a characteristic of the lower organisms, as compared with the higher. Speaking generally, plants are less definite than animals, both in shape and size—admit of greater modifications from variations of position and nutrition. Among animals, the *Amœba* and its allies are not only structureless but amorphous: the form is never specific, and is constantly changing. Of the organisms resulting from the aggregation of amœba-like creatures, we find that while some, as the Rhizopods, assume a certain definiteness of form, in their shells at least; others, as the Sponges, are very irregular. In the Zoophytes and in the *Polyzoa*, we see compound organisms, most of which have a mode of growth not more determinate than that of plants. But among the higher animals, we find not only that the mature shape of each species is very definite, but that the individuals of each species differ very little in size.

A parallel increase of contrast is likewise seen in *chemical composition*. With but few exceptions, and those only partial ones, the lowest animal and vegetable forms are inhabitants of the water; and water is almost their sole constituent. Desiccated *Protophyta* and *Protozoa* shrink into mere dust; and among the acalaphes we find but a few grains of solid matter to a pound of water. The higher aquatic plants, in common with

the higher aquatic animals, possessing as they do much greater tenacity of substance, also contain a greater proportion of the organic elements; and so are chemically more unlike their medium. And when we pass to the superior classes of organisms—land plants and animals—we find that, chemically considered, they have little in common either with the earth on which they stand or the air which surrounds them.

In *specific gravity* too, we may note the like truth. The very simplest forms, in common with the spores and gemmules of the higher ones, are as nearly as may be of the same specific gravity as the water in which they float; and though it cannot be said that among aquatic creatures superior specific gravity is a standard of general superiority, yet we may fairly say that the superior orders of them, when divested of the appliances by which their specific gravity is regulated, differ more from water in their relative weight than do the lowest. In terrestrial organisms, the contrast becomes extremely marked. Trees and plants, in common with insects, reptiles, mammals, birds, are all of a specific gravity considerably less than the earth and immensely greater than the air.

Yet further, we see the law similarly fulfilled in respect of *temperature*. Plants generate but an extremely small quantity of heat, which is to be detected only by very delicate experiments; and practically they may be considered as having the same temperature as their environment. The temperature of aquatic animals is very little above that of the surrounding water: that of the invertebrata being mostly less than a degree above it, and that of fishes not exceeding it by more than two or three degrees, save in the case of some large red-blooded fishes, as the tunny, which exceed it by nearly ten degrees. Among insects, the range is from two to ten degrees above that of the air: the excess varying according to their activity. The heat of reptiles is from four to fifteen degrees more than the heat of their medium. While mammals and birds maintain a heat which continues almost unaffected by external variations,

and is often greater than that of the air by seventy, eighty, ninety, and even a hundred degrees.

Once more, in greater *self-mobility* a progressive differentiation is traceable. The especial characteristic by which we distinguish dead matter is its inertness: some form of independent motion is our most general test of life. Passing over the indefinite border-land between the animal and vegetable kingdoms, we may roughly class plants as organisms which, while they exhibit that species of motion implied in growth, are not only devoid of locomotive power, but with some unimportant exceptions are devoid of the power of moving their parts in relation to each other; and thus are less differentiated from the inorganic world than animals. Though in those microscopic protophyta and protozoa inhabiting the water—the spores of algæ, the gemmules of sponges, and the infusoria generally—we see locomotion produced by ciliary action; yet this locomotion, while rapid relatively to their size, is absolutely slow. Of the *Cœlenterata*, a great part are either permanently rooted or habitually stationary; and so have scarcely any self-mobility but that implied in the relative movement of parts; while the rest, of which the common jelly-fish will serve as a sample, have mostly but little ability to move themselves through the water. Among the higher aquatic *Invertebrata*,—cuttle-fishes and lobsters, for instance,—there is a very considerable power of locomotion; and the aquatic *Vertebrata* are, considered as a class, much more active in their movements than the other inhabitants of the water. But it is only when we come to air-breathing creatures that we find the vital characteristic of self-mobility manifested in the highest degree. Flying insects, mammals, birds, travel with a velocity far exceeding that attained by any of the lower classes of animals; and so are more strongly contrasted with their inert environment.

Thus, on contemplating the various grades of organisms in their ascending order, we find them more and more distinguished from their inanimate media in *structure*, in *form*, in *chemical*

composition, in specific gravity, in temperature, in self-mobility. It is true that this generalization does not hold with complete regularity. Organisms which are in some respects the most strongly contrasted with the environing inorganic world, are in other respects less so than inferior organisms. As a class, mammals are higher than birds; and yet they are of lower temperature, and have smaller powers of locomotion. The stationary oyster is of higher organization than the free-swimming medusa; and the cold-blooded and less heterogeneous fish, is quicker in its movements than the warm-blooded and more heterogeneous sloth. But the admission, that the several aspects under which this increasing contrast shows itself bear a variable ratio to each other, does not conflict with the general truth enunciated. Contemplating the facts in the mass, it cannot be denied that the successively higher grades of organisms are severally characterised, not only by a greater differentiation of parts, but also by a greater differentiation from the surrounding medium in sundry other physical attributes. It would seem that this peculiarity has some necessary connection with superior vital manifestations. One of those lowly gelatinous forms, so transparent and colourless as to be with difficulty distinguished from the water it floats in, is not more like its medium in chemical, mechanical, optical, thermal, and other properties, than it is in the passivity with which it submits to all the influences and actions brought to bear upon it; while the mammal does not more widely differ from inanimate things in these properties, than it does in the activity with which it meets surrounding changes by compensating changes in itself. And between these two extremes, we shall observe a constant ratio between these two kinds of contrast. Whence we may say, that in proportion as an organism is physically like its environment does it remain a passive partaker of the changes going on in its environment; while in proportion as it is endowed with powers of counteracting such changes, it exhibits greater unlikeness to its environment.

Thus far we have treated our subject inductively, in conformity with established usage; but we are of opinion that much is to be done in this and other departments of biologic inquiry by pursuing the deductive method. The generalizations at present constituting the science of physiology, both general and special, have been reached *à posteriori*; but certain fundamental data have now been discovered, starting from which, we may reason our way *à priori*, not only to some of the truths that have been ascertained by observation and experiment, but also to some others. The possibility of such *à priori* conclusions will be at once recognised on considering a few familiar cases.

Chemists have shown that a necessary condition to vital activity in animals is oxidation of tissue. The oxygen requisite for this oxidation is contained in the surrounding medium—air or water, as the case may be. If the organism be some minute protozoon, mere contact of its external surface with the oxygenated medium secures the requisite oxidation; but if the organism is bulky, and so exposes a surface that is small in proportion to its mass, any considerable oxidation cannot be thus secured. One of two things is therefore implied. Either this bulky organism, receiving no oxygen but that absorbed through its integument, must possess but little vital activity; or else, if it possesses much vital activity, there must be some extensive ramified surface, internal or external, through which adequate aeration may take place—a respiratory apparatus. That is to say, lungs, or branchiæ, or their equivalents, are predicable *à priori* as possessed by all active creatures of any size.

Similarly with respect to nutriment. There are *entozoa* which, living in the insides of other animals, and being constantly bathed by nutritive fluids, absorb a sufficiency through their outer surfaces; and so have no need of stomachs and do not possess them. But all other animals, inhabiting media that are not in themselves nutritive, but only contain masses of food here and there, must have appliances by which these masses of food may be utilized. Evidently mere external contact of a

solid organism with a solid portion of nutriment, could not result in the assimilation of it in any moderate time, if at all. To achieve this end, there must be both a solvent or macerating action, and an extended surface fit for containing and imbibing the dissolved products ; that is, there must be a digestive cavity. Thus, given the ordinary conditions of animal life, and the possession of stomachs by all creatures living under these conditions may be deductively known.

Carrying out the train of reasoning still further, we may infer the existence of a vascular system, or something equivalent to it, in all creatures of any size and activity. In a comparatively small inert animal, such as the hydra, which consists of little more than a sac having a double wall—an outer layer of cells forming the skin, and an inner layer forming the assimilating surface—there is no need for a special apparatus to diffuse through the body the absorbed aliment ; for the body is little more than a wrapper to the food it encloses. But where the bulk is considerable, or where the activity is such as to involve much waste and repair, or where both these characteristics exist, there is a manifest necessity for a system of blood-vessels. It is not enough that there be adequately extensive surfaces for assimilation and aeration ; for in the absence of any means of conveyance the absorbed elements can be of little or no use to the organism at large. Evidently there must be channels of communication. When, as in the *Medusæ*, we find these channels of communication consisting simply of branching canals opening out of the stomach and spreading through the disk ; we may know, *à priori*, that such creatures are comparatively inactive : seeing that the nutriment thus partially distributed throughout their bodies is crude and dilute, and that there is no efficient appliance for keeping it in motion. Conversely, when we meet with a creature of considerable size which displays much vivacity, we may know *à priori* that it must have an apparatus for the unceasing supply of concentrated nutriment, and of oxygen, to every organ—a pulsating vascular system.

It is manifest, then, that setting out from certain known fundamental conditions to vital activity, we may deduce from them sundry of the chief characteristics of organized bodies. Doubtless these known fundamental conditions have been inductively established. But in this they do not differ from the ground truths of deductive science in general; all of which are inductions. What we wish to show is, that, given these inductively-established primary facts in physiology, we may with safety draw certain general deductions from them. And, indeed, the legitimacy of such deductions, though not formally acknowledged, is practically recognised in the convictions of every physiologist; as may be readily proved by citing a few illustrations. Thus, were a physiologist to find a creature exhibiting complex and variously co-ordinated movements, and yet having no nervous system; he would be less astonished at the breach of his empirical generalization that all such creatures have nervous systems, than at the disproof of his unconscious deduction that all creatures exhibiting complex and variously co-ordinated movements must have an "internuncial" apparatus by which the co-ordination may be effected. Or were he to find a creature having a rapid circulation and a rapid respiration, but yet showing a low temperature, the proof so afforded that active change of matter was not, as he had inferred from chemical data, the cause of animal heat, would stagger him more than would the exception to the constantly-observed relation between these characteristics. Clearly, then, the *à priori* method already plays a part in physiological reasoning: if not ostensibly employed as a means of reaching new truths, it is at least privately appealed to for confirmation of truths reached *à posteriori*.

We think, however, that the illustrations above given go far to show, that it may to a considerable extent be safely used as an independent instrument of research. The necessities for a nutritive system, a respiratory system, and a vascular system, in all animals of size and vivacity, seem to us legitimately inferable from the conditions to continued vital activity. Given the phy-

sical and chemical data, and these structural peculiarities may be deduced with as much certainty as may the hollowness of an iron ball from its power of floating in water.

Let us not, however, be understood as supposing that the more *special* physiological truths can be deductively reached. Our argument by no means implies this. Legitimate deduction presupposes adequate data; and in respect to all the *special* phenomena of organic growth, structure, and function, adequate data are unattainable, and will probably ever remain so. It is only in the case of the more *general* physiological truths, such as those above instanced, where we have something like adequate data, that deductive reasoning becomes possible.

And here we arrive at the point to which the foregoing considerations are introductory. We propose now to show that there are certain still more general attributes of organized bodies, which are deducible from certain still more general attributes of things.

In an essay on "Progress: its Law and Cause," elsewhere published,* we have endeavoured to show that the transformation of the homogeneous into the heterogeneous, in which all progress, organic or other, essentially consists, is consequent on the production of many effects by one cause—many changes by one force. Having pointed out that this is a law of all things, we proceeded to show deductively that the multiform evolutions of the homogeneous into the heterogeneous—astronomic, geologic, ethnologic, social &c., were explicable as corollaries of this law. And though in the case of organic evolution, lack of data disabled us from specifically tracing out the progressive complications as due to the multiplication of effects; yet, we found sundry indirect evidences that it was so. Now in so far as this conclusion, that organic evolution results from the decomposition of each expended force into several forces, was inferred from the general law previously pointed out, it was an

* In the *Westminster Review* for April 1857; and now reprinted in this volume.

example of deductive physiology. The particular was concluded from the universal.

We here propose in the first place to show, that there is another general truth standing in immediate correlation with the above; and in common with it underlying all forms of progress, and therefore the progress of organisms—a truth which may indeed be considered as taking precedence of it in respect of time, if not in respect of generality. This truth is, that *the condition of homogeneity is a condition of unstable equilibrium*.

The phrase *unstable equilibrium* is one used in mechanics to express a balance of forces of such kind, that the interference of any further force, however minute, will destroy the arrangement previously subsisting, and bring about a totally different arrangement. Thus, a stick poised on its lower end is in unstable equilibrium: however exactly it may be placed in a perpendicular position, as soon as it is left to itself it begins, at first imperceptibly, to lean on one side, and with increasing rapidity falls into another attitude. Conversely, a stick suspended from its upper end is in stable equilibrium: however much disturbed, it will return to the same position. Our meaning is, then, that the state of homogeneity, like the state of the stick poised on its lower end, is one that cannot be maintained; and that hence inevitably results the first step in its gravitation towards the heterogeneous. Let us take a few illustrations.

Of mechanical ones the most familiar is that of the scales. If they be accurately made and not clogged by dirt or rust, it is impossible to keep a pair of scales perfectly balanced: eventually one scale will descend and the other ascend—they will assume a heterogeneous relation. Again, if we sprinkle over the surface of a fluid a number of equal-sized particles, having an attraction for each other, they will, no matter how uniformly distributed, by and by concentrate irregularly into one or more groups. Were it possible to bring a mass of water into a state of perfect homogeneity—a state of complete quiescence, and exactly equal density throughout—yet the radiation of heat from

neighbouring bodies, by affecting differently its different parts, would inevitably produce inequalities of density and consequent currents; and would so render it to that extent heterogeneous. Take a piece of red-hot matter, and however evenly heated it may at first be, it will quickly cease to be so: the exterior, cooling faster than the interior, will become different in temperature from it. And the lapse into heterogeneity of temperature, so obvious in this extreme case, takes place more or less in all cases. The action of chemical forces supplies other illustrations. Expose a fragment of metal to air or water, and in course of time it will be coated with a film of oxide, carbonate, or other compound: that is—its outer parts will become unlike its inner parts. In short, every homogeneous aggregation of matter tends to lose its balance in some way or other—either mechanically, chemically, thermally or electrically; and the rapidity with which it lapses into a non-homogeneous state is simply a question of time and circumstances. Social bodies illustrate the law with like constancy. Endow the members of a community with equal properties, positions, powers, and they will forthwith begin to slide into inequalities. Be it in a representative assembly, a railway board, or a private partnership, the homogeneity, though it may continue in name, inevitably disappears in reality.

The instability thus variously illustrated becomes still more manifest if we consider its rationale. It is consequent on the fact, that the several parts of any homogeneous aggregation are necessarily exposed to different forces—forces that differ either in kind or amount; and being exposed to different forces they are of necessity differently modified. The relations of outside and inside, and of comparative nearness to neighbouring sources of influence, imply the reception of influences that are unlike in quantity or quality or both; and as a corollary from the law of “the conservation of force,” it follows that unlike changes will be produced in the parts thus dissimilarly acted upon. Thus the unstable equilibrium of any homogeneous aggregation can be shown both inductively and deductively.

And now let us consider the bearing of this general truth on the evolution of organisms. The germ of a plant or animal is one of these homogeneous aggregations whose equilibrium is unstable. But it has not simply the ordinary instability of homogeneous aggregations : it has something more. For it consists of units that are themselves specially characterised by instability. The constituent atoms of organic matter are distinguished by the feebleness of the affinities which hold their component elements together : they are extremely sensitive to heat, light, electricity, and the chemical action of foreign elements ; that is—they are peculiarly liable to be modified by disturbing forces. Hence then it follows, *à priori*, that a homogeneous aggregation of these unstable atoms will have an excessive tendency to lose its equilibrium. It will have a quite special aptitude to lapse into a non-homogeneous state. It will rapidly gravitate towards heterogeneity.

Moreover, the process must repeat itself in each of the subordinate groups of organic units that are differentiated by the modifying forces. Each of these subordinate groups, like the original group, must gradually, in obedience to the influences acting upon it, lose its balance of parts—must pass from a uniform into a multiform state. And so on continuously.

Thus, starting from the general laws of things, and the known chemical attributes of organic matter, we may conclude deductively that the homogeneous germs of organisms have a peculiar proclivity towards a non-homogeneous state ; which may be either the state we call decomposition, or the state we call organization.

Thus far our reasoning brings us to a conclusion only of the most general nature. We merely find that *some* kind of heterogeneity is inevitable ; but as yet there is nothing to tell us *what* kind. Besides that *orderly* heterogeneity which distinguishes organisms, there is the *disorderly* or *chaotic* heterogeneity, into which a loose mass of inorganic matter lapses ; and at present no reason has been given why the homogeneous

germ of a plant or animal should not lapse into the disorderly instead of the orderly heterogeneity. Let us see whether some light may not be thrown on this point by pursuing still further the line of argument hitherto followed.

We have seen that the instability of homogeneous aggregations in general, and of organic ones in particular, is consequent on the different ways and degrees in which their constituent parts are exposed to the disturbing forces brought to bear on them: they are differently acted upon, and therefore become different. Manifestly, then, a rationale of the special changes which a germ undergoes, must be sought in the particular relations which its several parts bear to each other and to their environment. However it may be masked we may suspect the fundamental principle of organization to be, that the many like units forming a germ acquire those kinds and degrees of unlikeness which their respective positions entail. But let us speak more specifically.

Take a mass of unorganized but organizable matter—either the body of one of the lowest living forms, or the germ of one of the higher. Consider its circumstances. Either it is immersed in water or air, or it is contained within a parent organism. Wherever placed, however, its outer and inner parts stand differently related to surrounding agencies—nutriment, oxygen, and the various stimuli. But this is not all. Whether it lies quiescent at the bottom of the water or on the leaf of a plant; whether it moves through the water preserving some definite attitude; or whether it is in the inside of an adult; it equally results that certain parts of its surface are more exposed to surrounding agencies than other parts—in some cases more exposed to light, heat, or oxygen, and in others to the maternal tissues and their contents. The destruction of its original equilibrium is therefore certain. It may take place in one of two ways. Either the disturbing forces may be such as to overbalance the affinities of the organic elements, in which case there results that chaotic heterogeneity known as decomposition; or, as is ordinarily the case, such changes are induced as

do not destroy the organic compounds, but only modify them : the parts most exposed to the modifying forces being most modified. Hence there result those first differentiations which constitute incipient organization. From the point of view thus reached, suppose we look at a few cases ; neglecting for the present all consideration of the tendency to assume the hereditary type.

Note first what appear to be exceptions, as the *Amæba*. In this creature and its allies, the substance of the jelly-like body remains throughout life unorganized—undergoes no permanent differentiations. But this fact, which seems directly opposed to our inference, is really one of the most significant evidences of its truth. For what is the peculiarity of this division of the *Protozoa* ? Its members undergo perpetual and irregular changes of form—they show no persistent relation of parts. What lately formed a portion of the interior is now protruded, and, as a temporary limb, is attached to some object it happens to touch. What is now a part of the surface will presently be drawn, along with the atom of nutriment sticking to it, into the centre of the mass. Thus there is an unceasing interchange of places ; and the relations of inner and outer have no permanent existence. But by the hypothesis, it is only in virtue of their unlike positions with respect to modifying forces, that the originally like units of a living mass become unlike. We must not therefore expect any established differentiation of parts in creatures which exhibit no established differences of position in their parts.

This negative evidence is borne out by abundant positive evidence. When we turn from these proteiform specks of living jelly to organisms having an unchanging distribution of substance, we find differences of tissue corresponding to differences of relative position. In all the higher *Protozoa*, as also in the *Protophyta*, we meet with a fundamental differentiation into cell-membrane and cell-contents, answering to that fundamental contrast of conditions implied by the terms outside and inside. And on passing from what are roughly

classed as unicellular organisms to the lowest of those which consist of aggregated cells, we equally observe the connection between structural differences and differences of circumstance. In the sponge, permeated throughout by currents of sea-water, the absence of definite organization corresponds with the absence of definite unlikeness of conditions. In the *Thalassicolla* of Professor Huxley—a transparent, colourless, body found floating passively at the surface of the sea, and consisting essentially of “a mass of cells united by jelly”—there is displayed a rude structure obviously subordinated to the primary relations of centre and surface: in all of its many and important varieties, the parts exhibit a more or less concentric arrangement.

After this primary modification, by which the outer tissues are differentiated from the inner, the next in order of constancy and importance is that by which some part of the outer tissues is differentiated from the rest; and this corresponds with the almost universal fact that some part of the outer tissues is more exposed to certain environing influences than the rest. Here, as before, the apparent exceptions are extremely significant. Some of the lowest vegetable organisms, as the *Hematococci* and *Protococci*, evenly imbedded in a mass of mucus, or dispersed through the Arctic snow, display no differentiations of surface; the several parts of the surface being subjected to no definite contrast of conditions. The *Thalassicolla* above mentioned, floating unfixed in the water, and passively rolled about by the waves, successively presents all its sides to the same agencies; and all its sides are alike. Ciliated spheres like the *Volvox* have no parts of their periphery unlike other parts; and it is not to be expected that they should have; seeing that as they revolve in all directions, they do not, in traversing the water, permanently expose any part to special conditions. But when we come to creatures that are either fixed, or while moving preserve a definite attitude, we no longer find uniformity of surface. The gemmule of a Zoophyte, which during its locomotive stage is distinguishable only into outer and inner

tissues, no sooner takes root than its upper end begins to assume a different structure from its lower. The free-swimming embryo of an aquatic annelid, being ovate and not ciliated all over, moves with one end foremost; and its differentiations proceed in conformity with this contrast of circumstances.

The principle thus displayed in the humbler forms of life, is visible in the development of the higher; though being here soon masked by the assumption of the hereditary type, it cannot be traced far. It is, however, conspicuous in those first stages of the higher organisms during which they simulate the lowest. Thus the "mulberry-mass" of cells into which a fertilized vertebrate ovum first resolves itself, soon begins to exhibit a difference between the outer and inner parts, answering to the fundamental difference of circumstances. The peripheral cells, after reaching a more complete development than the interior ones, coalesce into a membrane inclosing the rest; and the cells lying next to these outer ones become aggregated with them, and increase the thickness of the germinal membrane, while the central cells liquefy. Again, one part of the germinal membrane presently becomes distinguishable as the germinal spot; and without asserting that the cause of this is to be found in the unlike relations which the respective parts of the germinal membrane bear to enviroing influences, it is clear that we have in these unlike relations an element of disturbance tending to destroy the original homogeneity of the germinal membrane. Further, the germinal membrane by and by divides into two layers, internal and external; the one in contact with the liquefied part of the yolk, the other exposed to the surrounding fluids: this contrast of circumstances being in obvious correspondence with the contrast of structure which follows it. Once more, the subsequent appearance of the vascular layer between these mucous and serous layers, as they have been named, admits of a like interpretation. And in this and the various complications that now begin to show themselves, we may see coming into play that general law of the multiplication of effects flowing from one cause, to which the

increase of heterogeneity was elsewhere ascribed :* which multiplication of effects, however, is in harmony with the present hypothesis ; seeing that each newly differentiated part becomes the centre of a new influence acting upon all other parts in different degrees.

Confining our remarks as we do to the most general facts of development, we think that some light is thus thrown on them. That the unstable equilibrium of a homogeneous germ must be destroyed by the unlike exposure of its several units to surrounding influences, is an *à priori* conclusion. And it seems also to be an *à priori* conclusion, that the several units thus differently acted upon, must either be decomposed, or must undergo such modifications of nature as may enable them to live in the respective circumstances they are thrown into : in other words — *they must become adapted to their conditions*. Indeed, we might almost infer as much without going through the foregoing train of reasoning. The superficial organic units (be they the outer cells of a “mulberry-mass,” or be they the outer molecules of an individual cell) must assume the function which their position necessitates ; and assuming this function, must acquire such character as the performance of it involves. The layer of organic units lying in contact with the yolk must be those through which the yolk is assimilated ; and so must be adapted to the assimilative office. On this condition only does the process of organization appear possible. We might almost say that just as some original race of animals, which multiplies and spreads into different regions of the earth, becomes differentiated into several races through the adaptation of each to its conditions of life ; so, the originally homogeneous population of cells arising in a fertilized germ-cell, becomes divided into several populations of cells that grow unlike in virtue of the unlikeness of their circumstances.

Moreover, it is to be remarked in further proof of our position, that it finds its clearest and most abundant illustrations

* See Essay on “Progress : its Law and Cause.”

where the conditions of the case are the simplest and most general—where the phenomena are the least involved : we mean in the production of individual cells. The structures which presently arise round nuclei in a blastema, and which have in some way been determined by those nuclei as centres of influence, evidently conform to the law ; for the parts of the blastema in contact with the nuclei are differently circumstanced from the parts not in contact with them. Again, the formation of a membrane round each of the masses of granules into which the endochrome of an alga-cell breaks up, is an instance of analogous kind. And should the recently-asserted fact that cells may arise round vacuolæ in a mass of organizable substance, be confirmed, another good example will be furnished ; for such portions of substance as bound these vacant spaces are subject to influences unlike those to which other portions of the substance are subject. If then we can thus most clearly trace this law of modification in these primordial processes, as well as in those more complex but analogous ones exhibited in the early changes of an ovum, we have strong reason for thinking that the law is a fundamental one.

But, as already more than once hinted, this principle, understood in the simple form here presented, supplies no key to the detailed phenomena of organic development. It fails entirely to explain generic and specific peculiarities ; and indeed leaves us equally in the dark respecting those more important distinctions by which families and orders are marked out. Why two ova, similarly exposed in the same pool, should become the one a fish, and the other a reptile, it cannot tell us. That from two different eggs placed under the same hen, should respectively come forth a duckling and a chicken, is a fact not to be accounted for on the hypothesis above developed. We have here no alternative but to fall back upon the inexplicable principle of hereditary transmission. The capacity possessed by an unorganized germ of unfolding into a complex adult which repeats ancestral traits in the minutest details, and that even when it has been placed in conditions unlike those of its ances-

tors, is a capacity impossible for us to understand. That a microscopic portion of seemingly structureless matter should embody an influence of such kind, that the resulting man will in fifty years after become gouty or insane, is a truth which would be incredible were it not daily illustrated. But though the *manner* in which hereditary likeness, in all its complications, is conveyed, is a mystery passing comprehension, it is quite conceivable that it is conveyed in subordination to the law of adaptation above explained; and we are not without reasons for thinking that it is so. That acquired peculiarities resulting from the adaptation of constitution to conditions, are transmissible to offspring, is an established fact. Such acquired peculiarities consist of differences of structure or composition in one or more of the tissues. That is to say, of the aggregation of similar organic units composing a germ, the group going to the formation of a particular tissue, will take on the special character which the adaptation of that tissue to new circumstances had produced in the parents. We know this to be a general law of organic modifications. Further, it is the *only* law of organic modifications of which we have any evidence. It is not impossible then that it is the universal law; comprehending not simply those minor modifications which offspring inherit from recent ancestry, but comprehending also those larger modifications distinctive of species, genus, order, class, which they inherit from antecedent races of organisms. And thus it *may be* that the law of adaptation is the sole law; presiding not only over the differentiation of any race of organisms into several races, but also over the differentiation of the race of organic units composing a germ, into the many races of organic units composing an adult. So understood, the process gone through by every unfolding organism will consist, partly in the direct adaptation of its elements to their several circumstances, and partly in the assumption of characters resulting from analogous adaptations of the elements of all ancestral organisms.

But our argument does not commit us to any such far-

reaching speculation as this; which we introduce simply as suggested by it, not involved. All we are here concerned to show, is, that the deductive method aids us in interpreting some of the more general phenomena of development: and this we think we have shown. That all homogeneous aggregations are in unstable equilibrium is a universal truth, from which is deducible the instability of every organic germ. From the known sensitiveness of organic compounds to chemical, thermal, and other disturbing forces, we further infer the *unusual* instability of every organic germ—a proneness far beyond that of other homogeneous aggregations to lapse into a heterogeneous state. And by the same line of reasoning we are led to the additional inference, that the first divisions into which a germ resolves itself, being severally in a state of unstable equilibrium, are similarly prone to undergo further changes; and so on continuously. Moreover, we have found it to be equally an *à priori* conclusion, that as, in all other cases, the loss of homogeneity is due to the different degrees and kinds of force brought to bear upon the different parts; so, in this case also, difference of circumstances is the primary cause of differentiation. Add to which, that as the several changes undergone by the respective parts thus differently acted upon, are changes which do not destroy their vital activity, they must be changes which bring that vital activity into subordination to the incident forces—they must be adaptations: and the like must be in some sense true of all the subsequent changes. Thus by deductive reasoning we get considerable insight into the method of organization. However unable we are, and probably ever shall be, to comprehend the way in which a germ is made to take on the special form of its race, we may yet comprehend the general principles which regulate its first modifications; and, remembering the unity of plan so conspicuous throughout Nature, we may *suspect* that these principles regulate all succeeding modifications.

A controversy now going on among zoologists, opens yet

another field for the application of the deductive method. We believe that the question whether there does or does not exist a *necessary correlation* among the several parts of any organism is determinable *à priori*.

Cuvier, who first asserted this necessary correlation, professed to base his restorations of extinct animals upon it. Geoffroy St. Hilaire and De Blainville from different points of view, contested Cuvier's hypothesis; and the discussion, which has much interest as bearing on palæontology, has been recently revived under a somewhat modified form: Professors Huxley and Owen being respectively the assailant and defender of the hypothesis.

Cuvier says, "Comparative anatomy possesses a principle whose just development is sufficient to dissipate all difficulties; it is that of the correlation of forms in organized beings, by means of which every kind of organized being might, strictly speaking, be recognised by a fragment of any of its parts. Every organized being constitutes a whole, a single and complete system, whose parts mutually correspond and concur by their reciprocal reaction to the same definitive end. None of these parts can be changed without affecting the others; and consequently each taken separately, indicates and gives all the rest." And he then cites sundry illustrations: arguing that the carnivorous form of tooth necessitating a certain action of the jaw, implies a particular form in its condyle; implies also limbs fit for seizing and holding prey; and therefore implies claws, a certain structure of the leg-bones, a certain form of shoulder-blade; and winds up by saying, that "the claw, the scapula, the condyle, the femur, and all the other bones, taken separately, will give the tooth or one another; and by commencing with any one, he who had a rational conception of the laws of the organic economy could reconstruct the whole animal."

It will be seen, that the method of restoration here contended for, is based upon the alleged physiological necessity of the connection between these several peculiarities. The argu-

ment used is, not that a scapula of a certain shape may be recognised as having belonged to a carnivorous mammal because we always find that carnivorous mammals *do* possess such scapulas; but because they *must* possess them—because carnivorous habits would be impossible without them. And in the above quotation Cuvier asserts that the necessary correlation which he considers so obvious in these cases, exists between all parts of the system: admitting, however, that in consequence of our limited knowledge of physiology we are unable in many cases to trace this necessary correlation, and are obliged to base our conclusions upon observed coexistences, of which we do not understand the reason, but which we find invariable.

Now Professor Huxley has recently shown, that, in the first place, this empirical method, which Cuvier introduces as quite subordinate, and to be used only in aid of the rational method, is really the method which Cuvier habitually employed—the so-called rational method remaining practically a dead letter; and, in the second place, he has shown that Cuvier himself has in several places so far admitted the inapplicability of the rational method, as virtually to surrender it as a method. But more than this, Professor Huxley contends that the alleged law of necessary correlation is not true. Quite admitting the physiological dependence of parts on each other, he denies that it is a dependence of a kind that could not be otherwise. “Thus the teeth of a lion and the stomach of the animal are in such relation that the one is fitted to digest the food which the other can tear, they are physiologically correlated; but we have no reason for affirming this to be a necessary physiological correlation, in the sense that no other could equally fit its possessor for living on recent flesh. The number and form of the teeth might have been quite different from that which we know them to be, and the construction of the stomach might have been greatly altered; and yet the functions of these organs might have been equally well performed.”

Thus much is needful to give our readers an idea of the controversy as it now stands. It is not here our purpose to go

more at length into the evidence cited on both sides ; we simply wish to show that the question may be settled deductively. Before going on to do this, however, we must briefly notice two collateral points.

In his defence of the Cuvierian doctrine, Professor Owen avails himself of the *odium theologicum*. He attributes to his opponents "the insinuation and masked advocacy of the doctrine subversive of a recognition of the Higher Mind." Now, saying nothing about the questionable propriety of thus prejudging a point in science, we think this is a somewhat unfortunate accusation. What is there in the hypothesis of *necessary*, as distinguished from *actual*, correlation of parts, which is particularly in harmony with Theism? The maintenance of the *necessity*, whether of sequences or of coexistences is commonly thought rather a derogation from divine power than otherwise. Cuvier says, "None of these parts can be changed without affecting the others ; and consequently, each taken separately, indicates and gives all the rest :—" that is to say, in the nature of things the correlation *could not* have been otherwise. On the contrary, Professor Huxley contends we have no warrant for asserting that the correlation *could not* have been otherwise ; but have not a little reason for thinking that the same physiological ends might have been differently secured. The one doctrine limits the possibilities of creation ; the other denies the implied limit. Which, then, is most open to the charge of covert Atheism ?

On the other point to which we have referred, we lean to the opinion of Professor Owen. We agree with him in thinking that where a rational correlation (in the highest sense of the term) can be made out, it affords a better basis for deduction than an empirical correlation ascertained only by accumulated observations. Premising that by rational correlation we do not mean one in which we can trace, or think we can trace, a design, but one of which the negation is inconceivable (and this is the species of correlation which Cuvier's law implies) ; then we hold that our knowledge of the correlation is of a more

certain kind than where it is simply inductive. We think that Professor Huxley, in his anxiety to avoid the error of making Thought the measure of Things, does not sufficiently bear in mind the fact, that as our notion of necessity is determined by some absolute uniformity pervading all orders of our experiences, it follows that an organic correlation which cannot be conceived otherwise, is guaranteed by a much wider induction than one ascertained only by the observation of organisms. But the truth is, that there are scarcely any organic correlations of which the negation is inconceivable. If we find the skull, vertebræ, ribs, and phalanges of some quadruped as large as an elephant; we may indeed be certain that the legs of this quadruped were of considerable size—much larger than those of a rat: and our reason for conceiving this correlation as necessary, is, that it is based, not only upon our experiences of moving organisms, but upon all our mechanical experiences relative to masses and their supports. Not only, however, are there very few physiological correlations really of this order, but there is danger in pursuing this line of reasoning, in consequence of the liability to include within the class of truly necessary correlations, those which are not such. For instance, there would seem to be a necessary correlation between the eye and the surface of the body: the function of the eye being vision, and light being needful for vision, it might be supposed absolutely requisite that every eye should be external. Nevertheless it is a fact that there are creatures, as the *Cirrhipædia*, whose eyes (not very efficient ones, it may be) are deeply imbedded in the substance of the body. Again, a necessary correlation might be supposed to exist between the dimensions of the mammalian uterus and those of the pelvis. It would appear *à priori* an impossibility that in any species there should exist a well-developed uterus containing a full-sized fœtus, and yet that the arch of the pelvis should be so small as not to allow the fœtus to pass. And were the only mammal having a very small pelvic arch, a fossil one, it would have been inferred, on the Cuvierian method, that the fœtus must

have been born in a rudimentary state; and that the uterus must have been proportionally small. But there happens to be a living mammal having a very small pelvic arch—the mole—which presents us with a fact that saves us from this erroneous inference. Anomalous as the fact is, the young of the mole are not born through the pelvic arch at all; but in front of it! Thus, granting that some quite *direct* physiological correlations may be necessary, we see that there is great risk of including among them some that are not such.

With regard to the great mass of the correlations, however, including all the *indirect* ones, we agree with Professor Huxley in denying that they are necessary; and we now propose to show this deductively. Let us begin with an analogy.

Whoever has been through an extensive iron-works, has seen a gigantic pair of shears worked by machinery, and used for cutting in two, bars of iron that are from time to time thrust between its blades. Supposing these blades to be the only visible parts of the apparatus, any one observing their movements (or rather the movement of one, for the other is commonly fixed), will see from the manner in which the angle increases and decreases, and from the curve described by the moving extremity, that there must be some centre of motion round which the action takes place—either a pivot or an external box equivalent to it. This may be regarded as a necessary correlation. Moreover, he might infer that beyond the centre of motion the moving blade was produced into a lever, to which the power was applied; but as another arrangement is just possible, this could not be called anything more than a highly probable correlation. If now he went a step further, and considered how the reciprocal movement was given to the lever, he would very likely conclude that it was given by a crank. But if he knew anything of mechanics, he would know that it might possibly be given by an eccentric. Or again, he would know that the effect could be achieved by a cam. That is to say, he would see that there was no necessary correlation between the shears and the remoter parts of the apparatus. Take another case.

The plate of a printing-press is required to move up and down to the extent of an inch or so; and it is further requisite that it shall exert its greatest pressure when it reaches the extreme of its downward movement. If now any one will look over the stock of a printing-press maker, he will see half a dozen different mechanical arrangements by which these ends are achieved; and any clever machinist would tell him that as many more might readily be invented. And further, he would learn from the same authority, that in proportion to the complexity of a machine, is the number of possible arrangements of its other parts, which may be made without altering some one part. Should any objection be made to the analogy between a machine and an organism, it cannot be on the ground that the constituent parts of a machine are *less* rigorously correlated than those of an organism; for the reverse is the case—they are *more* rigorously correlated. An organism will continue to act when it has lost one or two of its limbs, or when one of the lungs is gone; but the abstraction of such important parts from either of the machines above described would immediately stop it. If, then, there is no necessary correlation between the special parts of a machine, still less is there between those of an organism.

From a converse point of view the same truth will be manifest. Bearing in mind the above analogy, it will be foreseen that an alteration in one part of an organism will not necessarily entail *some one specific set of alterations in the other parts*. Cuvier says, "None of these parts can be changed without affecting the others; and consequently, each taken separately, indicates and gives all the rest." The first of these propositions may pass, but the second, which is alleged to follow from it, is not true; for it implies that "all the rest" can be severally affected in only one way and degree, whereas they can be affected in many ways and degrees. To show this, we must again have recourse to a mechanical analogy.

If you set a brick on end and thrust it over, you can predict with certainty in what direction it will fall, and what attitude

it will assume. If, again setting it up, you put another on the top of it, you can no longer foresee with accuracy the results of an overthrow; and on repeating the experiment, no matter how much care is taken to place them in the same positions, and to apply the same degree of force in the same direction, the effects will on no two occasions be exactly alike. And in proportion as the aggregation is complicated by the addition of new and unlike parts, will the results of any disturbance become more varied and incalculable. If, instead of bodies placed in this loose mechanical dependence, you take a group held in more permanent connection—say tied together by strings, as the bones are tied by muscles and ligaments—it will be equally manifest that a disturbing force applied to one part, will affect the others, not in a definite, but in an indefinite way; and that no second group could be made so perfectly like the first, that an equivalent disturbance would produce exactly the same results. The like truth is very clearly and very curiously illustrated in the case of locomotive engines. It is a fact familiar to all mechanical engineers and engine-drivers, that out of a number of engines built as accurately as possible to the same pattern, no two will act in just the same manner. Each will have its idiosyncrasies. The play of actions and reactions will so far differ, that under like conditions each will behave in a somewhat different way; and every driver has to learn the constitution of his own engine before he can work it to the greatest advantage. In organisms themselves this indefiniteness of mechanical reaction is clearly traceable. Two boys throwing stones will always more or less differ in their attitudes; as will two billiard-players, or two persons dealing out cards. The familiar fact that each individual has a characteristic gait, illustrates the point still better. The rhythmical motion of the leg is simple, and on the Cuvierian hypothesis, should react upon the body in some uniform way. But in consequence of those slight differences of structure which consist with identity of species, no two individuals make exactly similar movements

either of the trunk or the arms: there is always a peculiarity recognizable by their friends.

When we pass to disturbing forces of a non-mechanical kind, the same truth becomes still more conspicuous. Expose several persons to a drenching storm; and while one will subsequently feel no appreciable inconvenience, another will have a cough, another a catarrh, another an attack of diarrhœa, another a fit of rheumatism. Vaccinate several children of the same age with the same quantity of virus, applied to the same part, and the symptoms will not be quite alike in any of them, either in kind or intensity; and in some cases the differences will be extreme. The quantity of alcohol which will send one man to sleep will render another unusually brilliant—will make this maudlin, and that irritable—will here excite feelings of kindness, and there feelings of enmity. Opium will produce either drowsiness or wakefulness: so will tobacco. And without further multiplying illustrations familiar to every one, we may repeat what we recently heard asserted by one of our most scientific physicians, that there is scarcely an influence brought to bear on the body, but what may, under different circumstances, produce quite opposite effects.

Now in all these cases—mechanical and other—some force is brought to bear primarily upon one part of an organism, and secondarily upon the rest; and, according to the doctrine of Cuvier, the rest ought to be affected in a quite specific way. We find this to be by no means the case. The original change produced in one part, does not stand in any necessary correlation with every one of the changes produced in the other parts; nor do these stand in any necessary correlation with each other. The functional alteration which the disturbing force causes in the organ directly acted upon, does not involve some *particular set* of functional alterations in the other organs; but will be followed by some one out of various sets. And it is a manifest corollary, that any *structural alteration* which may eventually be produced in the one organ, will not be accom-

panied by *some particular set of structural alterations* in the other organs : there will be no necessary correlation of forms.

The flaw in Cuvier's principle lies in assuming too specific a mutual dependence between the several parts of an organism. It is doubtless true, as he says, that "none of these parts can be changed without affecting the others." And were the members of any species *absolutely* alike in their minutest details, and always in *absolutely* the same constitutional state ; then, a change in any part must in every case be followed by one specific set of changes in the rest. But the absence of this absolute similarity vitiates his inference. The fact that no two individuals are exactly alike either in structure or state, involves the fact that the changes produced by any disturbing force will not be alike, but may be totally unlike. Just as delicately poised scales may, when shaken, preponderate either way, in virtue of some quite inappreciable difference ; so, the organic equilibrium in two creatures of the same kind may, by the same disturbance, be overthrown in opposite directions, in consequence of those minute unlikenesses which exist in every case. And having had the organic equilibrium thus overthrown in opposite directions, a persistence of the disturbing cause may produce in them quite different sets of permanent organic changes.

Thus Palæontology must depend upon the empirical method. Necessary correlation cannot be substantiated. A fossil species that was obliged to change its food or habits of life, did not of necessity undergo the particular set of modifications exhibited ; but, under some slight change of predisposing causes—as of season or latitude—might have undergone some other set of modifications : the determining circumstance being one which, in the human sense, we call fortuitous.

We venture to think, then, that the deductive method greatly elucidates this vexed question in physiology ; while at the same time our argument collaterally exhibits the limits within which the deductive method is applicable. For while we see that this extremely *general* question may be satisfactorily dealt with deduc-

tively; the conclusion at which we have arrived, itself implies that the more *special* phenomena of organization cannot be so dealt with.

With a brevity necessitated by our fast-diminishing space, we must draw attention to yet another method of investigating the general truths of physiology—a method to which physiology already owes one luminous idea, but which is not at present formally recognised as a method. We refer to the comparison of physiological phenomena with social phenomena.

The analogy between individual organisms and the social organism, is one that has in all ages forced itself upon the attention of the observant. And though modern science does not countenance those crude ideas of this analogy which have been from time to time expressed since the days of the Greeks; yet it more and more tends to show that there *is* an analogy, and a very remarkable one. While it is becoming clear that there are no such special parallelisms between the constituent parts of a man and those of a nation as have been thought to exist; it is also becoming clear that the general principles of development and structure displayed in all organized bodies are displayed in societies also. The fundamental characteristic both of societies and of living creatures, is, that they consist of mutually-dependent parts; and it would seem that this involves a community of various other characteristics. Most men who have any acquaintance with the broad facts of both physiology and sociology, are beginning to recognise this correspondence not as a plausible fancy, but as a scientific truth. And we are strongly of opinion that it will by and by be seen to hold to an extent which few at present suspect.

Meanwhile, if any such correspondence exists, it is clear that physiology and sociology will more or less interpret each other. Each affords its special facilities for inquiry. Relations of cause and effect clearly traceable in the social organism, may lead to the search for analogous ones in the individual organism; and may so elucidate what might else be inexplicable. Laws of

growth and function disclosed by the pure physiologist, may occasionally give us the clue to certain social modifications otherwise difficult to understand. If they can do no more, the two sciences can at least exchange suggestions and confirmations; and this will be no small aid. The conception of "the physiological division of labour," which political economy has already supplied to physiology, is one of no small value. And the probability is that it has others to give.

In support of this opinion, we will now cite cases in which such aid is furnished. And, in the first place, let us see whether the facts of social organization do not afford additional support to some of the doctrines set forth in the foregoing parts of this article.

One of the positions we have endeavoured to establish is, that in animals the process of development is carried on, not by differentiations only, but by subordinate integrations. Now in the social organism we may see the same duality of process; and further, it is to be observed that the integrations are of the same three kinds. Thus we have integrations that arise from the simple growth of adjacent parts that perform like functions: as, for instance, the coalescence of Manchester with its calico-weaving suburbs. We have other integrations that arise when, out of several places producing a particular commodity, one monopolizes more and more of the business, and leaves the rest to dwindle: as witness the growth of the Yorkshire cloth-districts at the expense of those in the west of England; or the absorption by Staffordshire of the pottery-manufacture, and the consequent decay of the establishments that once flourished at Worcester, Derby, and elsewhere. And we have those yet other integrations that result from the actual approximation of the similarly-occupied parts: whence result such facts as the concentration of publishers in Paternoster Row, of lawyers in the Temple and neighbourhood, of corn-merchants about Mark Lane, of civil engineers in Great George Street, of bankers in the centre of the city. Finding thus that in the evolution of the social organism, as in the evolution of individual organisms,

there are integrations as well as differentiations, and moreover that these integrations are of the same three orders; we have additional reason for considering these integrations as essential parts of the developmental process, needing to be included in its formula. And further, the circumstance that in the social organism these integrations are dependent on community of function, confirms the hypothesis that they are thus dependent in the individual organism.

Again, we endeavoured to show deductively, that the contrasts of parts first seen in all unfolding embryos, are consequent upon the contrasted circumstances to which such parts are exposed; that thus, adaptation of constitution to conditions is the principle which determines their primary changes; and that, possibly, if we include under the formula hereditarily-transmitted adaptations, all subsequent differentiations may be similarly determined. Well, we need not long contemplate the facts to see that the predominant social differentiations are brought about in an analogous way. As the members of an originally homogeneous community multiply and spread, the gradual separation into sections which simultaneously takes place, manifestly depends on differences of local circumstances. Those who happen to live near some place chosen, perhaps for its centrality, as one of periodical assemblage, become traders, and a town springs up; those who live dispersed continue to hunt or cultivate the earth; those who spread to the sea-shore fall into maritime occupations. And each of these classes undergoes modifications of character fitting it to its function. Later in the process of social evolution these local adaptations are greatly multiplied. In virtue of differences of soil and climate, the rural inhabitants in different parts of the kingdom have their occupations partially specialized; and are respectively distinguished as chiefly producing cattle, or sheep, or wheat, or oats, or hops, or cyder. People living where coal-fields are discovered become colliers; Cornishmen take to mining because Cornwall is metalliferous; and the iron-manufacture is the dominant industry where

ironstone is plentiful. Liverpool has assumed the office of importing cotton, in consequence of its proximity to the district where cotton goods are made; and for analogous reasons Hull has become the chief port at which foreign wools are brought in. Even in the establishment of breweries, of dye-works, of slate-quarries, of brick-yards, we may see the same truth. So that both in general and in detail these specializations of the social organism which characterize separate districts, primarily depend on local circumstances. Of the originally similar units making up the social mass, different groups assume the different functions which their respective positions entail; and become adapted to their conditions. Thus, that which we concluded, *à priori*, was the leading cause of organic differentiations, we find, *à posteriori*, to be the leading cause of social differentiations. Nay further, as we inferred that possibly the embryonic changes which are not thus directly caused, are caused by hereditarily-transmitted adaptations; so, we may actually see that in embryonic societies, such changes as are not due to direct adaptations, are in the main traceable to adaptations originally undergone by the parent society. The colonies founded by distinct nations, while they are alike in exhibiting specializations caused in the way above described, grow unlike in so far as they take on, more or less, the organizations of the nations they sprung from. A French settlement does not develop exactly after the same manner as an English one; and both assume forms different from what Roman settlements assumed. Now the fact that the differentiation of societies is determined partly by the direct adaptation of their units to local conditions, and partly by the transmitted influence of like adaptations undergone by ancestral societies, tends strongly to enforce the conclusion otherwise reached, that the differentiation of individual organisms, similarly results from immediate adaptations compounded with ancestral adaptations.

From confirmations thus furnished by sociology to physiology, let us now pass to a suggestion similarly furnished. A

factory, or other producing establishment, or a town made up of such establishments, is an agency for elaborating some commodity consumed by society at large; and may be regarded as analogous to a gland or viscus in an individual organism. If now we inquire what is the primitive mode in which one of these producing establishments grows up, we find it to be this. A single worker, who himself sells the produce of his labour, is the germ. His business increasing, he employs helpers—his sons or others; and having done this, he becomes a vendor not only of his own handiwork, but of that of others. A further increase of his business compels him to multiply his assistants, and his sale grows so rapid that he is obliged to confine himself to the process of selling; that is, he ceases to be a producer, and becomes simply a channel through which the produce of others is conveyed to the public. Should his prosperity rise yet higher, he finds that he is unable to manage even the sale of his commodities, and has to employ others, probably of his own family, to aid him in selling; that is, to him as a main channel are now added subordinate channels; and so on continuously. Moreover, when there grow up in one place, as a Manchester or a Birmingham, many establishments of like kind, this process is carried still further. There arise factors and buyers, who are the channels through which are transmitted the produce of many factories; and we believe that primarily these factors were manufacturers who undertook to dispose of the produce of smaller houses as well as their own, and ultimately became salesmen only. Under a converse aspect, all the stages of this development have been within these few years clearly exemplified in our railway contractors. There are sundry men now living who illustrate the whole process in their own persons—men who were originally navvies, digging and wheeling; who then undertook some small sub-contract, and worked along with those they paid; who presently took larger contracts, and employed foremen; and who now contract for whole railways, and let portions to sub-contractors. That is to say, we have men who were originally workers,

but have finally become the main channels out of which diverge secondary channels, which again bifurcate into the subordinate channels, through which flows the money (that is, the nutriment) supplied by society to the actual makers of the railway. Now it seems well worth inquiring whether this is not the original course followed in the evolution of secreting and excreting organs in an animal. We know that such is the process by which the liver is developed. Out of the group of bile-cells forming the germ of the liver, some centrally-placed ones, lying next to the intestine, are transformed into ducts through which the secretion of the peripheral bile-cells is poured into the intestine; and as the peripheral bile-cells multiply, there similarly arise secondary ducts emptying themselves into the main ones; tertiary ones into these; and so on. Recent inquiries show that the like is the case with the lungs, —that the bronchial tubes are thus formed. But while analogy suggests that this is the *original* mode in which such organs are developed, it at the same time suggests that this does not necessarily continue to be the mode. For as we find that in the social organism, manufacturing establishments are no longer commonly developed through the series of modifications above described, but now mostly arise by the direct transformation of a number of persons into master, clerks, foremen, workers, &c.; so the approximative method of forming organs, may in some cases be replaced by a direct metamorphosis of the organic elements into the destined structure, without any transitional structures being passed through. That there are organs thus formed is an ascertained fact; and the additional question which analogy suggests is, whether the direct method is substituted for the indirect method.

Such parallelisms might be multiplied. And were it possible here to show in detail the close correspondence between the two orders of organization, our case would be seen to have abundant support. But, as it is, these few illustrations will sufficiently justify our opinion that the study of organized bodies may be

indirectly furthered by the study of the body politic: hints, at least, may be expected, if nothing more. And thus we venture to think that the Inductive Method, usually alone employed by most physiologists, may not only derive important assistance from the Deductive Method, but that it may further be supplemented by the Sociological Method.

OVER-LEGISLATION.*

FROM time to time there returns upon the cautious thinker, the conclusion that, considered simply as a question of probabilities, it is decidedly unlikely that his views upon any debatable topic are correct. "Here," he reflects, "are thousands around me holding on this or that point opinions differing from mine—wholly in most cases; partially in the rest. Each is as confident as I am of the truth of his convictions. Many of them are possessed of great intelligence; and, rank myself high as I may, I must admit that some are my equals—perhaps my superiors. Yet, while every one of us is sure he is right, unquestionably most of us are wrong. Why should not I be among the mistaken? True, I cannot realize the likelihood that I am so. But this proves nothing; for though the majority of us are necessarily in error, we all labour under the inability to think we are in error. Is it not then foolish thus to trust myself? When I look back into the past, I find nations, sects, philosophers, cherishing beliefs in science, morals, politics, and religion, which we decisively reject. Yet they held them with a faith quite as strong as ours: nay—stronger, if their intolerance of dissent is any criterion. Of what little worth, therefore, seems this strength of my conviction that I am right! A like warrant has been felt by men all the world through; and, in

* Some of the illustrations used in this essay refer to laws and arrangements since changed; while many recent occurrences might now be cited in further aid of its argument. As, however, the reasoning is not affected by these changes; and as to keep it corrected to the facts of the day would involve perpetual alterations; it seems best to leave it substantially in its original state: or rather in the state in which it was republished in Mr. Chapman's "Library for the People."

nine cases out of ten, has proved a delusive warrant. Is it not then absurd in me to put so much faith in my judgments?"

Barren of practical results as this reflection at first sight appears, it may, and indeed should, influence some of our most important proceedings. Though in daily life we are constantly obliged to act out our inferences, trustless as they may be—though in the house, in the office, in the street, there hourly arise occasions on which we may not hesitate; seeing that if to act is dangerous, never to act at all is fatal—and though, consequently, on our private conduct, this abstract doubt as to the worth of our judgments, must remain inoperative; yet, in our public conduct, we may properly allow it to weigh with us. Here decision is no longer imperative; while the difficulty of deciding aright is incalculably greater. Clearly as we may think we see how a given measure will work, we may infer, drawing the above induction from human experience, that the chances are many against the truth of our anticipations. Whether in most cases it is not wiser to do nothing, becomes now a rational question. Continuing his self-criticism, the cautious thinker may reason:—"If in these personal transactions, where all the conditions of the case were known to me, I have so often miscalculated, how much oftener shall I miscalculate in political ones, where the conditions are too numerous, too wide-spread, too complex, too obscure to be understood. Here, doubtless, is a social evil and there a desideratum; and were I sure of doing no mischief I would forthwith try to cure the one and achieve the other. But when I remember how many of my private schemes have miscarried—how speculations have failed, agents proved dishonest, marriage been a disappointment—how I did but pauperise the relative I sought to help—how my carefully-governed son has turned out worse than most children—how the thing I desperately strove against as a misfortune did me immense good—how while the objects I ardently pursued brought me little happiness when gained, most of my pleasures have come from unexpected sources; when I recall these and hosts of like facts, I am struck with the

utter incompetence of my intellect to prescribe for society. And as the evil is one under which society has not only lived but grown, while the desideratum is one it may spontaneously secure, as it has most others, in some unforeseen way, I question the propriety of meddling."

There is a great want of this practical humility in our political conduct. Though we have less self-confidence than our ancestors, who did not hesitate to organize in law their judgments on all subjects whatever, we have yet far too much. Though we have ceased to assume the infallibility of our theological beliefs and so ceased to enact them, we have not ceased to enact hosts of other beliefs of an equally doubtful kind. Though we no longer presume to coerce men for their *spiritual good*, we still think ourselves called upon to coerce them for their *material good*—not seeing that the one is as useless and as unwarrantable as the other. Innumerable failures seem, so far, powerless to teach this. Take up a daily paper and you will probably find a leader exposing the corruption, negligence, or mismanagement of some State-department. Cast your eye down the next column, and it is not unlikely that you will read proposals for an extension of State-supervision. Yesterday came a charge of gross carelessness against the Colonial office: to-day Admiralty bunglings are burlesqued: to-morrow brings the question—"Should there not be more coal-mine inspectors?" Now there is a complaint that the Board of Health is useless; and now an outcry for more railway regulation. While your ears are still ringing with denunciations of Chancery abuses, or your cheeks still glowing with indignation at some well-exposed iniquity of the Ecclesiastical Courts, you suddenly come upon suggestions for organizing "a priesthood of science." Here is a vehement condemnation of the police for stupidly allowing sight-seers to crush each other to death: you look for the corollary that official regulation is not to be trusted: when instead, apropos of a shipwreck, you read an urgent demand for government-inspectors to see that ships always have their boats ready

for launching. Thus, while every day chronicles a failure, there every day reappears the belief that it needs but an Act of Parliament and a staff of officers, to effect any end desired. Nowhere is the perennial faith of mankind better seen. Ever since society existed Disappointment has been preaching—"Put not your trust in legislation;" and yet the trust in legislation seems scarcely diminished.

Did the State fulfil efficiently its unquestionable duties, there would be some excuse for this eagerness to assign it further ones. Were there no complaints of its faulty administration of justice; of its endless delays and untold expenses; of its bringing ruin in place of restitution; of its playing the tyrant where it should have been the protector—did we never hear of its complicated stupidities; its 20,000 statutes, which it assumes all Englishmen to know, and which not one Englishman does know; its multiplied forms, which, in the effort to meet every contingency, open far more loopholes than they provide against—had it not shown its folly in the system of making every petty alteration by a new act, variously affecting innumerable preceding acts; or in its score of successive sets of Chancery rules, which so modify, and limit, and extend, and abolish, and alter each other, that not even Chancery lawyers know what the rules are—were we never astounded by such a fact as that, under the system of land registration in Ireland, 6000*l.* have been spent in a "negative search" to establish the title of an estate—did we find in its doings no such terrible incongruity as the imprisonment of a hungry vagrant for stealing a turnip, while for the gigantic embezzlements of a railway director it inflicts no punishment;—had we, in short, proved its efficiency as judge and defender, instead of having found it treacherous, cruel, and anxiously to be shunned, there would be some encouragement to hope other benefits at its hands.

Or if, while failing in its judicial functions, the State had proved itself a capable agent in some other department—the military for example—there would have been some show of reason for extending its sphere of action. Suppose that it had

rationally equipped its troops, instead of giving them cumbrous and ineffective muskets, barbarous grenadier caps, absurdly heavy knapsacks and cartouche-boxes, and clothing coloured so as admirably to help the enemy's marksmen—suppose that it organized well and economically, instead of salarizing an immense superfluity of officers, creating sinecure colonelcies of £1000 a year, neglecting the meritorious, and promoting incapables—suppose that its soldiers were always well housed instead of being thrust into barracks that invalid hundreds, as at Aden, or that fall on their occupants, as at Loodianah, where ninety-five were thus killed—suppose that, in actual war, it had shown due administrative ability, instead of occasionally leaving its regiments to march barefoot, to dress in patches, to capture their own engineering tools, and to fight on empty stomachs, as during the Peninsular campaign;—suppose all this, and the wish for more State-control might still have had some warrant.

Even though it had bungled in everything else, yet had it in one case done well—had its naval management alone been efficient—the sanguine would have had a colourable excuse for expecting success in a new field. Grant that the reports about bad ships, ships that will not sail, ships that have to be lengthened, ships with unfit engines, ships that will not carry their guns, ships without stowage, and ships that have to be broken up, are all untrue—assume those to be mere slanderers who say that the *Megara* took double the time taken by a commercial steamer to reach the Cape; that during the same voyage the *Hydra* was three times on fire, and needed the pumps kept going day and night; that the *Charlotte* troop-ship set out with 75 days' provisions on board, and was three months in reaching her destination; that the *Harpy*, at an imminent risk of life, got home in 110 days from Rio—disregard as calumnies the statements about septuagenarian admirals, dilettante ship building, and “cooked” dockyard accounts—set down the affair of the Goldner preserved meats as a myth, and consider Professor Barlow mistaken when he reported of the Admiralty compasses

in store, that "at least one-half were mere lumber;"—let all these, we say, be held groundless charges, and there would remain for the advocates of much government some basis for their political air-castles, spite of military and judicial mismanagement.

As it is, however, they seem to have read backwards the parable of the talents. Not to the agent of proved efficiency do they consign further duties, but to the negligent and blundering agent. Private enterprise has done much, and done it well. Private enterprise has cleared, drained, and fertilized the country, and built the towns—has excavated mines, laid out roads, dug canals, and embanked railways—has invented, and brought to perfection, ploughs, looms, steam-engines, printing-presses, and machines innumerable—has built our ships, our vast manufactories, our docks—has established banks, insurance societies, and the newspaper press—has covered the sea with lines of steam-vessels, and the land with electric telegraphs. Private enterprise has brought agriculture, manufactures, and commerce to their present height, and is now developing them with increasing rapidity. Therefore, do not trust private enterprise. On the other hand, the State so fulfils its protective function as to ruin many, delude others, and frighten away those who most need succour; its national defences are so extravagantly and yet inefficiently administered, as to call forth almost daily complaint, expostulation, or ridicule; and as the nation's steward, it obtains from some of our vast public estates a minus revenue. Therefore, trust the State. Slight the good and faithful servant, and promote the unprofitable one from one talent to ten.

Seriously, the case, while it may not, in some respects, warrant this parallel, is, in one respect, even stronger. For the new work is not of the same order as the old, but of a more difficult order. Badly as government discharges its true duties, any other duties committed to it are likely to be still worse discharged. To guard its subjects against aggression, either individual or national, is a straightforward and tolerably simple matter; to

regulate, directly or indirectly, the personal actions of those subjects is an infinitely complicated matter. It is one thing to secure to each man the unhindered power to pursue his own good ; it is a widely different thing to pursue the good for him. To do the first efficiently, the State has merely to look on while its citizens act ; to forbid unfairness ; to adjudicate when called on ; and to enforce restitution for injuries. To do the last efficiently, it must become an ubiquitous worker—must know each man's needs better than he knows them himself—must, in short, possess superhuman power and intelligence. Even, therefore, had the State done well in its proper sphere, no sufficient warrant would have existed for extending that sphere ; but seeing how ill it has discharged those simple offices which we cannot help consigning to it, small indeed is the probability of its discharging well offices of a more complicated nature.

Change the point of view however we may, and this conclusion still presents itself. If we define the primary State-duty to be, protecting each individual against others ; then, all other State action comes under the definition of protecting each individual against himself—against his own stupidity, his own idleness, his own improvidence, rashness, or other defect—his own incapacity for doing something or other which should be done. There is no questioning this classification. For manifestly all the obstacles that lie between a man's desires and the satisfaction of them, are either obstacles arising from other men's counter desires, or obstacles arising from inability in himself. Such of these counter desires as are just, have as much claim to satisfaction as his ; and may not, therefore, be thwarted. Such of them as are unjust, it is the State's duty to hold in check. The only other possible sphere for it, therefore, is saving the individual from the results of his own weakness, apathy, or foolishness—warding off the consequences of his nature ; or, as we say—protecting him against himself. Making no comment, at present, on the policy of this, and confining ourselves solely to the practicability of it, let us inquire how

the proposal looks when reduced to its simplest form. Here are men endowed with instincts, and sentiments, and perceptions, all conspiring to self-preservation. Each of these faculties has some relationship, direct or indirect, to personal well-being. The due action of each brings its quantum of pleasure; the inaction, its more or less of pain. Those provided with these faculties in due proportions, prosper and multiply; those ill-provided, unceasingly tend to die out. And the general success of this scheme of human organization is seen in the fact, that under it the world has been peopled, and by it the complicated appliances and arrangements of civilized life have been developed. It is complained, however, that there are certain directions in which this apparatus of motives works but imperfectly. While it is admitted that men are duly prompted by it to bodily sustenance, to the obtainment of clothing and shelter, to marriage and the care of offspring, and to the establishment of the more important industrial and commercial agencies; it is yet argued that there are many desiderata, as pure air, more knowledge, good water, safe travelling, and so forth, which it does not duly achieve. And these shortcomings being assumed permanent, and not temporary, it is urged that some supplementary means must be employed. It is therefore proposed that out of the mass of men thus imperfectly endowed, a certain number, constituting the legislature, shall be instructed to secure these various objects. The legislators thus instructed (all characterized, on the average, by the same defects in this apparatus of motives as men in general), being unable personally to fulfil their tasks, must fulfil them by deputy—must appoint commissions, boards, councils, and staffs of officers; and must construct their agencies of this same defective humanity that acts so ill. Why now should this system of complex deputation succeed where the system of simple deputation does not? The industrial, commercial, and philanthropic agencies, which citizens form spontaneously, are directly deputed agencies; these governmental agencies made by electing legislators who appoint officers, are indirectly deputed ones. And it

is hoped that, by this process of double deputation, things may be achieved which the process of single deputation will not achieve. What, now, is the rationale of this hope? Is it that legislators, and their employés, are made to feel more intensely than the rest these evils they are to remedy, these wants they are to satisfy? Hardly; for by position they are mostly relieved from such evils and wants. Is it, then, that they are to have the primary motive replaced by a secondary motive—the fear of public displeasure, and ultimate removal from office? Why, scarcely; for the minor benefits which citizens will not organize to secure *directly*, they will not organize to secure *indirectly*, by turning out inefficient servants: especially if they cannot readily get efficient ones. Is it, then, that these State-agents are to do, from a sense of duty, what they would not do from any other motive? Evidently this is the only possibility remaining. The proposition on which the advocates of much government have to fall back, is, that things which the people will not unite to effect for personal benefit, a law-appointed portion of them will unite to effect for the benefit of the rest. Public men and functionaries love their neighbours better than themselves! The philanthropy of statesmen is stronger than the selfishness of citizens!

No wonder, then, that every day adds to the list of legislative miscarriages. If colliery explosions increase, notwithstanding the appointment of coal-mine inspectors, why it is but a natural moral to these false hypotheses. If Sunderland shipowners complain that, as far as tried, “the Mercantile Marine Act has proved a total failure;” and if, meanwhile, the other class affected by it—the sailors—show their disapprobation by extensive strikes; why it does but exemplify the folly of trusting a theorising benevolence rather than an experienced self-interest. On all sides we may expect such facts; and on all sides we find them. Government, turning engineer, appoints its lieutenant, the Sewers’ Commission, to drain London. Presently Lambeth sends deputations to say that it pays heavy rates, and gets no benefit. Tired of waiting, Bethnal-green

calls meetings to consider "the most effectual means of extending the drainage of the district." From Wandsworth come complainants, who threaten to pay no more until something is done. Camberwell proposes to raise a subscription and do the work itself. Meanwhile, no progress is made towards the purification of the Thames; the weekly returns show an increasing rate of mortality; in Parliament, the friends of the Commission have nothing save good intentions to urge in mitigation of censure; and, at length, despairing ministers gladly seize an excuse for quietly shelving the Commission and its plans altogether.* As architectural surveyor, the State has scarcely succeeded better than as engineer; witness the Metropolitan Buildings' Act. New houses still tumble down from time to time. A few months since two fell at Bayswater, and one more recently near the Pentonville Prison: all notwithstanding prescribed thicknesses, and hoop-iron bond, and inspectors. It never struck those who provided these delusive sureties, that it was possible to build walls without bonding the two surfaces together, so that the inner layer might be removed after the surveyor's approval. Nor did they foresee, that, in dictating a larger *quantity* of bricks than experience proved absolutely needful, they were simply insuring a slow deterioration of *quality* to an equivalent extent.† The government guarantee for safe passenger ships answers no better than its guarantee for safe houses. Though the burning of the *Amazon* arose from

* So complete is the failure of this and other sanitary bodies, that, at the present moment (March, 1854) a number of philanthropic gentlemen are voluntarily organizing a "Health Fund for London," with the view of meeting the threatened invasion of the Cholera; and the plea for this *purely private enterprise*, is, that the Local Boards of Health and Boards of Guardians are inoperative, from "ignorance, 1st, of the extent of the danger; 2nd, of the means which experience has discovered for meeting it; and 3rd, of the comparative security which those means may produce."

† The *Builder* remarks, that "the removal of the brick-duties has not yet produced that improvement in the make of bricks which we ought to find. . . . but as bad bricks can be obtained for less than good bricks, so long as houses built of the former will sell as readily as if the better had been used, no improvement is to be expected."

either bad construction or bad stowage, she had received the Admiralty certificate before sailing. Notwithstanding official approval, the *Adelaide* was found, on her first voyage, to steer ill, to have useless pumps, ports that let floods of water into the cabins, and coals so near the furnaces that they twice caught fire. The *W. S. Lindsay*, which turned out unfit for sailing, had yet been passed by the government agent; and, but for the owner, might have gone to sea at a great risk of life. The *Melbourne*—originally a State-built ship—which took twenty-four days to reach Lisbon, and then needed to be docked to undergo a thorough repair, had been duly inspected. And lastly, the notorious *Australian*, before her third futile attempt to proceed on her voyage, had, her owners tell us, received “the full approbation of the government inspector.” Neither does the like supervision give security to land-traveling. The iron bridge at Chester, which, breaking, precipitated a train into the Dee, had passed under the official eye. Inspection did not prevent a column on the South-eastern from being so placed as to kill a man who put his head out of the carriage window. The locomotive that burst at Brighton lately, did so notwithstanding a State approval given but ten days previously. And—to look at the facts in the gross—this system of supervision has not prevented the gradual increase of railway accidents; which, be it remembered, has arisen *since* the system was commenced.

“Well, let the State fail. It can but do its best. If it succeed, so much the better: if it do not, where is the harm? Surely it is wiser to act, and take the chance of success, than to do nothing.” To this plea the rejoinder is, that unfortunately the results of legislative intervention are not only negatively bad, but often positively so. Acts of Parliament do not simply fail; they frequently make worse. The familiar truth that persecution aids rather than hinders proscribed doctrines—a truth lately afresh illustrated by the forbidden work of Gervinus—is a part of the general truth that legislation often does indirectly, the reverse of that which it directly aims to do.

Thus has it been with the Metropolitan Buildings' Act. As was lately agreed unanimously by the delegates from all the parishes in London, and as was stated by them to Sir William Molesworth, this act "has encouraged bad building, and has been the means of covering the suburbs of the metropolis with thousands of wretched hovels, which are a disgrace to a civilized country." Thus also has it been in provincial towns. The Nottingham Inclosure Act of 1845, by prescribing the structure of the houses to be built, and the extent of yard or garden to be allotted to each, has rendered it impossible to build working-class dwellings at such moderate rents as to compete with existing ones; it is estimated that, as a consequence of this, 10,000 of the population are debarred from the new homes they would otherwise have, and are forced to live crowded together in miserable places, unfit for human habitation; and so, in its anxiety to insure healthy accommodation for artisans, the law has entailed on them still worse accommodation than before. Thus, too, has it been with the Passengers' Act. The terrible fevers which arose in the Australian emigrant ships a few months since, causing in the *Bourneuf* 83 deaths, in the *Wanota* 39 deaths, in the *Marco Polo* 53 deaths, and in the *Ticonderoga* 104 deaths, arose in vessels sent out by the government; and arose in consequence of the close packing which the Passengers' Act authorizes.* Thus moreover has it been with the safeguards provided by the Mercantile Marine Act. The examinations devised for insuring the efficiency of captains, have had the effect of certifying the superficially-clever and unpractised men, and, as we are told by a shipowner, rejecting many of the long-trying and most trustworthy: the general result being that *the ratio of shipwrecks has increased*. Thus also has it happened with Boards of Health, which have, in sundry cases, exacerbated the evils to be removed; as, for instance, at Croydon, where, according to the official report, the

* Against which close packing, by the way, a private mercantile body—the Liverpool Shipowners' Association—unavailingly protested when the Act was before Parliament.

measures of the sanitary authorities produced an epidemic, which attacked 1600 people, and killed 70. Thus again has it been with the Joint Stock Companies Registration Act. As was shown by Mr. James Wilson, in his late motion for a select committee on life-assurance associations, this measure, passed in 1844 to guard the public against bubble schemes, actually facilitated the rascalities of 1845 and subsequent years. The legislative sanction, devised as a guarantee of genuineness, and supposed by the people to be such, clever adventurers have without difficulty obtained for the most worthless projects; having obtained it, an amount of public confidence has followed which they could never otherwise have gained; and in this way literally hundreds of sham enterprises, that would not else have seen the light, have been fostered into being; and thousands of families have been ruined who would never have been so but for legislative efforts to make them more secure.

Moreover, when these topical remedies applied by statesmen do not exacerbate the evils they were meant to cure, they constantly—we believe invariably—induce collateral evils; and these often graver than the original ones. It is the vice of this empirical school of politicians that they never look beyond proximate causes and immediate effects. In common with the uneducated masses they habitually regard each phenomenon as involving but one antecedent and one consequent. They do not bear in mind that each phenomenon is a link in an infinite series—is the result of myriads of preceding phenomena, and will have a share in producing myriads of succeeding ones. Hence they overlook the fact, that, in disturbing any natural chain of sequences, they are not only modifying the result next in succession, but all the future results into which this will enter as a part cause. The serial genesis of phenomena, and the interaction of each series upon every other series, produces a complexity utterly beyond human grasp. Even in the simplest cases this is so. A servant who mends the fire sees but few effects from the burning of a lump of coal. The man of science, however, knows that there are very many effects. He

knows that the combustion establishes numerous atmospheric currents, and through them moves thousands of cubic feet of air inside the house and out. He knows that the heat diffused causes expansions and subsequent contractions of all bodies within its range. He knows that the persons warmed are affected in their rate of respiration and their waste of tissue; and that these physiological changes must have various secondary results. He knows that, could he trace to their ramified consequences all the forces disengaged, mechanical, chemical, thermal, electric—could he enumerate all the subsequent effects of the evaporation caused, the gases generated, the light evolved, the heat radiated; a volume would scarcely suffice to enter them. If now from a simple inorganic change such complex results arise, how infinitely multiplied, how utterly incalculable must be the ultimate consequences of any force brought to bear upon society. Wonderfully constructed as it is—mutually dependent as are its members for the satisfaction of their wants—affected as each unit of it is by his fellows, not only as to his safety and prosperity, but in his health, his temper, his culture; the social organism cannot be dealt with in any one part, without all other parts being influenced in ways that cannot be foreseen. You put a duty on paper, and by-and-by find that, through the medium of the jacquard-cards employed, you have inadvertently taxed figured silk, sometimes to the extent of several shillings per piece. On removing the impost from bricks, you discover that its existence had increased the dangers of mining, by preventing shafts from being lined and workings from being tunnelled. By the excise on soap, you have, it turns out, greatly encouraged the use of caustic washing-powders; and so have unintentionally entailed an immense destruction of clothes. In every case you perceive, on careful inquiry, that besides acting upon that which you sought to act upon, you have acted upon many other things, and each of these again on many others; and so have propagated a multitude of changes more or less appreciable in all directions. We need feel no surprise, then, that in their efforts to cure specific evils, legislators have con-

tinually caused collateral evils they never looked for. No Carlyle's wisest man, nor any body of such, could avoid causing them. Though their production is explicable enough after it has occurred, it is never anticipated. When, under the New Poor-law, provision was made for the accommodation of vagrants in the Union-houses, it was hardly expected that a body of tramps would be thereby called into existence, who would spend their time in walking from Union to Union throughout the kingdom. It was little thought by those who in past generations assigned parish-pay for the maintenance of illegitimate children, that, as a result, a family of such would by-and-by be considered a small fortune, and the mother of them a desirable wife; nor did the same statesmen see, that, by the law of settlement, they were organizing a disastrous inequality of wages in different districts, and entailing a system of clearing away cottages, which would result in the crowding of bedrooms, and in a consequent moral and physical deterioration. The English tonnage law was enacted simply with a view to regulate the mode of measurement: its framers overlooked the fact that they were practically providing "for the effectual and compulsory construction of bad ships;" and that "to cheat the law, that is, to build a tolerable ship in spite of it, was the highest achievement left to an English builder."* Greater commercial security was alone aimed at by the partnership law. We now find, however, that the unlimited liability it insists upon is a serious hindrance to progress; it practically forbids the association of small capitalists; it is found a great obstacle to the building of improved dwellings for the people; it prevents a better relationship between artisans and employers; and by withholding from the working-classes good investments for their savings, it checks the growth of provident habits and encourages drunkenness. Thus on all sides are well-meant measures producing unforeseen mischiefs—a licensing law that promotes the adulteration of beer; a ticket-of-leave system that encourages

* Lecture before the Royal Institution, by J. Scott Russell, Esq., "On Wave-line Ships and Yachts," Feb. 6, 1852.

men to commit crime; a police regulation that forces street-huxters into the workhouse. And then, in addition to the obvious and proximate evils, come the remote and less distinguishable ones, which, could we estimate their accumulated result, we should probably find even more serious.

But the thing to be discussed is, not so much whether, by any amount of intelligence, it is *possible* for a government to work out the various ends consigned to it, as whether its fulfilment of them is *probable*. It is less a question of *can* than a question of *will*. Granting the absolute competence of the State, let us consider what hope there is of getting from it satisfactory performance. Let us look at the moving force by which the legislative machine is worked, and then inquire whether this force is thus employed as economically as it would otherwise be.

Manifestly, as desire of some kind is the invariable stimulus to action in the individual, every social agency, of what nature soever, must have some aggregate of desires for its motive power. Men in their collective capacity can exhibit no result but what has its origin in some appetite, feeling, or taste common among them. Did not they like meat, there could be no cattle-graziers, no Smithfield, no distributing organization of butchers. Operas, Philharmonic Societies, music-publishers, and street organ-boys, have all been called into being by our love of melodious sounds. Look through the trades' directory; take up a guide to the London sights; read the index of Bradshaw's time-tables, the reports of the learned societies, or the advertisements of new books; and you see in the publication itself, and in the things it describes, so many products of human activity, stimulated by human desire. Under this stimulus grow up agencies alike the most gigantic and the most insignificant, the most complicated and the most simple—agencies for national defence and for the sweeping of crossings; for the daily distribution of letters, and for the collection of bits of coal out of the Thames mud—agencies that subserve all ends, from the preaching of Christianity to the protection of ill-treated

animals; from the production of bread for a nation to the supply of groundsel for caged singing-birds. The accumulated desires of individuals being, then, the moving power by which every social agency is worked, the question to be considered is—Which is the most economical kind of agency? The agency having no power in itself, but being merely an instrument, our inquiry must be for the most efficient instrument—the instrument that costs least, and wastes the smallest amount of the moving power—the instrument least liable to get out of order, and most readily put right again when it goes wrong. Of the two kinds of social mechanism exemplified above, the spontaneous and the governmental, which is the best?

From the form of this question will be readily foreseen the intended answer—that is the best mechanism which contains the fewest parts. The common saying, “What you wish well done you must do yourself,” embodies a truth equally applicable to political as to private life. The experience of the agriculturist who finds that farming by bailiff entails loss, while tenant-farming pays, is an experience still better illustrated in national history than in a landlord’s account books. The admitted fact, that joint-stock companies are beaten wherever individuals compete with them, is a still more certain fact when the joint-stock company comprehends the whole nation. This transference of power from constituencies to members of parliament, from these to the executive, from the executive to a board, from the board to its inspectors, and from inspectors through their subs down to the actual workers—this operating through a series of levers, each of which absorbs in friction and inertia part of the moving force; is as bad, in virtue of its complexity, as the direct employment by society of individuals, private companies, and spontaneously-formed institutions, is good, in virtue of its simplicity. Fully to realize the contrast, we must compare in detail the working of the two systems.

Officialism is habitually slow. When non-governmental agencies are dilatory, the public has its remedy: it ceases to employ them, and soon finds quicker ones. Under this discipline all

private bodies are taught promptness. But for delays in State-departments there is no such easy cure. Life-long Chancery suits must be patiently borne; Museum-catalogues must be hopelessly waited for. While, by the people themselves, a Crystal Palace is designed, erected, and filled, in the course of a few months, the legislature takes twenty years to build itself a new house. While by private persons, the debates are daily printed and dispersed over the kingdom within a few hours of their utterance, the Board of Trade tables are regularly published a month, and sometimes more, after date. And so throughout. Here is a Board of Health which, since 1849, has been about to close the metropolitan graveyards, but has not done it yet; and which has so long dawdled over projects for cemeteries, that the London Necropolis Company has taken the matter out of its hands. Here is a patentee who has had fourteen years' correspondence with the Horse Guards, before getting a definite answer respecting the use of his improved boot for the Army. Here is a Plymouth port-admiral who delays sending out to look for the missing boats of the *Amazon* until ten days after the wreck.

Again, officialism is stupid: Under the natural course of things each citizen tends towards his fittest function. Those who are competent to the kind of work they undertake, succeed, and, in the average of cases, are advanced in proportion to their efficiency; while the incompetent, society soon finds out, ceases to employ, forces to try something easier, and eventually turns to use. But it is quite otherwise in State-organizations. Here, as every one knows, birth, age, back-stairs intrigue, and sycophancy, determine the selections, rather than merit. The "fool of the family" readily finds a place in the Church, if "the family" have good connections. A youth, too ill-educated for any active profession, does very well for an officer in the Army. Grey hair, or a title, is a far better guarantee of naval promotion than genius is. Nay, indeed, the man of capacity often finds that, in government offices, superiority is a hindrance—that his chiefs hate to be pestered with his proposed improvements, and

are offended by his implied criticism. Not only, therefore, is legislative machinery complex, but it is made of inferior materials. Hence the blunders we daily read of—the supplying to the dockyards from the royal forests of timber unfit for use; the administration of relief during the Irish famine in such a manner as to draw labourers from the field, and diminish the subsequent harvest by one-fourth*; the filing of patents at three different offices and keeping an index at none; the building of iron, war-vessels that should be of wood, and the insisting on wood, for mail-steamers that should be of iron. Everywhere does this bungling show itself, from the elaborate failure of House of Commons ventilation down to the publication of the London Gazette, which invariably comes out wrongly folded.

A further characteristic of officialism is its extravagance. In its chief departments, Army, Navy, and Church, it employs far more officers than are needful, and pays some of the useless ones exorbitantly. The work done by the Sewers Commission has cost, as Sir B. Hall tells us, from 300 to 400 per cent. over the contemplated outlay; while the management charges have reached 35, 40, and 45 per cent. on the expenditure. The trustees of Ramsgate Harbour—a harbour, by the way, that has taken a century to complete—are spending 18,000*l.* a year in doing what 5000*l.* has been proved sufficient for. The Board of Health is causing new surveys to be made of all the towns under its control—a proceeding which, as Mr. Stephenson states, and as every tyro in engineering knows, is, for drainage purposes, a wholly needless expense. These public agencies are subject to no such influence as that which obliges private enterprise to be economical. Traders and mercantile bodies succeed by serving society cheaply. Such of them as cannot do this are continually supplanted by those who can. They cannot saddle the nation with the results of their extravagance, and so are prevented from being extravagant. On works that are to return a profit it does not answer to spend 48 per cent. of the capital in

* See Evidence of Major Larcom.

superintendence, as in the engineering department of the Indian Government ; and Indian railway companies, knowing this, manage to keep their superintendence charges within 8 per cent. A shopkeeper leaves out of his accounts no item analagous to that 6,000,000*l.* of its revenues, which Parliament allows to be deducted on the way to the Exchequer. Walk through a manufactory, and you see that the stern alternatives, carefulness or ruin, dictate the saving of every penny ; visit one of the national dockyards, and the comments you make on any glaring wastefulness are carelessly met by the slang phrase—“ Nunky pays.”

The unadaptiveness of officialism is another of its vices. Unlike private enterprise which quickly modifies its action to meet emergencies—unlike the shopkeeper who promptly finds the wherewith to satisfy a sudden demand—unlike the railway company which doubles its trains to carry a special influx of passengers ; the law-made instrumentality lumbers on under all varieties of circumstances through its ordained routine at its habitual rate. By its very nature it is fitted only for the average requirements, and inevitably fails under unusual requirements. You cannot step into the street without having the contrast thrust upon you. Is it summer ? You see the water-carts going their prescribed rounds with scarcely any regard to the needs of the weather—to-day sprinkling afresh the already moist roads ; to-morrow bestowing their showers with no greater liberality upon roads cloudy with dust. Is it winter ? You see the scavengers do not vary in number and activity according to the quantity of mud ; and if there comes a heavy fall of snow, you find the thoroughfares remaining for nearly a week in a scarcely passable state, without an effort being made even in the heart of London to meet the exigency. The late snow-storm, indeed, supplied a neat antithesis between the two orders of agency in the effects it respectively produced upon omnibuses and cabs. Not being under a law-fixed tariff, the omnibuses put on extra horses and raised their fares. The cabs on the contrary, being limited in their charges by an Act of Parliament

which, with the usual shortsightedness, never contemplated such a contingency as this, declined to ply, deserted the stands and the stations, left luckless travellers to stumble home with their luggage as best they might, and so became useless at the very time of all others when they were most wanted! Not only by its unsusceptibility of adjustment does officialism entail serious inconveniences, but it likewise entails great injustices. In this case of cabs for example, it has resulted since the late change of law, that old cabs, which were before saleable at 10*l.* and 12*l.* each, are now unsaleable and have to be broken up; and thus legislation has robbed cab-proprietors of part of their capital. Again, the recently-passed Smoke-Bill for London, which applies only within certain prescribed limits, has the effect of taxing one manufacturer while leaving untaxed his competitor working within a quarter of a mile; and so, as we are credibly informed, gives one an advantage of 1500*l.* a year over another. These typify the infinity of wrongs, varying in degrees of hardship, which legal regulations necessarily involve. Society, a living growing organism, placed within apparatuses of dead, rigid, mechanical formulas, cannot fail to be hampered and pinched. The only agencies which can efficiently serve it, are those through which its pulsations hourly flow, and which change as it changes.

How invariably officialism becomes corrupt every one knows. Exposed to no such antiseptic as free competition—not dependent for existence, as private unendowed organizations are, upon the maintenance of a vigorous vitality; all law-made agencies fall into an inert, over-fed state, from which to disease is a short step. Salaries flow in irrespective of the activity with which duty is performed; continue after duty wholly ceases; become rich prizes for the idle well born; and prompt to perjury, to bribery, to simony. East India directors are elected not for any administrative capacity they may have; but they buy votes by promised patronage—a patronage alike asked and given, in utter disregard of the welfare of a hundred millions of people. Registrars of wills not only get many thousands a

year each for doing work which their miserably paid deputies leave half done ; but they, in some cases, defraud the revenue, and that after repeated reprimands. Dockyard promotion is the result not of efficient services, but of political favouritism. That they may continue to hold rich livings, clergymen preach what they do not believe ; bishops make false returns of their revenues ; and at their elections to college-fellowships, well-to-do priests make oath that they are *pauper, pius et doctus*. From the local inspector whose eyes are shut to an abuse by a contractor's present, up to the prime minister who finds lucrative berths for his relations, this venality is daily illustrated ; and that in spite of public reprobation and perpetual attempts to prevent it. As we once heard said by a State-official of twenty-five years' standing—"Wherever there is government there is villainy." It is the inevitable result of destroying the direct connection between the profit obtained and the work performed. No incompetent person hopes, by offering a *douceur* in the *Times*, to get a permanent place in a mercantile office. But where, as under government, there is no employer's self-interest to forbid—where the appointment is made by some one on whom inefficiency entails no loss ; there a *douceur* is operative. In hospitals, in public charities, in literary funds, in endowed schools, in all social agencies in which duty done and income gained do not go hand in hand, the like corruption is found ; and is great in proportion as the dependence of income upon duty is remote. In State-organizations, therefore, corruption is unavoidable. In trading organizations it rarely makes its appearance ; and when it does, the instinct of self-preservation soon provides a remedy.

To all which broad contrasts add this, that while private bodies are enterprising and progressive, public bodies are unchanging, and, indeed, obstructive. That officialism should be inventive nobody expects. That it should go out of its easy mechanical routine to introduce improvements, and this at a considerable expense of thought and application, without the prospect of profit, is not to be supposed. But it is not simply

stationary; it strenuously resists every amendment either in itself or in anything with which it deals. Until now that County Courts are taking away their practice, all officers of the law have doggedly opposed law reform. The universities have maintained an old *curriculum* for centuries after it ceased to be fit; and are now struggling to prevent a threatened reconstruction. Every postal improvement has been vehemently protested against by the postal authorities. Mr. Whiston can say how pertinacious is the conservatism of Church grammar-schools. Not even the gravest consequences in view preclude official resistance: witness the fact that though, as a while since mentioned, Professor Barlow reported in 1820, of the Admiralty compasses then in store, that "at least one-half were mere lumber," yet notwithstanding the constant risk of shipwrecks thence arising, "very little amelioration in this state of things appears to have taken place until 1838 to 1840."* Nor is official obstructiveness to be readily overborne even by a powerful public opinion: witness the fact that though, for generations, nine-tenths of the nation have disapproved this ecclesiastical system which pampers the drones and starves the workers, and though commissions have been appointed to rectify it, it still remains substantially as it was: witness again the fact, that though since 1818, there have been a score attempts to rectify the scandalous mal-administration of Charitable Trusts—though ten times in ten successive years, remedial measures have been brought before Parliament—the abuses still continue in all their grossness. Not only do these legal instrumentalities resist reforms in themselves, but they hinder reforms in other things. In defending their vested interests, the clergy delay the closing of town burial-grounds. As Mr. Lindsay can show, government emigration-agents are checking the use of iron for sailing-vessels. Excise officers prevent improvements in the processes they have to overlook. That organic conservatism which is visible in the daily conduct of all men, is an obstacle which in private life self-interest slowly overcomes.

* "Rudimentary Magnetism," by Sir W. Snow Harris. Part III. p. 145.

The prospect of profit does, in the end, teach farmers that deep draining is good; though it takes long to do this. Manufacturers do, ultimately, learn the most economical speed at which to work their steam-engines; though precedent has long misled them. But in the public service, where there is no self-interest to overcome it, this conservatism exerts its full force; and produces results alike disastrous and absurd. For generations after book-keeping had become universal, the Exchequer accounts were kept by notches cut on sticks. In the estimates for the current year appears the item, "Trimming the oil-lamps at the Horse-Guards."

Between these law-made agencies, and the spontaneously formed ones, who then can hesitate? The one class are slow, stupid, extravagant, unadaptive, corrupt, and obstructive: can any point out in the other, vices that balance these? It is true that trade has its dishonesties, speculation its follies. These are evils inevitably entailed by the existing imperfections of humanity. It is equally true, however, that these imperfections of humanity are shared by State-functionaries; and that being unchecked in them by the same stern discipline, they grow to far worse results. Given a race of men having a certain proclivity to misconduct, and the question is, whether a society of these men shall be so organized that ill-conduct directly brings punishment, or whether it shall be so organized that punishment is but remotely contingent on ill-conduct? Which will be the most healthful community—that in which agents who perform their functions badly, immediately suffer by the withdrawal of public patronage; or that in which such agents can be made to suffer only through an apparatus of meetings, petitions, polling booths, parliamentary divisions, cabinet-councils, and red-tape documents? Is it not an absurdly utopian hope that men will behave better when correction is far removed and uncertain than when it is near at hand and inevitable? Yet this is the hope which most political schemers unconsciously cherish. Listen to their plans, and you find that just what they propose to have done, they assume the appointed

agents will do. That functionaries are trustworthy is their first postulate. Doubtless could good officers be ensured, much might be said for officialism: just as despotism would have its advantages could we ensure a good despot.

If, however, we would duly realize the contrast between the artificial and the natural modes of achieving social desiderata, we must look not only at the vices of the one but at the virtues of the other. These are many and important. Consider first how immediately every private enterprise is dependent upon the need for it; and how impossible it is for it to continue if there be no need. Daily are new trades and new companies established. If they subserve some existing public want, they take root and grow. If they do not, they die of inanition. It needs no agitation, no act of Parliament, to put them down. As with all natural organizations, if there is no function for them, no nutriment comes to them, and they dwindle away. Moreover, not only do the new agencies disappear if they are superfluous, but the old ones cease to be when they have done their work. Unlike law-made instrumentalities—unlike Heralds' Offices, which are maintained for ages after heraldry has lost all value—unlike Ecclesiastical Courts, which continue to flourish for generations after they have become an abomination; these private instrumentalities dissolve when they become needless. A widely ramified coaching system ceases to exist as soon as a more efficient railway system comes into being. And not simply does it cease to exist, and to abstract funds, but the materials of which it was made are absorbed and turned to use. Coachmen, guards, and the rest, are employed to profit elsewhere—do not continue for twenty years a burden, like the compensated officials of some abolished department of the State. Consider again how necessarily these unordained agencies fit themselves to their work. It is a law of all organized things, that efficiency presupposes apprenticeship. Not only is it true that the young merchant must begin by carrying letters to the post, that the way to be a successful innkeeper is to commence as waiter—not only is it true that in the deve-

lopment of the intellect there must come first the perceptions of identity and duality, next of number, and that without these, arithmetic, algebra, and the infinitesimal calculus, remain impracticable; but it is true that there is no part of any organism whatever but begins in some very simple form with some insignificant function, and passes to its final stage through successive phases of complexity. Every heart is at first a mere pulsatile sac; every brain begins as a slight enlargement of the spinal chord. This law equally extends to the social organism. An instrumentality that is to work well must not be designed and suddenly put together by legislators, but must grow gradually from a germ; each successive addition must be tried and proved good by experience before another addition is made; and by this tentative process only, can an efficient instrumentality be produced. From a trustworthy man who receives deposits of money, insensibly grows up a vast banking system, with its notes, checks, bills, its complex transactions, and its Clearing-house. Pack-horses, then waggons, then coaches, then steam-carriages on common roads, and, finally, steam-carriages on roads made for them—such has been the slow genesis of our present means of communication. Not a trade in the directory but has formed itself an apparatus of manufacturers, brokers, travellers, and distributors, in so gradual a way that no one can trace the steps. And so with organizations of another order. The Zoological Gardens, the largest and best thing of its kind in the world, began as the private collection of a few naturalists. The best working-class school known—that at Price's factory—commenced with half-a-dozen boys sitting among the candle-boxes, after hours, to teach themselves writing with worn-out pens. Mark, too, that as a consequence of their mode of growth, these spontaneous agencies expand to any extent required. The same stimulus which brought them into being makes them send their ramifications wherever they are needed. But supply does not thus readily follow demand in governmental agencies. Appoint a board and a staff, fix their duties, and let the apparatus have a generation or two to

consolidate, and you cannot get it to fulfil larger requirements without some act of parliament obtained only after long delay and difficulty.

Were there space, much more might be said upon the superiority of what naturalists would call the *exogenous* order of institutions over the *endogenous* one. But, from the point of view indicated, the further contrasts between their characteristics will be sufficiently visible.

Hence then the fact, that while the one order of means is ever failing, making worse, or producing more evils than it cures, the other order of means is ever succeeding, ever improving. Strong as it looks at the outset, State-agency perpetually disappoints every one. Puny as are its first stages, private effort daily achieves results that astound the world. It is not only that joint-stock companies do so much—it is not only that by them a whole kingdom is covered with railways in the same time that it takes the Admiralty to build a hundred-gun ship; but it is that law-made instrumentalities are outdone even by individuals. The often quoted contrast between the Academy whose forty members took fifty-six years to compile the French Dictionary, while Dr. Johnson alone compiled the English one in eight—a contrast still marked enough after making due set-off for the difference in the works—is by no means without parallel. Sundry kindred facts may be cited. That great sanitary desideratum—the bringing of the New River to London—which the wealthiest corporation in the world attempted and failed, Sir Hugh Myddleton achieved single-handed. The first canal in England—a work of which government might have been thought the fit projector, and the only competent executor—was undertaken and finished as the private speculation of one man—the Duke of Bridgewater. By his own unaided exertions, William Smith completed that great achievement, the geological map of Great Britain; meanwhile, the Ordnance Survey—a very accurate and elaborate one, it is true—has already occupied a large staff for some two generations, and will not be completed before the lapse of another. Howard and the prisons of Europe;

Bianconi and Irish travelling; Waghorn and the Overland route; Dargan and the Dublin Exhibition—do not these suggest startling contrasts? While private gentlemen like Mr. Denison, build model lodging-houses in which the deaths are greatly below the average, the State builds barracks in which the deaths are greatly above the average, even of the much-pitied town populations: barracks, which, though filled with picked men under medical supervision, show an annual mortality per thousand of 13·6, 17·9 and even 20·4; though among civilians of the same age in the same places, the mortality per thousand is but 11·9.* While the State has laid out large sums, at Parkhurst, in the effort to reform juvenile criminals, who are *not* reformed; Mr. Ellis takes fifteen of the worst young thieves in London—thieves considered by the police utterly irreclaimable—and reforms them all. Side by side with the Emigration Board, under whose management hundreds die of fever from close packing, and under whose licence sail vessels which, like the *Washington*, are the homes of fraud, brutality, tyranny, and obscenity, stands Mrs. Chisholm's Family Colonisation Loan Society, which does not provide worse accommodation than ever before, but much better; which does not demoralize by promiscuous crowding, but improves by mild discipline; which does not pauperize by charity, but encourages providence; which does not increase our taxes, but is self-supporting. Here are lessons for the lovers of legislation. The State outdone by a working shoemaker! The State beaten by a woman!

Yet still stronger becomes this contrast between the results of public action and private action, when we remember that the one is constantly eked out by the other, even in doing the things unavoidably left to it. Passing over military and naval departments, in which much is done by contractors, and not by men receiving government pay,—passing over the Church, which is constantly extended not by law but by voluntary effort—passing over the Universities, where all the efficient teaching is given

* See "Statistical Reports on the Sickness, Mortality, and Invaliding amongst the Troops." 1853.

not by the appointed officers but by private tutors ; let us look at the mode in which our judicial system is worked. Lawyers perpetually tell us that codification is impossible ; and there are many simple enough to believe them. Merely remarking, in passing, that what government and all its employés cannot do for the Acts of Parliament in general, was done for the 1500 Customs acts in 1825 by the energy of one man—Mr. Deacon Hume—let us see how the absence of a digested system of law is made good. In preparing themselves for the bar, and finally the bench, law students, by years of research, have to gain an acquaintance with this vast mass of unorganized legislation ; and that organization which it is held impossible for the State to effect, it is held possible (sly sarcasm on the State !) for each student to effect for himself. Every judge can privately codify, though “united wisdom” cannot. But how is each judge enabled to codify ? By the private enterprise of men who have prepared the way for him ; by the partial codifications of Blackstone, Coke, and others ; by the digests of Partnership Law, Bankruptcy Law, Law of Patents, Laws affecting Women, and the rest that daily issue from the press ; by abstracts of cases, and volumes of reports—every one of them unofficial products. Sweep away all these fractional codifications made by individuals, and the State would be in utter ignorance of its own laws ! Had not the bunglings of legislators been made good by private enterprise, the administration of justice would have been impossible !

Where, then, is the warrant for the constantly-proposed extensions of legislative action ? If, as we have seen in a large class of cases, government measures do not remedy the evils they aim at ; if, in another large class, they make these evils worse instead of remedying them ; and if, in a third large class, while curing some evils they entail others, and often greater ones—if, as we lately saw, public action is continually outdone in efficiency by private action ; and if, as just shown, private action is obliged to make up for the shortcomings of public action, even in fulfilling the vital functions of the State ; what reason is

there for wishing more public administrations? The advocates of such may claim credit for philanthropy, and for ingenuity, but not for wisdom; unless wisdom is shown by disregarding experience.

“Much of this argument is beside the question,” will rejoin our opponents. “The true point at issue is, not whether individuals and companies outdo the State when they come in competition with it, but whether there are not certain social wants which the State alone can satisfy. Admitting that private enterprise does much, and does it well, it is nevertheless true that we have daily thrust upon our notice many desiderata which it has not achieved, and is not achieving. In these cases its incompetency is obvious; and in these cases, therefore, it behoves the State to make up for its deficiencies: doing this, if not well, yet as well as it can.”

Not to fall back upon the many experiences already quoted, showing that the State is likely to do more harm than good in attempting this; nor to dwell upon the fact, that, in most of the alleged cases, the apparent insufficiency of private enterprise is a *result* of previous State-interferences, as may be conclusively shown; let us deal with the proposition on its own terms. Though there would have been no need for a Mercantile Marine Act to prevent the unscaworthiness of ships, and the ill-treatment of sailors, had there been no Navigation Laws to produce these; and though were all like cases of evils and short-comings directly or indirectly produced by law, taken out of the category, there would probably remain but small basis for the plea above put; yet let it be granted that, every artificial obstacle being removed, there would still remain many desiderata unachieved, which there was no seeing how spontaneous effort could achieve. Let all this, we say, be granted; the propriety of legislative action may yet be rightly questioned.

For the said plea involves the quite unwarrantable assumption that social agencies will continue to work only as they are now working; and will produce no results but those they seem

likely to produce. It is the habit of this school of thinkers to make a limited human intelligence the measure of phenomena which it requires omniscience to grasp. That which it does not see the way to, it does not believe will take place. Though society has, generation after generation, been growing to developments which none foresaw, yet there is no practical belief in unforeseen developments in the future. The parliamentary debates constitute an elaborate balancing of probabilities, having for data things as they are. Meanwhile every day adds new elements to things as they are, and seemingly improbable results constantly occur. Who, a few years ago, expected that a Leicester-square refugee would shortly become Emperor of the French? Who looked for free trade from a landlords' ministry? Who dreamed that Irish over-population would spontaneously cure itself, as it is now doing? So far from social changes arising in likely ways, they almost always arise in ways that, to common sense, appear unlikely. A barber's shop was not a probable-looking place for the germination of the cotton manufacture. No one supposed that important agricultural improvements would come from a Leadenhall-street tradesman. A farmer would have been the last man thought of to bring to bear the screw propulsion of steam-ships. The invention of a new order of architecture we should have hoped from any one rather than a gardener. Yet while the most unexpected changes are daily wrought out in the strangest ways, legislation daily assumes that things will go, just as human foresight thinks they will go. Though by the trite exclamation—"What would our forefathers have said!" there is a constant acknowledgment of the fact, that wonderful results have been achieved in modes wholly unforeseen, yet there seems no belief that this will be again. Would it not be wise to admit such a probability into our politics? May we not rationally infer that, as in the past so in the future?

This strong faith in State-agencies is, however, accompanied by so weak a faith in natural agencies (the two being antagonistic), that, spite of past experience, it will by many be thought

absurd to rest in the conviction, that existing social needs will be spontaneously met, though we cannot say how they will be met. Nevertheless, illustrations exactly to the point are now transpiring before their eyes. Instance the adulteration of food—a thing which law has unsuccessfully tried to stop time after time, and which yet there seemed no power but law competent to deal with. Law, however, having tried and failed, here steps in *The Lancet*, and, with a view to extend its circulation, begins publishing weekly analyses, and gives lists of honest and dishonest tradesmen. By-and-by we shall be having such lists published in other papers, as portions of these reports have been already. And when every retailer finds himself thus liable to have his sins told to all his customers, a considerable improvement may be expected. Who, now, would have looked for such a remedy as this? Instance, again, the scarcely credible phenomenon lately witnessed in the midland counties. Every one has heard of the distress of the stockings—a chronic evil of some generation or two's standing. Repeated petitions have prayed Parliament for remedy; and legislation has made attempts, but without success. The disease seemed incurable. Two or three years since, however, the circular knitting machine was introduced—a machine immensely outstripping the old stocking-frame in productiveness, but which can make only the legs of stockings, not the feet. Doubtless, the Leicester and Nottingham artizans regarded this new engine with alarm, as one likely to intensify their miseries. On the contrary, it has wholly removed them. By cheapening production, it has so enormously increased consumption, that the old stocking-frames, which were before too many by half for the work to be done, are now all employed in putting feet to the legs which the new machines make. How insane would he have been thought who anticipated cure from such a cause! If from the unforeseen removal of evils we turn to the unforeseen achievement of desiderata, we find like cases. No one recognized in Oersted's electro-magnetic discovery the germ of a new agency for the catching of criminals and the facilitation of commerce. No

one expected railways to become agents for the diffusion of cheap literature, as they now are. No one supposed when the Society of Arts was planning an international exhibition of manufactures, that the result would be a place for popular recreation and culture at Sydenham.

But there is yet a deeper reply to the appeals of impatient philanthropists. It is not simply that social vitality may be trusted by-and-by to fulfil each much-exaggerated requirement in some quiet spontaneous way—it is not simply that when thus naturally fulfilled it will be fulfilled efficiently, instead of being botched as when attempted artificially ; but it is that until thus naturally fulfilled it ought not to be fulfilled at all. A startling paradox, this, to many ; but one quite justifiable, as we hope shortly to show.

It was pointed out some distance back, that the force which produces and sets in motion every social mechanism—governmental, mercantile, or other—is some accumulation of personal desires. As there is no individual action without a desire, so, it was urged, there can be no social action without an aggregate desire. To which there here remains to add, that as it is a general law of the individual that the intenser desires—those corresponding to all-essential functions—are satisfied first, and if need be to the neglect of the weaker and less important ones ; so, it must be a general law of society that the chief requisites of social life—those necessary to popular existence and multiplication—will, in the natural order of things, be subserved before those of a less pressing kind. Having a common root in humanity, the two series of phenomena cannot fail to accord. As the private man first ensures himself food ; then clothing and shelter ; these being secured, takes a wife ; and, if he can afford it, presently supplies himself with carpeted rooms and piano, and wines, hires servants and gives dinner parties ; so, in the evolution of society, we see first a combination for defence against enemies, and for the better pursuit of game ; by-and-by come such political arrangements as are needed to maintain this combination ; afterwards, under a demand for

more food, more clothes, more houses, arises division of labour; and when satisfaction of the animal wants has been tolerably provided for, there slowly grow up science, and literature, and the arts. Is it not obvious that these successive evolutions occur in the order of their importance? Is it not obvious, that being each of them produced by an aggregate desire they *must* occur in the order of their importance, if it be a law of the individual that the strongest desires correspond to the most needful actions? Is it not, indeed, obvious that the order of relative importance will be more uniformly followed in social action than in individual action; seeing that the personal idiosyncrasies which disturb that order in the latter case are *averaged* in the former? If any one does not see this, let him take up a book describing life at the gold-diggings. There he will find the whole process exhibited in little. He will read that as the diggers must eat, they are compelled to offer such prices for food, that it pays better to keep a store than to dig. As the store-keepers must get supplies, they will give enormous sums for carriage from the nearest town; and some men quickly seeing they can get rich at that, make it their business. This brings drays and horses into demand; the high rates draw these from all quarters, and after them wheelwrights and harness-makers. Blacksmiths to sharpen pickaxes, doctors to cure fevers, get pay exorbitant in proportion to the need for them; and are so brought flocking in proportionate numbers. Presently commodities become scarce; more must be fetched from abroad; sailors must have increased wages to prevent them from deserting; this necessitates higher charges for freight; higher freights quickly bring more ships; and so there rapidly develops an organization for supplying goods from all parts of the world. Every phase of this evolution takes place in the order of its necessity; or as we say—in the order of the intensity of the desires subserved. Each man does that which he finds pays best; that which pays best is that for which other men will give most; that for which they will give most is that which, under the circumstances, they most desire.

Hence the succession must be throughout from the more important to the less important. A requirement which at any period still remains unfulfilled, must be one for the fulfilment of which men will not pay so much as to make it worth any one's while to fulfil it—must be a *less* requirement than all the others for the fulfilment of which they will pay more; and must wait until other more needful things are done. Well, is it not clear that the same law holds good in every community? Will it not be true of the later phases of social evolution, as of the earlier, that when uncontrolled the smaller desiderata are postponed to the greater? No reasonable person can doubt it.

Hence, then, the justification of the seeming paradox, that until spontaneously fulfilled a public want should not be fulfilled at all. It must, on the average, result in our complex state, as in simpler ones, that the thing left undone is a thing by doing which citizens cannot gain so much as by doing other things—is therefore a thing which society does not want done so much as it wants these other things done; and the corollary is, that to effect a neglected thing by artificially employing citizens to do it, is to leave undone some more important thing which they would have been doing—is to sacrifice the greater requisite to the smaller.

“But,” it will perhaps be objected, “if the things done by a government, or at least by a representative government, are also done in obedience to some aggregate desire, why may we not look for this normal subordination of the more needful to the less needful in them too?” The reply is, that though they have a certain tendency to follow this order—though those primal desires for public defence and personal protection, out of which government originates, were satisfied through its instrumentality in proper succession—though possibly some other early and simple requirements may have been so too; yet, when the desires are not few, universal and intense, but, like those remaining to be satisfied in the latter stages of civilization, numerous, partial, and moderate, the judgment of

a government is no longer to be trusted. To select out of an immense number of minor wants, physical, intellectual, and moral, felt in different degrees by different classes, and by a total mass varying in every case, the want that is most pressing, is a task which no legislature can accomplish. No man or men by inspecting society can *see* what it most needs; society must be left to *feel* what it most needs. The mode of solution must be experimental, not theoretical. When left, day after day, to experience evils and dissatisfactions of various kinds, affecting them in various degrees, citizens gradually acquire repugnance to these proportionate to their greatness, and corresponding desires to get rid of them, which are likely to end in the worst inconvenience being first removed. And however irregular this process may be—and we admit that men's habits and prejudices produce many anomalies, or seeming anomalies, in it—it is a process far more trustworthy than are legislative judgments. For those who question this there are instances; and that the parallel may be the more conclusive, we will take a case in which the ruling power is deemed specially fit to decide: we refer to our means of communication.

Do those who maintain that railways would have been better laid out and constructed by government, hold that the order of importance would have been as uniformly followed as it has been by private enterprise? Under the stimulus of an enormous traffic—a traffic too great for the then existing means—the first line sprung up between Liverpool and Manchester. Next came the Grand Junction and the London and Birmingham; afterwards the Great Western, the South Western, the South Eastern, the Eastern Counties, the Midland. Since then subsidiary lines and branches have occupied our capitalists. As they were quite certain to do, companies made first the most needed, and therefore the best paying lines; under the same impulse that a labourer chooses high wages in preference to low. That government would have adopted a better order can hardly be, for the best has been followed; but that it would have adopted a worse, all the

evidence we have goes to show. In default of materials for a direct parallel, we might quote cases of injudicious road-making from India and the colonies. Or, as exemplifying State-efforts to facilitate communication, we might dwell on the fact, that while our rulers have sacrificed hundreds of lives and spent untold treasure in seeking a North-west passage, which would be useless if found, they have left the exploration of the Isthmus of Panama, and the making railways and canals through it, to private companies. But, not to make much of this indirect evidence, we will content ourselves with the one sample of a State-made channel for commerce, which we have at home—the Caledonian Canal. Up to the present time, this public work has cost upwards of 1,100,000*l.*; it has now been open for many years, and salaried emissaries have been constantly employed to get traffic for it; the results, as given in its forty-seventh annual report, issued in 1852, are—receipts during the year, 7,909*l.*; expenditure ditto, 9,261*l.*—loss, 1,352*l.* Has any such large investment been made with such a pitiful result by a private canal company?

And if a government is so bad a judge of the relative importance of social requirements, when these requirements are *of the same kind*, how worthless a judge must it be when they are of different kinds. If, where a fair share of intelligence might be expected to lead them right, legislators and their officers go so wrong, how terribly will they err where no amount of intelligence would suffice them,—where they must daily decide among hosts of needs, bodily, intellectual, and moral, that admit of no direct comparison; and how disastrous must be the results if they act out their erroneous decisions. Should any one need this bringing home to him by an illustration, let him read the following extract from the last of the series of letters some time since published in the *Morning Chronicle*, on the state of agriculture in France. After expressing the opinion that French farming is some century behind English farming, the writer goes on to say:—

“There are two causes principally chargeable with this. In

the first place, strange as it may seem in a country in which two-thirds of the population are agriculturists, agriculture is a very unhonoured occupation. Develop in the slightest degree a Frenchman's mental faculties, and he flies to a town as surely as steel filings fly to a loadstone. He has no rural tastes, no delight in rural habits. A French amateur farmer would indeed be a sight to see. Again, this national tendency is directly encouraged by the centralising system of government—by the multitude of officials, and by the payment of all functionaries. From all parts of France, men of great energy and resource struggle up, and fling themselves on the world of Paris. There they try to become great functionaries. Through every department of the eighty-four, men of less energy and resource struggle up to the *chef-lieu*—the provincial capital. There they try to become little functionaries. Go still lower—deal with a still smaller scale—and the result will be the same. As is the department to France, so is the *arrondissement* to the department, and the *commune* to the *arrondissement*. All who have, or think they have, heads on their shoulders, struggle into towns to fight for office. All who are, or are deemed by themselves or others, too stupid for anything else, are left at home to till the fields, and breed the cattle, and prune the vines, as their ancestors did for generations before them. Thus there is actually no intelligence left in the country. The whole energy, and knowledge, and resource of the land are barreled up in the towns. You leave one city, and in many cases you will not meet an educated or cultivated individual until you arrive at another—all between is utter intellectual barrenness.”—*Morning Chronicle*, August, 1851.

To what end now is this constant abstraction of able men from rural districts? To the end that there may be enough functionaries to achieve those many desiderata which French governments have thought ought to be achieved—to provide amusements, to manage mines, to construct roads and bridges and erect numerous buildings—to print books, encourage the fine arts, control this trade, and inspect that manufacture—to do all

the thousand-and-one things which the State does in France. That the army of officers needed for this may be maintained, agriculture must go unofficered. That certain social conveniences may be better secured, the chief social necessity is neglected. The very basis of the national life is sapped, to gain a few non-essential advantages. Said we not truly, then, that until a requirement is spontaneously fulfilled, it should not be fulfilled at all?

And here indeed we may recognise the close kinship between the fundamental fallacy involved in these State-meddlings and the fallacy lately exploded by the free-trade agitation. These various law-made instrumentalities for effecting ends that might otherwise not yet be effected, all embody a subtler form of the protectionist hypothesis. The same short-sightedness which, looking at commerce, prescribed bounties and restrictions, looking at social affairs in general, prescribes these multiplied administrations; and the same criticism applies alike to all its proceedings.

For was not the error that vitiated every law aiming at the artificial maintenance of a trade, substantially that which we have just been dwelling upon: namely, the overlooking the fact, that in setting people to do one thing, some other thing is necessarily left undone? The statesmen who thought it wise to protect home-made silks against French silks, did so under the impression that the manufacture thus secured constituted a pure gain to the nation. They did not reflect that the men employed in this manufacture would otherwise have been producing something else—a something else which, as they could produce it without legal help, they could more profitably produce. Landlords who have been so anxious to prevent foreign wheat from displacing their own wheat, have never duly realized the fact, that if their fields would not yield wheat so economically as to prevent the feared displacement, it simply proved that they were growing unfit crops in place of fit crops; and so working their land at a relative loss. In all cases where, by restrictive

duties, a trade has been upheld that would otherwise not have existed, capital has been turned into a channel less productive than some other into which it would naturally have flowed. In the absence of these restrictions, the article made would have been fetched from some place where it was more cheaply made; and in exchange for it we should have given some article in which aptitude and local circumstances enabled us to excel those with whom we thus exchanged. And so, to pursue certain State-patronized occupations, men have been drawn from more advantageous occupations.

Is it not, then, as above alleged, that the same oversight runs through all these interferences; be they with commerce, or be they with other things? Is it not that in employing people to achieve this or that desideratum, legislators have not perceived that they were thereby preventing the achievement of some other desideratum? Has it not been constantly assumed that each proposed good would, if secured, be a pure good; instead of being a good purchasable only by submission to some evil that would else have been remedied? And may we not rationally believe that, as in trade, so in other things, labour will spontaneously find out, better than any government can find out for it, the things on which it may best expend itself? Undoubtedly we may. Rightly regarded, the two propositions are identical. This division into commercial and non-commercial affairs is quite a superficial one. All the actions going on in society come under the generalization—human effort administering to human desire. Whether the administration be effected through a process of buying and selling, or whether in any other way, matters not so far as the general law of it is concerned. In all cases it will be true that the stronger desires will get themselves satisfied before the weaker ones; and in all cases it will be true that to get satisfaction for the weaker ones before they would naturally have it, is to deny satisfaction to the stronger ones.

To the immense positive evils entailed by over-legislation have

to be added the equally great negative evils—evils which, notwithstanding their greatness, are scarcely at all recognised, even by the far-seeing. It is not simply that the State does those things which it ought not to do, but that, *as an inevitable consequence*, it leaves undone those things which it ought to do. Time and human activity being limited, it necessarily follows that legislators' sins of *commission* entail corresponding sins of *omission*. The injury is unavoidably doubled. Mischievous meddling involves disastrous neglect; and until statesmen are ubiquitous and omnipotent, must ever do so. It is in the very nature of things that an agency employed for two purposes must fulfil both imperfectly; partly, because while fulfilling the one it cannot be fulfilling the other, and partly because its adaptation to both ends implies incomplete fitness for either. As has been well said apropos of this point,—“A blade which is designed both to shave and to carve, will certainly not shave so well as a razor or carve so well as a carving-knife. An academy of painting, which should also be a bank, would in all probability exhibit very bad pictures and discount very bad bills. A gas company, which should also be an infant-school society, would, we apprehend, light the streets ill, and teach the children ill.”* And if an institution undertakes, not two functions, but a score—if a government, whose office it is to defend citizens against aggressors, foreign and domestic, engages also to disseminate Christianity, to administer charity, to teach children their lessons, to adjust prices of food, to inspect coal-mines, to regulate railways, to superintend house-building, to arrange cab-fares, to look into people's stink-traps, to vaccinate their children, to send out emigrants, to prescribe hours of labour, to examine lodging-houses, to test the knowledge of mercantile captains, to provide public libraries, to read and authorize dramas, to inspect passenger-ships, to see that small dwellings are supplied with water, to regulate endless things from a banker's issues down to the boat-fares on the Serpentine—is it not manifest that its primary duty must be ill-discharged in proportion to

* *Edinburgh Review*, April, 1839.

the multiplicity of affairs it busies itself with? Is it not manifest that its time and energies must be frittered away in schemes, and inquiries, and amendments, in proposals, and debates, and divisions, to the utter neglect of its essential office? And does not a glance over the debates make it manifest that this is the fact? and that, while parliament and public are alike occupied with these chimerical projects, these mischievous interferences, these utopian hopes, the one thing needful is left almost undone?

See here, then, the proximate cause of all our legal abominations. We drop the substance in our efforts to catch shadows. While our firesides, and clubs, and taverns are filled with talk about corn-law questions, and church questions, and education questions, and sanitary questions—all of them raised by over-legislation—the justice question gets scarcely any attention; and we daily submit to be oppressed, cheated, robbed. This institution, which should succour the man who has fallen among thieves, turns him over to solicitors, barristers, and a legion of law-officers; drains his purse for writs, briefs, affidavits, subpoenas, fees of all kinds and expenses innumerable; involves him in the intricacies of common courts, chancery courts, suits, counter-suits, and appeals; and often ruins where it should aid. Meanwhile, meetings are called, and leading articles written, and votes asked, and societies formed, and agitations carried on, not to rectify these gigantic evils, but partly to abolish our ancestors' mischievous meddlings, and partly to establish meddlings of our own. Is it not obvious that this fatal neglect is a result of this mistaken officiousness? Suppose that external and internal protection had been the sole recognised functions of the legislature. Is it conceivable that our administration of justice would have been as corrupt as now? Can any one believe that had parliamentary elections been habitually contested on questions of legal reform, our judicial system would still have been what Sir John Romilly calls it,—“a technical system invented for the creation of costs?” Does any one suppose that, if the efficient defence of person and property had

been the constant subject-matter of hustings pledges, we should yet be waylaid by a Chancery Court which has now more than two hundred millions of property in its clutches—which keeps suits pending fifty years, until all the funds are gone in fees—which swallows in costs two millions annually? Dare any one assert that had constituencies been always canvassed on principles of law-reform versus law-conservatism, Ecclesiastical Courts would have continued for centuries fattening on the goods of widows and orphans? The questions are next to absurd. A child may see that with the general knowledge people have of legal corruptions and the universal detestation of legal atrocities, an end would long since have been put to them, had the administration of justice always been *the* political topic. Had not the public mind been constantly pre-occupied, it could never have been tolerated that a man, neglecting to file an answer to a bill in due course, should be imprisoned fifteen years for contempt of court, as Mr. James Taylor was. It would have been impossible that on the abolition of their sinecures the sworn-clerks should have been compensated by the continuance of their exorbitant incomes, not only till death, but for seven years after, at a total estimated cost of £700,000. Were the State confined to its defensive and judicial functions, not only the people but legislators themselves would agitate against abuses. The sphere of activity and the opportunities for distinction being narrowed, all the thought, and industry, and eloquence which members of Parliament now expend on countless impracticable schemes and countless artificial grievances, would be expended in rendering justice pure, certain, prompt, and cheap. The complicated follies of our legal verbiage, which the uninitiated cannot understand, and which the initiated interpret in various senses, would be quickly put an end to. We should no longer constantly hear of Acts of Parliament so bunglingly drawn up that it requires half a dozen actions and judges' decisions under them, before even lawyers can say how they apply. There would be no such stupidly-designed measures as the Railway Winding-up Act; which, though passed in 1846 to

close the accounts of the bubble schemes of the mania, leaves them still unsettled in 1854—which, even with funds in hand, withholds payment from creditors whose claims have been years since admitted. Lawyers would no longer be suffered to maintain and to complicate the present absurd system of land titles ; which, besides the litigation and ruin it perpetually causes, lowers the value of estates, prevents the ready application of capital to them, checks the development of agriculture, and so, seriously hinders the improvement of the peasantry and the prosperity of the country. In short, the follies, terrors, and abominations which now environ law would cease ; and that which men now shrink from as an enemy they would come to regard as what it purports to be—a friend.

How vast then is the negative evil, which, in addition to the positive evils before enumerated, this meddling policy entails on us ! How many are the grievances men bear, from which they would otherwise be free ! Who is there that has not submitted to injuries rather than run the risk of heavy law-costs ? Who is there that has not abandoned just claims rather than “ throw good money after bad ? ” Who is there that has not paid unjust demands rather than withstand the threat of an action ? Who is there that cannot point to property that has been alienated from his family from lack of funds, or courage to fight for it ? Who is there that has not a relation ruined by a law-suit ? Who is there that does not know a lawyer who has grown rich on the hard earnings of the needy and the savings of the oppressed ? Who is there that cannot name a once wealthy man who has been brought by legal iniquities to the workhouse or the lunatic asylum ? Who is there that has not, within his own personal knowledge, evidence of the great extent to which the badness of our judicial system vitiates our whole social life : renders almost every family poorer than it would otherwise be ; hampers almost every business transaction ; inflicts daily anxieties on every trader ? And all this continual loss of property, time, temper, comfort, men quietly submit to from being absorbed in the pursuit of impracticable

schemes which eventually bring upon them other losses of kindred nature.

Nay, the case is even worse. It is distinctly proveable that many of these evils, about which so great an outcry is raised, and to cure which special Acts of Parliament are so loudly invoked, are themselves *produced* by the disgraceful administration of our judicial system. For example, it is well known that the horrors out of which our sanitary agitators make political capital, are found in their greatest intensity on properties that have been for a generation in Chancery—are distinctly traceable to the ruin thus brought about; and would never have existed but for the infamous corruptions of law. Again, it has been clearly shown that the long-drawn miseries of Ireland, which have been the subject of endless legislation—of Coercion Bills, of Poor Laws, of Rates in Aid, of Drainage Bills, of tinkering without number—have been mainly produced by inequitable land-tenure and the complicated system of entail: a system which wrought such involvements as to prevent sales; which practically negated all improvement; which brought landlords to the workhouse; and which required an Incumbered Estates Act to cut its gordian knots and render the proper cultivation of the soil possible. Judicial negligence, too, is the main cause of railway accidents. If the State would duly fulfil its true function, by giving passengers an easy remedy for breach of contract when trains are behind time, it would do more to prevent accidents than can be done by the minutest inspection, or the most cunningly-devised regulations; for it is notorious that the majority of accidents are primarily caused by irregularity. In the case of bad house-building, also, it is obvious that a cheap, rigorous, and certain administration of justice, would make Building Acts needless. For is not the man who erects a house of bad materials ill put together, and, concealing these with papering and plaster, sells it as a substantial dwelling, guilty of fraud? And should not the law recognise this fraud as it does in the analogous case of an unsound horse? And if the legal remedy were easy, prompt, and sure, would builders be such fools as to

continue transgressing? So is it in numerous other cases: the evils which men perpetually call upon the State to cure by superintendence, themselves arise from the non-performance of its original duty.

Observe then how this vicious policy complicates itself—how it acts and re-acts, and multiplies its injuries. Not only does meddling legislation fail to cure the evils it aims at; not only does it make many evils worse; not only does it create new evils greater than the old; but while doing this it entails on men all the terrible oppressions, robberies, cruelties, ruin, that flow from the non-administration of justice: and not only to the positive evils does it add this vast negative one, but this again, by fostering many social abuses that would not else exist, furnishes occasions for more meddlings which again act and re-act in the same way. And thus as ever, “things bad begun make strong themselves by ill.”

After assigning reasons thus fundamental, for condemning all State-action save that which universal experience has proved to be absolutely needful, it would seem superfluous to assign subordinate ones. Were it called for, we might, taking for text Mr. Lindsay's work on “Navigation and Mercantile Marine Law,” say much upon the complexity to which this process of adding regulation to regulation—each necessitated by foregoing ones—ultimately leads: a complexity which, by the misunderstandings, delays, and disputes it entails, greatly hampers our social life. Something, too, might be added upon the perturbing effects of that “gross delusion,” as M. Guizot calls it, “a belief in the sovereign power of political machinery”—a delusion to which he partly ascribes, and, we believe, rightly so, the late revolution in France; and a delusion which is fostered by every new interference. But, passing over these, we would dwell for a short space upon the national enervation which this State-superintendence produces—an evil which, though secondary, is, so far from being subordinate, perhaps greater than any other.

The enthusiastic philanthropist, urgent for some act of par-

liament to remedy this evil or secure the other good, thinks it a very trivial and far-fetched objection that the people will be morally injured by doing things for them instead of leaving them to do things themselves. He vividly realises the benefit he hopes to get achieved, which is a positive and readily imaginable thing: he does not realize the diffused, invisible, and slowly-accumulating effect wrought on the popular mind, and so does not believe in it; or, if he admits it, thinks it beneath consideration. Would he but remember, however, that all national character is gradually produced by the daily action of circumstances, of which each day's result seems so insignificant as not to be worth mentioning, he would see that what is trifling when viewed in its increments, may be formidable when viewed in its sum total. Or if he would go into the nursery, and watch how repeated actions—each of them apparently unimportant,—create, in the end, a habit which will affect the whole future life; he would be reminded that every influence brought to bear on human nature tells, and, if continued, tells seriously. The thoughtless mother who hourly yields to the requests—"Mamma, tie my pinafore," "Mamma, button my shoe," and the like, cannot be persuaded that each of these concessions is detrimental; but the wiser spectator sees that if this policy be long pursued, and be extended to other things, it will end in hopeless dependence. The teacher of the old school who showed his pupil the way out of every difficulty, did not perceive that he was generating an attitude of mind greatly militating against success in life. The modern instructor, however, induces his pupil to solve his difficulties himself; believes that in so doing he is preparing him to meet the difficulties which, when he goes into the world, there will be no one to help him through; and finds confirmation for this belief in the fact that a great proportion of the most successful men are self-made. Well, is it not obvious that this relationship between discipline and success holds good nationally? Are not nations made of men; and are not men subject to the same laws of modification in their adult as in their early years?

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Is it not true of the drunkard, that each carouse adds a thread to his bonds? of the trader, that each acquisition strengthens the wish for acquisitions? of the pauper, that the more you assist him the more he wants? of the busy man, that the more he has to do the more he can do? And does it not follow that if every individual is subject to this process of adaptation to conditions, a whole nation must be so—that just in proportion as its members are little helped by extraneous power they will become self-helping, and in proportion as they are much helped they will become helpless? What folly is it to ignore these results because they are not direct, and not immediately visible. Though slowly wrought out, they are inevitable. We can no more elude the laws of human development than we can elude the law of gravitation: and so long as they hold true must these effects occur.

If we are asked in what special directions this alleged helplessness, entailed by much State-superintendence, shows itself; we reply that it is seen in a retardation of all social growths requiring self-confidence in the people—in a timidity that fears all difficulties not before encountered—in a thoughtless contentment with things as they are. Let any one, after duly watching the rapid evolution going on in England, where men have been comparatively little helped by governments—or better still, after contemplating the unparalleled progress of the United States, which is peopled by self-made men, and the recent descendants of self-made men;—let such an one, we say, go on to the Continent, and consider the relatively slow advance which things are there making; and the still slower advance they would make but for English enterprise. Let him go to Holland, and see that though the Dutch early showed themselves good mechanics, and have had abundant practice in hydraulics, Amsterdam has been without any due supply of water until now that works are being established by an English company. Let him go to Berlin, and there be told that, to give that city a water-supply such as London has had for generations, the project of an English firm is about to be

executed by English capital, under English superintendence. Let him go to Paris, where he will find a similar lack, and a like remedy now under consideration. Let him go to Vienna, and learn that it, in common with other continental cities, is lighted by an English gas-company. Let him go on the Rhone, on the Loire, on the Danube, and discover that Englishmen established steam navigation on those rivers. Let him inquire concerning the railways in Italy, Spain, France, Sweden, Denmark, how many of them are English projects, how many have been largely helped by English capital, how many have been executed by English contractors, how many have had English engineers. Let him discover, too, as he will, that where railways have been government-made, as in Russia, the energy, the perseverance, and the practical talent developed in England and the United States have been called in to aid. And then if these illustrations of the progressiveness of a self-dependent race, and the torpidity of paternally-governed ones, do not suffice him, he may read Mr. Laing's successive volumes of European travel, and there study the contrast in detail. What, now, is the cause of this contrast? In the order of nature, a capacity for self-help must in every case have been brought into existence by the practice of self-help; and, other things equal, a lack of this capacity must in every case have arisen from the lack of demand for it. Do not these two antecedents and their two consequents agree with the facts as presented in England and Europe? Were not the inhabitants of the two, some centuries ago, much upon a par in point of enterprise? Were not the English even behind, in their manufactures, in their colonization, and in their commerce? Has not the immense relative change the English have undergone in this respect, been coincident with the great relative self-dependence they have been since habituated to? And is not this change proximately ascribable to this habitual self-dependence? Whoever doubts it, is asked to assign a more probable cause. Whoever admits it, must admit that the enervation of a

people by perpetual State-aids is not a trifling consideration, but the most weighty consideration. A general arrest of national growth he will see to be an evil greater than any special benefits can compensate for. And, indeed, when, after contemplating this great fact, the overspreading of the Earth by the Anglo-Saxons, he remarks the absence of any parallel phenomenon exhibited by a continental race—when he reflects how this difference must depend chiefly on difference of character, and how such difference of character has been mainly produced by difference of discipline; he will perceive that the policy pursued in this matter may have a large share in determining a nation's ultimate fate.

We are not sanguine, however, that argument will change the convictions of those who put their trust in legislation. With men of a certain order of thought the foregoing reasons will have weight. With men of another order of thought they will have little or none: nor would any accumulation of such reasons affect them. The truth that experience teaches, has its limits. The experiences that will teach, must be experiences that can be appreciated; and experiences exceeding a certain degree of complexity become inappreciable to the majority. It is thus with most social phenomena. If we remember that for these two thousand years and more, mankind have been making regulations for commerce, which have all along been strangling some trades, and killing others with kindness; and that though the proofs of this have been constantly before their eyes, they have only just discovered that they have been uniformly doing mischief;—if we remember that even now only a small portion of them see this; we are taught that perpetually-repeated and ever-accumulating experiences will fail to teach, until there exist the mental conditions required for the assimilation of them. Nay, when they are assimilated, it is very imperfectly. The truth they teach is only half understood, even by those supposed to understand it best. For example, Sir Robert Peel, in one of his last speeches, after describing

the immensely increased consumption consequent on free trade, goes on to say:—

“If, then, you can only continue that consumption—if, *by your legislation*, under the favour of Providence, *you can maintain the demand for labour and make your trade and manufactures prosperous*, you are not only increasing the sum of human happiness, but are giving the agriculturists of this country the best chance of that increased demand which must contribute to their welfare.”—*Times*, Feb. 22, 1850.

Thus the prosperity really due to the abandonment of all legislation, is ascribed to a particular kind of legislation. “*You can maintain the demand*,” he says; “*you can make trade and manufactures prosperous* ;” whereas, the facts he quotes prove that they can do this only by doing nothing. The essential truth of the matter—that law had been doing immense harm, and that this prosperity resulted not from law, but from the absence of law—is missed; and his faith in legislation in general, which should, by this experience, have been greatly shaken, seemingly remains as strong as ever. Here, again, is the House of Lords, apparently not yet believing in the relationship of supply and demand, adopting within these few weeks, the standing order—

“That before the first reading of any bill for making any work in the construction of which compulsory power is sought to take thirty houses or more inhabited by the labouring classes in any one parish or place, the promoters be required to deposit in the office of the clerk of the parliaments a statement of the number, description, and situation of the said houses, the number (so far as they can be estimated) of persons to be displaced, *and whether any and what provision is made in the bill for remedying the inconvenience likely to arise from such displacements.*”

If, then, in the comparatively simple relationships of trade, the teachings of experience remain for so many ages unperceived, and are so imperfectly apprehended when they are perceived, it is scarcely to be hoped that where all social

phenomena—moral, intellectual, and physical—are involved, any due appreciation of the truths displayed will presently take place. The facts cannot yet get recognised as facts. As the alchemist attributed his successive disappointments to some disproportion in the ingredients, some impurity, or some too great temperature, and never to the futility of his process, or the impossibility of his aim ; so, every failure cited to prove the impotence of State-regulations the law-worshipper explains away as being caused by this trifling oversight, or that little mistake : all which oversights and mistakes he assures you will in future be avoided. Eluding the facts as he does after this fashion, volley after volley of them produce no effect.

Indeed, this faith in governments is in a certain sense organic ; and can diminish only by being outgrown. A subtle form of fetishism, it is as natural to the present phase of human evolution as its grosser prototype was to an earlier phase. From the time when rulers were thought demi-gods, there has been a gradual decline in men's estimates of their power. This decline is still in progress, and has still far to go. Doubtless, every increment of evidence furthers it in *some* degree, though not to the degree that at first appears. Only in so far as it modifies character does it produce a permanent effect. For while the mental type remains the same, the removal of a special error is inevitably followed by the growth of other errors of the same genus. All superstitions die hard ; and we fear that this belief in government-omnipotence will form no exception.

THE ORIGIN AND FUNCTION OF MUSIC.

WHEN Carlo, standing, chained to his kennel, sees his master in the distance, a slight motion of the tail indicates his but faint hope that he is about to be let out. A much more decided wagging of the tail, passing by-and-by into lateral undulations of the body, follows his master's nearer approach. When hands are laid on his collar, and he knows that he is really to have an outing, his jumping and wriggling are such that it is by no means easy to loose his fastenings. And when he finds himself actually free, his joy expends itself in bounds, in pirouettes, and in scourings hither and thither at the top of his speed. Puss, too, by erecting her tail, and by every time raising her back to meet the caressing hand of her mistress, similarly expresses her gratification by certain muscular actions; as likewise do the parrot by awkward dancings on his perch, and the canary by hopping and fluttering about his cage with unwonted rapidity. Under emotions of an opposite kind, animals equally display muscular excitement. The enraged lion lashes his sides with his tail, knits his brows, protrudes his claws. The cat sets up her back; the dog retracts his upper lip; the horse throws back his ears. And in the struggles of creatures in pain, we see that the like relation holds between excitement of the muscles and excitement of the nerves of sensation.

In ourselves, distinguished from lower creatures as we are by feelings alike more powerful and more varied, parallel facts are at once more conspicuous and more numerous. We may conveniently look at them in groups. We shall find that pleasurable

sensations and painful sensations, pleasurable emotions and painful emotions, all tend to produce active demonstrations in proportion to their intensity.

In children, and even in adults who are not restrained by regard for appearances, a highly agreeable taste is followed by a smacking of the lips. An infant will laugh and bound in its nurse's arms at the sight of a brilliant colour or the hearing of a new sound. People are apt to beat time with head or feet to music which particularly pleases them. In a sensitive person an agreeable perfume will produce a smile; and smiles will be seen on the faces of a crowd gazing at some splendid burst of fireworks. Even the pleasant sensation of warmth felt on getting to the fireside out of a winter's storm, will similarly express itself in the face.

Painful sensations, being mostly far more intense than pleasurable ones, cause muscular actions of a much more decided kind. A sudden twinge produces a convulsive start of the whole body. A pain less violent, but continuous, is accompanied by a knitting of the brows, a setting of the teeth or biting of the lip, and a contraction of the features generally. Under a persistent pain of a severer kind, other muscular actions are added: the body is swayed to and fro; the hands clench anything they can lay hold of; and should the agony rise still higher, the sufferer rolls about on the floor almost convulsed.

Though more varied, the natural language of the pleasurable emotions comes within the same generalization. A smile, which is the commonest expression of gratified feeling, is a contraction of certain facial muscles; and when the smile broadens into a laugh, we see a more violent and more general muscular excitement produced by an intenser gratification. Rubbing together of the hands, and that other motion which Dickens somewhere describes as "washing with impalpable soap in invisible water," have like implications. Children may often be seen to "jump for joy." Even in adults of excitable temperament, an action approaching to it is sometimes witnessed. And

dancing has all the world through been regarded as natural to an elevated state of mind. Many of the special emotions show themselves in special muscular actions. The gratification resulting from success, raises the head and gives firmness to the gait. A hearty grasp of the hand is currently taken as indicative of friendship. Under a gush of affection the mother clasps her child to her breast, feeling as though she could squeeze it to death. And so in sundry other cases. Even in that brightening of the eye with which good news is received we may trace the same truth; for this appearance of greater brilliancy is due to an extra contraction of the muscle which raises the eyelid, and so allows more light to fall upon, and be reflected from, the wet surface of the eyeball.

The bodily indications of painful emotion are equally numerous, and still more vehement. Discontent is shown by raised eyebrows and wrinkled forehead; disgust by a curl of the lip; offence by a pout. The impatient man beats a tattoo with his fingers on the table, swings his pendant leg with increasing rapidity, gives needless pokings to the fire, and presently paces with hasty strides about the room. In great grief there is wringing of the hands, and even tearing of the hair. An angry child stamps, or rolls on its back and kicks its heels in the air; and in manhood, anger, first showing itself in frowns, in distended nostrils, in compressed lips, goes on to produce grinding of the teeth, clenching of the fingers, blows of the fist on the table, and perhaps ends in a violent attack on the offending person, or in throwing about and breaking the furniture. From that pursing of the mouth indicative of slight displeasure, up to the frantic struggles of the maniac, we shall find that mental irritation tends to vent itself in bodily activity.

All feelings, then—sensations or emotions, pleasurable or painful—have this common characteristic, that they are muscular stimuli. Not forgetting the few apparently exceptional cases in which emotions exceeding a certain intensity produce prostration, we may set it down as a general law that, alike in man and animals, there is a direct connection between feeling and motion; the last growing more vehement as the first grows more intense.

Were it allowable here to treat the matter scientifically, we might trace this general law down to the principle known among physiologists as that of *reflex action*.* Without doing this, however, the above numerous instances justify the generalization, that mental excitement of all kinds ends in excitement of the muscles; and that the two preserve a more or less constant ratio to each other.

“But what has all this to do with *The Origin and Function of Music?*” asks the reader. Very much, as we shall presently see. All music is originally vocal. All vocal sounds are produced by the agency of certain muscles. These muscles, in common with those of the body at large, are excited to contraction by pleasurable and painful feelings. And therefore it is that feelings demonstrate themselves in sounds as well as in movements. Therefore it is that Carlo barks as well as leaps when he is let out—that puss purrs as well as crests her tail—that the canary chirps as well as flutters. Therefore it is that the angry lion roars while he lashes his sides, and the dog growls while he retracts his lip. Therefore it is that the maimed animal not only struggles, but howls. And it is from this cause that a human being bodily suffering expresses itself not only in contortions, but in shrieks and groans—that in anger, and fear, and grief, the gesticulations are accompanied by shouts and screams—that delightful sensations are followed by exclamations—and that we hear screams of joy and shouts of exultation.

We have here, then, a principle underlying all vocal phenomena; including those of vocal music, and by consequence those of music in general. The muscles that move the chest, larynx, and vocal chords, contracting like other muscles in proportion to the intensity of the feelings; every different contraction of these muscles involving, as it does, a different adjustment of the vocal organs; every different adjustment of the vocal organs causing a change in the sound emitted;—it fol-

* Those who seek information on this point may find it in an interesting tract by Mr. Alexander Bain, on *Animal Instinct and Intelligence*.

lows that variations of voice are the physiological results of variations of feeling ; it follows that each inflection or modulation is the natural outcome of some passing emotion or sensation ; and it follows that the explanation of all kinds of vocal expression, must be sought in this general relation between mental and muscular excitements. Let us, then, see whether we cannot thus account for the chief peculiarities in the utterance of the feelings : grouping these peculiarities under the heads of *loudness, quality or timbre, pitch, intervals, and rate of variation.*

Between the lungs and the organs of voice, there is much the same relation as between the bellows of an organ and its pipes. And as the loudness of the sound given out by an organ-pipe increases with the strength of the blast from the bellows ; so, other things equal, the loudness of a vocal sound increases with the strength of the blast from the lungs. But the expulsion of air from the lungs is effected by certain muscles of the chest and abdomen. The force with which these muscles contract, is proportionate to the intensity of the feeling experienced. Hence, *à priori*, loud sounds will be the habitual results of strong feelings. That they are so we have daily proof. The pain which, if moderate, can be borne silently, causes outcries if it becomes extreme. While a slight vexation makes a child whimper, a fit of passion calls forth a howl that disturbs the neighbourhood. When the voices in an adjacent room become unusually audible, we infer anger, or surprise, or joy. Loudness of applause is significant of great approbation ; and with uproarious mirth we associate the idea of high enjoyment. Commencing with the silence of apathy, we find that the utterances grow louder as the sensations or emotions, whether pleasurable or painful, grow stronger.

That different *qualities* of voice accompany different mental states, and that under states of excitement the tones are more sonorous than usual, is another general fact admitting of a parallel explanation. The sounds of common conversation

have but little resonance ; those of strong feeling have much more. Under rising ill temper the voice acquires a metallic ring. In accordance with her constant mood, the ordinary speech of a virago has a piercing quality quite opposite to that softness indicative of placidity. A ringing laugh marks an especially joyous temperament. Grief unburdening itself uses tones approaching in *timbre* to those of chanting ; and in his most pathetic passages an eloquent speaker similarly falls into tones more vibratory than those common to him. Now any one may readily convince himself that resonant vocal sounds can be produced only by a certain muscular effort additional to that ordinarily needed. If after uttering a word in his speaking voice, the reader, without changing the pitch or the loudness, will *sing* this word, he will perceive that before he can sing it, he has to alter the adjustment of the vocal organs ; to do which a certain force must be used ; and by putting his fingers on that external prominence marking the top of the larynx, he will have further evidence that to produce a sonorous tone the organs must be drawn out of their usual position. Thus, then, the fact that the tones of excited feeling are more vibratory than those of common conversation, is another instance of the connexion between mental excitement and muscular excitement. The speaking voice, the recitative voice, and the singing voice, severally exemplify one general principle.

That the *pitch* of the voice varies according to the action of the vocal muscles, scarcely needs saying. All know that the middle notes, in which they converse, are made without any appreciable effort ; and all know that to make either very high or very low notes requires a considerable effort. In either ascending or descending from the pitch of ordinary speech, we are conscious of an increasing muscular strain, which, at both extremes of the register, becomes positively painful. Hence it follows from our general principle, that while indifference or calmness will use the medium tones, the tones used during excitement will be either above or below them ; and will rise higher and higher, or fall lower and lower, as the feelings grow

stronger. This physiological deduction we also find to be in harmony with familiar facts. The habitual sufferer utters his complaints in a voice raised considerably above the natural key; and agonizing pain vents itself in either shrieks or groans—in very high or very low notes. Beginning at his talking pitch, the cry of the disappointed urchin grows more shrill as it grows louder. The “Oh!” of astonishment or delight, begins several notes below the middle voice, and descends still lower. Anger expresses itself in high tones, or else in “curses not loud but *deep*.” Deep tones, too, are always used in uttering strong reproaches. Such an exclamation as “Beware!” if made dramatically—that is, if made with a show of feeling—must be many notes lower than ordinary. Further, we have groans of disapprobation, groans of horror, groans of remorse. And extreme joy and fear are alike accompanied by shrill outcries.

Nearly allied to the subject of pitch, is that of *intervals*; and the explanation of them carries our argument a step further. While calm speech is comparatively monotonous, emotion makes use of fifths, octaves, and even wider intervals. Listen to any one narrating or repeating something in which he has no interest, and his voice will not wander more than two or three notes above or below his medium note, and that by small steps; but when he comes to some exciting event he will be heard not only to use the higher and lower notes of his register, but to go from one to the other by larger leaps. Being unable in print to imitate these traits of feeling, we feel some difficulty in fully realizing them to the reader. But we may suggest a few remembrances which will perhaps call to mind a sufficiency of others. If two men living in the same place, and frequently seeing one another, meet, say at a public assembly, any phrase with which one may be heard to accost the other—as “Hallo, are you here?”—will have an ordinary intonation. But if one of them, after long absence, has unexpectedly returned, the expression of surprise with which his friend may greet him—“Hallo! how came you here?”—will be uttered in much more strongly contrasted tones. The two syllables of the word

“Hallo” will be, the one much higher and the other much lower than before; and the rest of the sentence will similarly ascend and descend by longer steps. Again, if, supposing her to be in an adjoining room, the mistress of the house calls “Mary,” the two syllables of the name will be spoken in an ascending interval of a third. If Mary does not reply, the call will be repeated probably in a descending fifth; implying the slightest shade of annoyance at Mary’s inattention. Should Mary still make no answer, the increasing annoyance will show itself by the use of a descending octave on the next repetition of the call. And supposing the silence to continue, the lady, if not of a very even temper, will show her irritation at Mary’s seemingly intentional negligence by finally calling her in tones still more widely contrasted—the first syllable being higher and the last lower than before. Now, these and analogous facts, which the reader will readily accumulate, clearly conform to the law laid down. For to make large intervals requires more muscular action than to make small ones. But not only is the *extent* of vocal intervals thus explicable as due to the relation between nervous and muscular excitement, but also in some degree their *direction*, as ascending or descending. The middle notes being those which demand no appreciable effort of muscular adjustment; and the effort becoming greater as we either ascend or descend; it follows that a departure from the middle notes in either direction will mark increasing emotion; while a return towards the middle notes will mark decreasing emotion. Hence it happens that an enthusiastic person uttering such a sentence as—“It was the most splendid sight I ever saw!” will ascend to the first syllable of the word “splendid,” and thence will descend: the word “splendid” marking the climax of the feeling produced by the recollection. Hence, again, it happens that, under some extreme vexation produced by another’s stupidity, an irascible man, exclaiming—“What a confounded fool the fellow is!” will begin somewhat below his middle voice, and descending to the word “fool,” which he will utter in one of his deepest notes, will then ascend again. And it may be

remarked, that the word "fool" will not only be deeper and louder than the rest, but will also have more emphasis of articulation—another mode in which muscular excitement is shown. There is some danger, however, in giving instances like this; seeing that as the mode of rendering will vary according to the intensity of the feeling which the reader feigns to himself, the right cadence may not be hit upon. With single words there is less difficulty. Thus the "Indeed!" with which a surprising fact is received, mostly begins on the middle note of the voice, and rises with the second syllable; or, if disapprobation as well as astonishment is felt, the first syllable will be below the middle note, and the second lower still. Conversely, the word "Alas!" which marks not the rise of a paroxysm of grief, but its decline, is uttered in a cadence descending towards the middle note; or, if the first syllable is in the lower part of the register, the second ascends towards the middle note. In the "Heigh-ho!" expressive of mental and muscular prostration, we may see the same truth; and if the cadence appropriate to it be inverted, the absurdity of the effect clearly shows how the meaning of intervals is dependent on the principle we have been illustrating.

The remaining characteristic of emotional speech which we have to notice, is that of *variability of pitch*. It is scarcely possible here to convey adequate ideas of this more complex manifestation. We must be content with simply indicating some occasions on which it may be observed. On a meeting of friends, for instance—as when there arrives a party of much-wished-for visitors—the voices of all will be heard to undergo changes of pitch not only greater but much more numerous than usual. If a speaker at a public meeting is interrupted by some squabble among those he is addressing, his comparatively level tones will be in marked contrast with the rapidly changing ones of the disputants. And among children, whose feelings are less under control than those of adults, this peculiarity is still more decided. During a scene of complaint and recrimination between two excitable little girls, the voices may be

heard to run up and down the gamut several times in each sentence. In such cases we once more recognise the same law: for muscular excitement is shown not only in strength of contraction, but also in the rapidity with which different muscular adjustments succeed each other.

Thus we find all the leading vocal phenomena to have a physiological basis. They are so many manifestations of the general law that feeling is a stimulus to muscular action—a law conformed to throughout the whole economy, not of man only, but of every sensitive creature—a law, therefore, which lies deep in the nature of animal organization. The expressiveness of these various modifications of voice is therefore innate. Each of us, from babyhood upwards, has been spontaneously making them, when under the various sensations and emotions by which they are produced. Having been conscious of each feeling at the same time that we heard ourselves make the consequent sound, we have acquired an established association of ideas between such sound and the feeling which caused it. When the like sound is made by another, we ascribe the like feeling to him; and by a further consequence we not only ascribe to him that feeling, but have a certain degree of it aroused in ourselves: for to become conscious of the feeling which another is experiencing, is to have that feeling awakened in our own consciousness, which is the same thing as experiencing the feeling. Thus these various modifications of voice become not only a language through which we understand the emotions of others, but also the means of exciting our sympathy with such emotions.

Have we not here, then, adequate data for a theory of music? These vocal peculiarities which indicate excited feeling, *are those which especially distinguish song from ordinary speech.* Every one of the alterations of voice which we have found to be a physiological result of pain or pleasure, *is carried to its greatest extreme in vocal music.* For instance, we saw that, in virtue of the general relation between mental and muscular excitement, one characteristic of passionate utterance is *loudness.* Well, its

comparative loudness is one of the distinctive marks of song as contrasted with the speech of daily life; and further, the *forte* passages of an air are those intended to represent the climax of its emotion. We next saw that the tones in which emotion expresses itself, are, in conformity with this same law, of a more sonorous *timbre* than those of calm conversation. Here, too, song displays a still higher degree of the peculiarity; for the singing tone is the most resonant we can make. Again, it was shown that, from a like cause, mental excitement vents itself in the higher and lower notes of the register; using the middle notes but seldom. And it scarcely needs saying that vocal music is still more distinguished by its comparative neglect of the notes in which we talk, and its habitual use of those above or below them; and, moreover, that its most passionate effects are commonly produced at the two extremities of its scale, but especially the upper one. A yet further trait of strong feeling, similarly accounted for, was the employment of larger intervals than are employed in common converse. This trait, also, every ballad and *aria* carries to an extent beyond that heard in the spontaneous utterances of emotion: add to which, that the direction of these intervals, which, as diverging from or converging towards the medium tones, we found to be physiologically expressive of increasing or decreasing emotion, may be observed to have in music like meanings. Once more, it was pointed out that not only extreme but also rapid variations of pitch, are characteristic of mental excitement; and once more we see in the quick changes of every melody, that song carries the characteristic as far, if not farther. Thus, in respect alike of *loudness*, *timbre*, *pitch*, *intervals*, and *rate of variation*, song employs and exaggerates the natural language of the emotions;—it arises from a systematic combination of those vocal peculiarities which are the physiological effects of acute pleasure and pain.

Besides these chief characteristics of song as distinguished from common speech, there are sundry minor ones similarly explicable as due to the relation between mental and muscular

excitement; and before proceeding further, these should be briefly noticed. Thus, certain passions, and perhaps all passions when pushed to an extreme, produce (probably through their influence over the action of the heart) an effect the reverse of that which has been described: they cause a physical prostration, one symptom of which is a general relaxation of the muscles, and a consequent trembling. We have the trembling of anger, of fear, of hope, of joy; and the vocal muscles being implicated with the rest, the voice too becomes tremulous. Now, in singing, this tremulousness of voice is very effectively used by some vocalists in highly pathetic passages; sometimes, indeed, because of its effectiveness, too much used by them—as by Tamberlik, for instance. Again, there is a mode of musical execution known as the *staccato*, appropriate to energetic passages—to passages expressive of exhilaration, of resolution, of confidence. The action of the vocal muscles which produces this *staccato* style, is analogous to the muscular action which produces the sharp, decisive, energetic movements of body indicating these states of mind; and therefore it is that the *staccato* style has the meaning we ascribe to it. Conversely, slurred intervals are expressive of gentler and less active feelings; and are so because they imply the smaller muscular vivacity due to a lower mental energy. The difference of effect resulting from difference of *time* in music, is also attributable to this same law. Already it has been pointed out that the more frequent changes of pitch which ordinarily result from passion, are imitated and developed in song; and here we have to add, that the various rates of such changes, appropriate to the different styles of music, are further traits having the same derivation. The slowest movements, *largo* and *adagio*, are used where such depressing emotions as grief, or such unexciting emotions as reverence, are to be portrayed; while the more rapid movements, *andante*, *allegro*, *presto*, represent successively increasing degrees of mental vivacity; and do this because they imply that muscular activity which flows from this mental vivacity. Even the *rhythm*, which forms a remaining distinc-

tion between song and speech, may not improbably have a kindred cause. Why the actions excited by strong feeling should tend to become rhythmical, is not very obvious; but that they do so there are divers evidences. There is the swaying of the body to and fro under pain or grief, of the leg under impatience or agitation. Dancing, too, is a rhythmical action natural to elevated emotion. That under excitement speech acquires a certain rhythm, we may occasionally perceive in the highest efforts of an orator. In poetry, which is a form of speech used for the better expression of emotional ideas, we have this rhythmical tendency developed. And when we bear in mind that dancing, poetry, and music are connate—are originally constituent parts of the same thing, it becomes clear that the measured movement common to them all implies a rhythmical action of the whole system, the vocal apparatus included; and that so the rhythm of music is a more subtle and complex result of this relation between mental and muscular excitement.

But it is time to end this analysis, which possibly we have already carried too far. It is not to be supposed that the more special peculiarities of musical expression are to be definitely explained. Though probably they may all in some way conform to the principle that has been worked out, it is obviously impracticable to trace that principle in its more ramified applications. Nor is it needful to our argument that it should be so traced. The foregoing facts sufficiently prove that what we regard as the distinctive traits of song, are simply the traits of emotional speech intensified and systematized. In respect of its general characteristics, we think it has been made clear that vocal music, and by consequence all music, is an idealization of the natural language of passion.

As far as it goes, the scanty evidence furnished by history confirms this conclusion. Note first the fact (not properly an historical one, but fitly grouped with such) that the dance-chants of savage tribes are very monotonous; and in virtue of their monotony are much more nearly allied to ordinary speech than

are the songs of civilized races. Joining with this the fact that there are still extant among boatmen and others in the East, ancient chants of a like monotonous character, we may infer that vocal music originally diverged from emotional speech in a gradual, unobtrusive manner; and this is the inference to which our argument points. Further evidence to the same effect is supplied by Greek history. The early poems of the Greeks—which, be it remembered, were sacred legends embodied in that rhythmical, metaphorical language which strong feeling excites—were not recited, but chanted: the tones and cadences were made musical by the same influences which made the speech poetical. By those who have investigated the matter, this chanting is believed to have been not what we call singing, but nearly allied to our recitative; (far simpler indeed, if we may judge from the fact that the early Greek lyre, which had but *four* strings, was played in *unison* with the voice, which was therefore confined to four notes;) and as such, much less remote from common speech than our own singing is. For recitative, or musical recitation, is in all respects intermediate between speech and song. Its average effects are not so *loud* as those of song. Its tones are less sonorous in *timbre* than those of song. Commonly it diverges to a smaller extent from the middle notes—uses notes neither so high nor so low in *pitch*. The *intervals* habitual to it are neither so wide nor so varied. Its *rate of variation* is not so rapid. And at the same time that its primary *rhythm* is less decided, it has none of that secondary rhythm produced by recurrence of the same or parallel musical phrases, which is one of the marked characteristics of song. Thus, then, we may not only infer, from the evidence furnished by existing barbarous tribes, that the vocal music of pre-historic times was emotional speech very slightly exalted; but we see that the earliest vocal music of which we have any account, differed much less from emotional speech than does the vocal music of our days.

That recitative—beyond which, by the way, the Chinese and Hindoos seem never to have advanced—grew naturally out of

the modulations and cadences of strong feeling, we have indeed still current evidence. There are even now to be met with occasions on which strong feeling vents itself in this form. Whoever has been present when a meeting of Quakers was addressed by one of their preachers (whose practice it is to speak only under the influence of religious emotion), must have been struck by the quite unusual tones, like those of a subdued chant, in which the address was made. It is clear, too, that the intoning used in some churches, is representative of this same mental state; and has been adopted on account of the instinctively felt congruity between it and the contrition, supplication, or reverence verbally expressed.

And if, as we have good reason to believe, recitative arose by degrees out of emotional speech, it becomes manifest that by a continuance of the same process song has arisen out of recitative. Just as, from the orations and legends of savages, expressed in the metaphorical, allegorical style natural to them, there sprung epic poetry, out of which lyric poetry was afterwards developed; so, from the exalted tones and cadences in which such orations and legends were delivered, came the chant or recitative music, from whence lyrical music has since grown up. And there has not only thus been a simultaneous and parallel genesis, but there is also a parallelism of results. For lyrical poetry differs from epic poetry, just as lyrical music differs from recitative: each still further intensifies the natural language of the emotions. Lyrical poetry is more metaphorical, more hyperbolic, more elliptical, and adds the rhythm of lines to the rhythm of feet; just as lyrical music is louder, more sonorous, more extreme in its intervals, and adds the rhythm of phrases to the rhythm of bars. And the known fact that out of epic poetry the stronger passions developed lyrical poetry as their appropriate vehicle, strengthens the inference that they similarly developed lyrical music out of recitative.

Nor indeed are we without evidences of the transition. It needs but to listen to an opera to hear the leading gradations.

Between the comparatively level recitative of ordinary dialogue, the more varied recitative with wider intervals and higher tones used in exciting scenes, the still more musical recitative which precludes an air, and the air itself, the successive steps are but small; and the fact that among airs themselves gradations of like nature may be traced, further confirms the conclusion that the highest form of vocal music was arrived at by degrees.

Moreover, we have some clue to the influences which have induced this development; and may roughly conceive the process of it. As the tones, intervals, and cadences of strong emotion were the elements out of which song was elaborated; so, we may expect to find that still stronger emotion produced the elaboration: and we have evidence implying this. Instances in abundance may be cited, showing that musical composers are men of extremely acute sensibilities. The Life of Mozart depicts him as one of intensely active affections and highly impressionable temperament. Various anecdotes represent Beethoven as very susceptible and very passionate. Mendelssohn is described by those who knew him to have been full of fine feeling. And the almost incredible sensitiveness of Chopin has been illustrated in the memoirs of George Sand. An unusually emotional nature being thus the general characteristic of musical composers, we have in it just the agency required for the development of recitative and song. Intenser feeling producing intenser manifestations, any cause of excitement will call forth from such a nature, tones and changes of voice more marked than those called forth from an ordinary nature—will generate just those exaggerations which we have found to distinguish the lower vocal music from emotional speech, and the higher vocal music from the lower. Thus it becomes credible that the four-toned recitative of the early Greek poets (like all poets, nearly allied to composers in the comparative intensity of their feelings), was really nothing more than the slightly exaggerated emotional speech natural to them, which grew by frequent use into an organized form. And it is readily conceivable that the accumulated agency of

subsequent poet-musicians, inheriting and adding to the products of those who went before them, sufficed, in the course of the ten centuries which we know it took, to develop this four-toned recitative into a vocal music having a range of two octaves.

Not only may we so understand how more sonorous tones, greater extremes of pitch, and wider intervals, were gradually introduced; but also how there arose a greater variety and complexity of musical expression. For this same passionate, enthusiastic temperament, which naturally leads the musical composer to express the feelings possessed by others as well as himself, in extremest intervals and more marked cadences than they would use, also leads him to give musical utterance to feelings which they either do not experience, or experience in but slight degrees. In virtue of this general susceptibility which distinguishes him, he regards with emotion, events, scenes, conduct, character, which produce upon most men no appreciable effect. The emotions so generated, compounded as they are of the simpler emotions, are not expressible by intervals and cadences natural to these, but by combinations of such intervals and cadences: whence arise more involved musical phrases, conveying more complex, subtle, and unusual feelings. And thus we may in some measure understand how it happens that music not only so strongly excites our more familiar feelings, but also produces feelings we never had before—arouses dormant sentiments of which we had not conceived the possibility and do not know the meaning; or, as Richter says—tells us of things we have not seen and shall not see.

Indirect evidences of several kinds remain to be briefly pointed out. One of them is the difficulty, not to say impossibility, of otherwise accounting for the expressiveness of music. Whence comes it that special combinations of notes should have special effects upon our emotions?—that one should give us a feeling of exhilaration, another of melancholy, another of

affection, another of reverence? Is it that these special combinations have intrinsic meanings apart from the human constitution?—that a certain number of aërial waves per second, followed by a certain other number, in the nature of things signify grief, while in the reverse order they signify joy; and similarly with all other intervals, phrases, and cadences? Few will be so irrational as to think this. Is it, then, that the meanings of these special combinations are conventional only?—that we learn their implications, as we do those of words, by observing how others understand them? This is an hypothesis not only devoid of evidence, but directly opposed to the experience of every one. How, then, are musical effects to be explained? If the theory above set forth be accepted, the difficulty disappears. If music, taking for its raw material the various modifications of voice which are the physiological results of excited feeling, intensifies, combines, and complicates them—if it exaggerates the loudness, the resonance, the pitch, the intervals, and the variability, which, in virtue of an organic law, are the characteristics of passionate speech—if, by carrying out these further, more consistently, more unitedly, and more sustainedly, it produces an idealized language of emotion; then its power over us becomes comprehensible. But in the absence of this theory, the expressiveness of music appears to be inexplicable.

Again, the preference we feel for certain qualities of sound presents a like difficulty, admitting only of a like solution. It is generally agreed that the tones of the human voice are more pleasing than any others. Grant that music takes its rise from the modulations of the human voice under emotion, and it becomes a natural consequence that the tones of that voice should appeal to our feelings more than any others; and so should be considered more beautiful than any others. But deny that music has this origin, and the only alternative is the untenable position that the vibrations proceeding from a vocalist's throat are, objectively considered, of a higher order than those from a horn or a violin. Similarly with harsh and soft sounds. If

the conclusiveness of the foregoing reasonings be not admitted, it must be supposed that the vibrations causing the last are intrinsically better than those causing the first; and that, in virtue of some pre-established harmony, the higher feelings and natures produce the one, and the lower the other. But if the foregoing reasonings be valid, it follows, as a matter of course, that we shall like the sounds that habitually accompany agreeable feelings, and dislike those that habitually accompany disagreeable feelings.

Once more, the question—How is the expressiveness of music to be otherwise accounted for? may be supplemented by the question—How is the genesis of music to be otherwise accounted for? That music is a product of civilization is manifest; for though savages have their dance-chants, these are of a kind scarcely to be dignified by the title musical: at most, they supply but the vaguest rudiment of music, properly so called. And if music has been by slow steps developed in the course of civilization, it must have been developed out of something. If, then, its origin is not that above alleged, what is its origin?

Thus we find that the negative evidence confirms the positive, and that, taken together, they furnish strong proof. We have seen that there is a physiological relation, common to man and all animals, between feeling and muscular action; that as vocal sounds are produced by muscular action, there is a consequent physiological relation between feeling and vocal sounds; that all the modifications of voice expressive of feeling are the direct results of this physiological relation; that music, adopting all these modifications, intensifies them more and more as it ascends to its higher and higher forms, and becomes music simply in virtue of thus intensifying them; that, from the ancient epic poet chanting his verses, down to the modern musical composer, men of unusually strong feelings prone to express them in extreme forms, have been naturally the agents of these successive intensifications; and that so there has little by little arisen a wide divergence between this ideal-

ized language of emotion and its natural language: to which direct evidence we have just added the indirect—that on no other tenable hypothesis can either the expressiveness or the genesis of music be explained.

And now, what is the *function* of music? Has music any effect beyond the immediate pleasure it produces? Analogy suggests that it has. The enjoyments of a good dinner do not end with themselves, but minister to bodily well-being. Though people do not marry with a view to maintain the race, yet the passions which impel them to marry secure its maintenance. Parental affection is a feeling which, while it conduces to parental happiness, ensures the nurture of offspring. Men love to accumulate property, often without thought of the benefits it produces; but in pursuing the pleasure of acquisition they indirectly open the way to other pleasures. The wish for public approval impels all of us to do many things which we should otherwise not do,—to undertake great labours, face great dangers, and habitually rule ourselves in a way that smooths social intercourse: that is, in gratifying our love of approbation we subserve divers ulterior purposes. And, generally, our nature is such that in fulfilling each desire, we in some way facilitate the fulfilment of the rest. But the love of music seems to exist for its own sake. The delights of melody and harmony do not obviously minister to the welfare either of the individual or of society. May we not suspect, however, that this exception is apparent only? Is it not a rational inquiry—What are the indirect benefits which accrue from music, in addition to the direct pleasure it gives?

But that it would take us too far out of our track, we should prelude this inquiry by illustrating at some length a certain general law of progress;—the law that alike in occupations, sciences, arts, the divisions that had a common root, but by continual divergence have become distinct, and are now being separately developed, are not truly independent, but severally act and react on each other to their mutual advancement.

Merely hinting thus much, however, by way of showing that there are many analogies to justify us, we go on to express the opinion that there exists a relationship of this kind between music and speech.

All speech is compounded of two elements, the words and the tones in which they are uttered—the signs of ideas and the signs of feelings. While certain articulations express the thought, certain vocal sounds express the more or less of pain or pleasure which the thought gives. Using the word *cadence* in an unusually extended sense, as comprehending all modifications of voice, we may say that *cadence is the commentary of the emotions upon the propositions of the intellect*. This duality of spoken language, though not formally recognised, is recognised in practice by every one; and every one knows that very often more weight attaches to the tones than to the words. Daily experience supplies cases in which the same sentence of disapproval will be understood as meaning little or meaning much, according to the inflections of voice which accompany it; and daily experience supplies still more striking cases in which words and tones are in direct contradiction—the first expressing consent, while the last express reluctance; and the last being believed rather than the first.

These two distinct but interwoven elements of speech have been undergoing a simultaneous development. We know that in the course of civilization words have been multiplied, new parts of speech have been introduced, sentences have grown more varied and complex; and we may fairly infer that during the same time new modifications of voice have come into use, fresh intervals have been adopted, and cadences have become more elaborate. For while, on the one hand, it is absurd to suppose that, along with the undeveloped verbal forms of barbarism, there existed a developed system of vocal inflections; it is, on the other hand, necessary to suppose that, along with the higher and more numerous verbal forms needed to convey the multiplied and com-

plicated ideas of civilized life, there have grown up those more involved changes of voice which express the feelings proper to such ideas. If intellectual language is a growth, so also, without doubt, is emotional language a growth.

Now, the hypothesis which we have hinted above, is, that beyond the direct pleasure which it gives, music has the indirect effect of developing this language of the emotions. Having its root, as we have endeavoured to show, in those tones, intervals, and cadences of speech which express feeling—arising by the combination and intensifying of these, and coming finally to have an embodiment of its own; music has all along been reacting upon speech, and increasing its power of rendering emotion. The use in recitative and song of inflections more expressive than ordinary ones, must from the beginning have tended to develop the ordinary ones. Familiarity with the more varied combinations of tones that occur in vocal music, can scarcely have failed to give greater variety of combination to the tones in which we utter our impressions and desires. The complex musical phrases by which composers have conveyed complex emotions, may rationally be supposed to have influenced us in making those involved cadences of conversation by which we convey our subtler thoughts and feelings. That the cultivation of music has no effect on the mind, few will be absurd enough to contend. And if it has an effect, what more natural effect is there than this of developing our perception of the meanings of inflections, qualities, and modulations of voice; and giving us a correspondingly increased power of using them? Just as mathematics, taking its start from the phenomena of physics and astronomy, and presently coming to be a separate science, has since reacted on physics and astronomy to their immense advancement—just as chemistry, first arising out of the processes of metallurgy and the industrial arts, and gradually growing into an independent study, has now become an aid to all kinds of production—just as physiology, originating

out of medicine and once subordinate to it, but latterly pursued for its own sake, is in our day coming to be the science on which the progress of medicine depends;—so, music, having its root in emotional language, and gradually evolved from it, has ever been reacting upon and further advancing it. Whoever will examine the facts, will find this hypothesis to be in harmony with the method of civilization everywhere displayed.

It will scarcely be expected that much direct evidence in support of this conclusion can be given. The facts are of a kind which it is difficult to measure, and of which we have no records. Some suggestive traits, however, may be noted. May we not say, for instance, that the Italians, among whom modern music was earliest cultivated, and who have more especially practised and excelled in melody (the division of music with which our argument is chiefly concerned)—may we not say that these Italians speak in more varied and expressive inflections and cadences than any other nation? On the other hand, may we not say that, confined almost exclusively as they have hitherto been to their national airs, which have a marked family likeness, and therefore accustomed to but a limited range of musical expression, the Scotch are unusually monotonous in the intervals and modulations of their speech? And again, do we not find among different classes of the same nation, differences that have like implications? The gentleman and the clown stand in very decided contrast with respect to variety of intonation. Listen to the conversation of a servant-girl, and then to that of a refined, accomplished lady, and the more delicate and complex changes of voice used by the latter will be conspicuous. Now, without going so far as to say that out of all the differences of culture to which the upper and lower classes are subjected, difference of musical culture is that to which alone this difference of speech is ascribable; yet we may fairly say that there seems a much more obvious connexion of cause and effect between these than between any others. Thus, while the induc-

tive evidence to which we can appeal is but scanty and vague, yet what there is favours our position.

Probably most will think that the function here assigned to music is one of very little moment. But further reflection may lead them to a contrary conviction. In its bearings upon human happiness, we believe that this emotional language which musical culture develops and refines, is only second in importance to the language of the intellect; perhaps not even second to it. For these modifications of voice produced by feelings, are the means of exciting like feelings in others. Joined with gestures and expressions of face, they give life to the otherwise dead words in which the intellect utters its ideas; and so enable the hearer not only to *understand* the state of mind they accompany, but to *partake* of that state. In short, they are the chief media of *sympathy*. And if we consider how much both our general welfare and our immediate pleasures depend upon sympathy, we shall recognise the importance of whatever makes this sympathy greater. If we bear in mind that by their fellow-feeling men are led to behave justly, kindly and considerately to each other—that the difference between the cruelty of the barbarous and the humanity of the civilized, results from the increase of fellow-feeling; if we bear in mind that this faculty which makes us sharers in the joys and sorrows of others, is the basis of all the higher affections—that in friendship, love, and all domestic pleasures, it is an essential element; if we bear in mind how much our direct gratifications are intensified by sympathy,—how, at the theatre, the concert, the picture gallery, we lose half our enjoyment if we have no one to enjoy with us; if, in short, we bear in mind that for all happiness beyond what the unfriended recluse can have, we are indebted to this same sympathy;—we shall see that the agencies which communicate it can scarcely be overrated in value. The tendency of civilization is more and more to repress the antagonistic elements of our characters and to develop the social ones—to curb our

purely selfish desires and exercise our unselfish ones—to replace private gratifications by gratifications resulting from, or involving, the happiness of others. And while, by this adaptation to the social state, the sympathetic side of our nature is being unfolded, there is simultaneously growing up a language of sympathetic intercourse—a language through which we communicate to others the happiness we feel, and are made sharers in their happiness. This double process, of which the effects are already sufficiently appreciable, must go on to an extent of which we can as yet have no adequate conception. The habitual concealment of our feelings diminishing, as it must, in proportion as our feelings become such as do not demand concealment, we may conclude that the exhibition of them will become much more vivid than we now dare allow it to be; and this implies a more expressive emotional language. At the same time, feelings of a higher and more complex kind, as yet experienced only by the cultivated few, will become general; and there will be a corresponding development of the emotional language into more involved forms. Just as there has silently grown up a language of ideas, which, rude as it at first was, now enables us to convey with precision the most subtle and complicated thoughts; so, there is still silently growing up a language of feelings, which notwithstanding its present imperfection, we may expect will ultimately enable men vividly and completely to impress on each other all the emotions which they experience from moment to moment.

Thus if, as we have endeavoured to show, it is the function of music to facilitate the development of this emotional language, we may regard music as an aid to the achievement of that higher happiness which it indistinctly shadows forth. Those vague feelings of unexperienced felicity which music arouses—those indefinite impressions of an unknown ideal life which it calls up, may be considered as a prophecy, to the fulfilment of which music is itself partly instrumental. The strange capacity which we have for being so affected by melody and harmony, may be taken to imply both that it is within the possibilities of

our nature to realize those intenser delights they dimly suggest, and that they are in some way concerned in the realization of them. On this supposition the power and the meaning of music become comprehensible; but otherwise they are a mystery.

We will only add, that if the probability of these corollaries be admitted, then music must take rank as the highest of the fine arts—as the one which, more than any other, ministers to human welfare. And thus, even leaving out of view the immediate gratifications it is hourly giving, we cannot too much applaud that progress of musical culture which is becoming one of the characteristics of our age.

THE HAYTHORNE PAPERS.

No. I.—USE AND BEAUTY.

IN one of his essays, Emerson remarks, that what Nature at one time provides for use, she afterwards turns to ornament; and he cites in illustration the structure of a sea-shell, in which the parts that have for a while formed the mouth are at the next season of growth left behind, and become decorative nodes and spines.

It has often occurred to me that this same remark might be extended to the progress of Humanity. Here, too, the appliances of one era serve as embellishments to the next. Equally in institutions, creeds, customs, and superstitions, we may trace this evolution of beauty out of what was once purely utilitarian.

The contrast between the feeling with which we regard portions of the Earth's surface still left in their original state, and the feeling with which the savage regarded them, is an instance that naturally comes first in order of time. If any one walking over Hampstead Heath, will note how strongly its picturesqueness is brought out by contrast with the surrounding cultivated fields and the masses of houses lying in the distance; and will further reflect that, had this irregular gorse-covered surface extended on all sides to the horizon, it would have looked dreary and prosaic rather than pleasing; he will see that to the primitive man a country so clothed presented no beauty at all. To him it was merely a haunt of wild animals, and a ground out of which roots might be dug. What have become for us places of relaxation and enjoyment—places for afternoon strolls and for gathering flowers—were his places for labour and food, probably arousing in his mind none but utilitarian associations.

Ruined castles afford an obvious instance of this metamorphosis of the useful into the beautiful. To feudal barons and their retainers, security was the chief, if not the only end, sought in choosing the sites and styles of their strongholds. Probably they aimed as little at the picturesque as do the builders of cheap brick houses in our modern towns. Yet what were erected for shelter and safety, and what in those early days fulfilled an important function in the social economy, have now assumed a purely ornamental character. They serve as scenes for picnics; pictures of them decorate our drawing-rooms; and each supplies its surrounding districts with legends for Christmas Eve.

Following out the train of thought suggested by this last illustration, we may see that not only do the material exuviae of past social states become the ornaments of our landscapes; but that past habits, manners, and arrangements, serve as ornamental elements in our literature. The tyrannies that, to the serfs who bore them, were harsh and dreary facts; the feuds which, to those who took part in them, were very practical life-and-death affairs; the mailed, moated, sentinelled security that was irksome to the nobles who needed it; the imprisonments, and tortures, and escapes, which were stern and quite prosaic realities to all concerned in them; have become to us material for romantic tales—material which, when woven into *Ivanhoses* and *Marmions*, serves for amusement in leisure hours, and becomes poetical by contrast with our daily lives.

Thus, also, is it with extinct creeds. Stonehenge, which in the hands of the Druids had a governmental influence over men, is in our day a place for antiquarian excursions; and its attendant priests are worked up into an opera. Greek sculptures, preserved for their beauty in our galleries of art, and copied for the decoration of pleasure grounds and entrance halls, once lived in men's minds as gods demanding obedience; as did also the grotesque idols that now amuse the visitors to our museums.

Equally marked is this change of function in the case of

minor superstitions. The fairy lore, which in past times was matter of grave belief, and held sway over people's conduct, has since been transformed into ornament for *A Midsummer Night's Dream*, *The Tempest*, *The Fairy Queen*, and endless small tales and poems; and still affords subjects for children's story-books, themes for ballets, and plots for Planché's burlesques. Gnomes, and genii, and afrits, losing all their terrors, give piquancy to the woodcuts in our illustrated edition of the *Arabian Nights*. While ghost-stories, and tales of magic and witchcraft, after serving to amuse boys and girls in their leisure hours, become matter for jocose allusions that enliven tea-table conversation.

Even our serious literature and our speeches are very generally relieved by ornaments drawn from such sources. A Greek myth is often used as a parallel by which to vary the monotony of some grave argument. The lecturer breaks the dead level of his practical discourse by illustrations drawn from bygone customs, events, or beliefs. And metaphors, similarly derived, give brilliancy to political orations, and to *Times* leading articles.

Indeed, on careful inquiry, I think it will be found that we turn to purposes of beauty most bygone phenomena that are at all conspicuous. The busts of great men in our libraries, and their tombs in our churches; the once useful but now purely ornamental heraldic symbols; the monks, nuns, and convents, that give interest to a certain class of novels; the bronze mediæval soldiers used for embellishing drawing-rooms; the gilt Apollos that recline on time-pieces; the narratives that serve as plots for our great dramas; and the events that afford subjects for historical pictures;—these and such like illustrations of the metamorphosis of the useful into the beautiful, are so numerous as to suggest that, did we search diligently enough, we should find that in some place, or under some circumstance, nearly every notable product of the past has assumed a decorative character.

And here the mention of historical pictures reminds me that

an inference may be drawn from all this, bearing directly on the practice of art. It has of late years been a frequent criticism upon our historical painters, that they err in choosing their subjects from the past; and that, would they found a genuine and vital school, they must render on canvas the life and deeds and aims of our own time. If, however, there be any significance in the foregoing facts, it seems doubtful whether this criticism is a just one. For if it be the process of things, that what has performed some practical function in society during one era, becomes available for ornament in a subsequent one; it almost follows that, conversely, whatever is performing some practical function now, or has very recently performed one, does not possess the ornamental character; and is, consequently, inapplicable to any purpose of which beauty is the aim, or of which it is a needful ingredient.

Still more reasonable will this conclusion appear, when we consider the nature of this process by which the useful is changed into the ornamental. An essential pre-requisite to all beauty is *contrast*. To obtain artistic effect, light must be put in juxtaposition with shade, bright colours with dull colours, a fretted surface with a plain one. *Forte* passages in music must have *piano* passages to relieve them; concerted pieces need interspersing with solos; and rich chords must not be continuously repeated. In the drama we demand contrast of characters, of scenes, of sentiment, of style. In prose composition an eloquent passage should have a comparatively plain setting; and in poems great effect is obtained by occasional change of versification. This general principle will, I think, explain the transformation of the bygone useful into the present beautiful. It is by virtue of their contrast with our present modes of life, that past modes of life look interesting and romantic. Just as a picnic, which is a temporary return to an aboriginal condition, derives, from its unfamiliarity, a certain poetry which it would not have were it habitual; so, everything ancient gains, from its relative novelty to us, an element of interest. Gradually as, by the growth of society, we leave

behind the customs, manners, arrangements, and all the products, material and mental, of a bygone age—gradually as we recede from these so far that there arises a conspicuous difference between them and those we are familiar with; so gradually do they begin to assume to us a poetical aspect, and become applicable for ornament. And hence it follows that things and events which are close to us, and which are accompanied by associations of ideas not markedly contrasted with our ordinary associations, are relatively inappropriate for purposes of art.

NO. II.—THE DEVELOPMENT HYPOTHESIS.

IN a debate upon the development hypothesis, lately narrated to me by a friend, one of the disputants was described as arguing, that as, in all our experience, we know no such phenomenon as transmutation of species, it is unphilosophical to assume that transmutation of species ever takes place. Had I been present, I think that, passing over his assertion, which is open to criticism, I should have replied that, as in all our experience we have never known a species *created*, it was, by his own showing, unphilosophical to assume that any species ever had been created.

Those who cavalierly reject the Theory of Evolution, as not adequately supported by facts, seem quite to forget that their own theory is supported by no facts at all. Like the majority of men who are born to a given belief, they demand the most rigorous proof of any adverse belief, but assume that their own needs none. Here we find, scattered over the globe, vegetable and animal organisms numbering, of the one kind (according to Humboldt), some 320,000 species, and of the other, some 2,000,000 species (see Carpenter); and if to these we add the numbers of animal and vegetable species that have become extinct, we may safely estimate the number of species that

have existed, and are existing, on the Earth, at not less than *ten millions*. Well, which is the most rational theory about these ten millions of species? Is it most likely that there have been ten millions of special creations? or is it most likely that by continual modifications, due to change of circumstances, ten millions of varieties have been produced, as varieties are being produced still.

Doubtless many will reply that they can more easily conceive ten millions of special creations to have taken place, than they can conceive that ten millions of varieties have arisen by successive modifications. All such, however, will find, on inquiry, that they are under an illusion. This is one of the many cases in which men do not really believe, but rather *believe they believe*. It is not that they can truly conceive ten millions of special creations to have taken place, but that they *think they can do so*. Careful introspection will show them that they have never yet realized to themselves the creation of even *one* species. If they have formed a definite conception of the process, let them tell us how a new species is constructed, and how it makes its appearance. Is it thrown down from the clouds? or must we hold to the notion that it struggles up out of the ground? Do its limbs and viscera rush together from all the points of the compass? or must we receive the old Hebrew idea, that God takes clay and moulds a new creature? If they say that a new creature is produced in none of these modes, which are too absurd to be believed; then they are required to describe the mode in which a new creature *may* be produced—a mode which does *not* seem absurd: and such a mode they will find that they neither have conceived nor can conceive.

Should the believers in special creations consider it unfair thus to call upon them to describe how special creations take place, I reply, that this is far less than they demand from the supporters of the Development Hypothesis. They are merely asked to point out a *conceivable* mode. On the other hand, they ask, not simply for a *conceivable* mode, but for the *actual*

mode. They do not say—Show us how this *may* take place ; but they say—Show us how this *does* take place. So far from its being unreasonable to put the above question, it would be reasonable to ask not only for a *possible* mode of special creation, but for an *ascertained* mode ; seeing that this is no greater a demand than they make upon their opponents.

And here we may perceive how much more defensible the new doctrine is than the old one. Even could the supporters of the Development Hypothesis merely show that the origination of species by the process of modification is conceivable, they would be in a better position than their opponents. But they can do much more than this. They can show that the process of modification has effected, and is effecting, decided changes in all organisms subject to modifying influences. Though, from the impossibility of getting at a sufficiency of facts, they are unable to trace the many phases through which any existing species has passed in arriving at its present form, or to identify the influences which caused the successive modifications ; yet, they can show that any existing species—animal or vegetable—when placed under conditions different from its previous ones, *immediately begins to undergo certain changes of structure fitting it for the new conditions*. They can show that in successive generations these changes continue, until ultimately the new conditions become the natural ones. They can show that in cultivated plants, in domesticated animals, and in the several races of men, such alterations have taken place. They can show that the degrees of difference so produced are often, as in dogs, greater than those on which distinctions of species are in other cases founded. They can show that it is a matter of dispute whether some of these modified forms *are* varieties or separate species. They can show, too, that the changes daily taking place in ourselves—the facility that attends long practice, and the loss of aptitude that begins when practice ceases—the strengthening of passions habitually gratified, and the weakening of those habitually curbed—the development of every faculty, bodily, moral, or intellectual, according to the

use made of it—are all explicable on this same principle. And thus they can show that throughout all organic nature there is at work a modifying influence of the kind they assign as the cause of these specific differences: an influence which, though slow in its action, does, in time, if the circumstances demand it, produce marked changes—an influence which, to all appearance, would produce in the millions of years, and under the great varieties of condition which geological records imply, any amount of change.

Which, then, is the most rational hypothesis?—that of special creations which has neither a fact to support it nor is even definitely conceivable; or that of modification, which is not only definitely conceivable, but is countenanced by the habitudes of every existing organism?

That by any series of changes a protozoon should ever become a mammal, seems to those who are not familiar with zoology, and who have not seen how clear becomes the relationship between the simplest and the most complex forms when intermediate forms are examined, a very grotesque notion. Habitually looking at things rather in their statical than in their dynamical aspect, they never realize the fact that, by small increments of modification, any amount of modification may in time be generated. That surprise which they feel on finding one whom they last saw as a boy, grown into a man, becomes incredulity when the degree of change is greater. Nevertheless, abundant instances are at hand of the mode in which we may pass to the most diverse forms by insensible gradations. Arguing the matter some time since with a learned professor, I illustrated my position thus:—You admit that there is no apparent relationship between a circle and an hyperbola. The one is a finite curve; the other is an infinite one. All parts of the one are alike; of the other no two parts are alike. The one incloses a space; the other will not inclose a space though produced for ever. Yet opposite as are these curves in all their properties, they may be connected together by a series of intermediate curves, no one of which differs from

the adjacent ones in any appreciable degree. Thus, if a cone be cut by a plane at right angles to its axis we get a circle. If, instead of being perfectly at right angles, the plane subtends with the axis an angle of $89^{\circ} 59'$, we have an ellipse which no human eye, even when aided by an accurate pair of compasses, can distinguish from a circle. Decreasing the angle minute by minute, the ellipse becomes first perceptibly eccentric, then manifestly so, and by and by acquires so immensely elongated a form, as to bear no recognisable resemblance to a circle. By continuing this process, the ellipse passes insensibly into a parabola; and ultimately, by still further diminishing the angle, into an hyperbola. Now here we have four different species of curve—circle, ellipse, parabola, and hyperbola—each having its peculiar properties and its separate equation, and the first and last of which are quite opposite in nature, connected together as members of one series, all producible by a single process of insensible modification.

But the blindness of those who think it absurd to suppose that complex organic forms may have arisen by successive modifications out of simple ones, becomes astonishing when we remember that complex organic forms are daily being thus produced. A tree differs from a seed immeasurably in every respect—in bulk, in structure, in colour, in form, in specific gravity, in chemical composition: differs so greatly that no visible resemblance of any kind can be pointed out between them. Yet is the one changed in the course of a few years into the other: changed so gradually, that at no moment can it be said—Now the seed ceases to be, and the tree exists. What can be more widely contrasted than a newly-born child and the small, semi-transparent, gelatinous spherule constituting the human ovum? The infant is so complex in structure that a cyclopædia is needed to describe its constituent parts. The germinal vesicle is so simple that it may be defined in a line. Nevertheless, a few months suffice to develop the one out of the other; and that, too, by a series of modifications so small, that were the embryo examined at successive minutes,

even a microscope would with difficulty disclose any sensible changes. That the uneducated and the ill-educated should think the hypothesis that all races of beings, man inclusive, may in process of time have been evolved from the simplest monad, a ludicrous one, is not to be wondered at. But for the physiologist, who knows that every individual being is so evolved—who knows further, that in their earliest condition the germs of all plants and animals whatever are so similar, “that there is no appreciable distinction amongst them which would enable it to be determined whether a particular molecule is the germ of a conferva or of an oak, of a zoophyte or of a man;” *—for him to make a difficulty of the matter is inexcusable. Surely if a single cell may, when subjected to certain influences, become a man in the space of twenty years; there is nothing absurd in the hypothesis that under certain other influences, a cell may in the course of millions of years give origin to the human race. The two processes are generically the same; and differ only in length and complexity.

We have, indeed, in the part taken by many scientific men in this controversy of “Law *versus* Miracle,” a good illustration of the tenacious vitality of superstitions. Ask one of our leading geologists or physiologists whether he believes in the Mosaic account of the creation, and he will take the question as next to an insult. Either he rejects the narrative entirely, or understands it in some vague non-natural sense. Yet one part of it he unconsciously adopts; and that, too, literally. For whence has he got this notion of “special creations,” which he thinks so reasonable, and fights for so vigorously? Evidently he can trace it back to no other source than this myth which he repudiates. He has not a single fact in nature to quote in proof of it; nor is he prepared with any chain of abstract reasoning by which it may be established. Catechise him, and he will be forced to confess that the notion was put into his mind in childhood as part of a story which he now

* Carpenter.

thinks absurd. And why, after rejecting all the rest of this story, he should strenuously defend this last remnant of it as though he had received it on valid authority, he would be puzzled to say.

No. III.—THE SOURCES OF ARCHITECTURAL TYPES.

WHEN lately looking through the gallery of the Old Water-Colour Society, I was struck with the incongruity produced by putting regular architecture into irregular scenery. In one case, where the artist had introduced a perfectly symmetrical Grecian edifice into a mountainous and somewhat wild landscape, the discordant effect was particularly marked. "How very unpicturesque," said a lady to her friend, as they passed; showing that I was not alone in my opinion. Her phrase, however, set me speculating. Why unpicturesque? Picturesque means, like a picture—like what men choose for pictures. Why then should this be not fit for a picture?

Thinking the matter over, it seemed to me that the artist had sinned against that unity which is essential to a good picture. When the other constituents of a landscape have irregular forms, any artificial structure introduced must have an irregular form, that it may seem *part* of the landscape. The same general character must pervade it and surrounding objects; otherwise it, and the scene amid which it stands, become not *one* thing but *two* things; and we say that it looks out of place. Or, speaking psychologically, the associated ideas called up by a building with its wings, windows, and all its parts symmetrically disposed, differ widely from the ideas associated with an entirely irregular landscape; and the one set of ideas tends to banish the other.

Pursuing the train of thought, sundry illustrative facts came to mind. I remembered that a castle, which is more irre-

gular in outline than any other kind of building, pleases us most when seated amid crags and precipices ; while a castle on a plain seems an incongruity. The partly-regular and partly-irregular forms of our old farm-houses, and our gabled gothic manors and abbeys, appear quite in harmony with an undulating, wooded country. In towns we prefer symmetrical architecture ; and in towns it produces in us no feeling of incongruity, because all surrounding things—men, horses, vehicles—are symmetrical also.

And here I was reminded of a notion that has frequently recurred to me ; namely, that there is some relationship between the several kinds of architecture and the several classes of natural objects. Buildings in the Greek and Roman styles seem, in virtue of their symmetry, to take their type from animal life. In the partially-irregular Gothic, ideas derived from the vegetable world appear to predominate. And wholly irregular buildings, such as castles, may be considered as having inorganic forms for their basis.

Whimsical as this speculation looks at first sight, it is countenanced by numerous facts. The connexion between symmetrical architecture and animal forms, may be inferred from the *kind* of symmetry we expect, and are satisfied with, in regular buildings. Thus in a Greek temple we require that the front shall be symmetrical in itself, and that the two flanks shall be alike ; but we do not look for uniformity between the flanks and the front, nor between the front and the back. The identity of this symmetry with that found in animals is obvious. Again, why is it that a building making any pretension to symmetry displeases us if not quite symmetrical ? Probably the reply will be—Because we see that the designer's idea is not fully carried out ; and that hence our love of completeness is offended. But then there come the further questions—How do we know that the architect's conception was symmetrical ? Whence comes this notion of symmetry which we have, and which we attribute to him ? Unless we fall back upon the old doctrine of innate ideas, we must admit that the idea of bi-

lateral symmetry is derived from without ; and to admit this is to admit that it is derived from the higher animals.

That there is some relationship between Gothic architecture and vegetable forms is a position generally admitted. The often-remarked analogy between a groined nave and an avenue of trees with interlacing branches, shows that the fact has forced itself on men's observation. It is not only in this analogy, however, that the kinship is seen. It is seen still better in the essential characteristic of Gothic ; namely, what is termed its *aspiring* tendency. That predominance of vertical lines which so strongly distinguishes Gothic from other styles, is the most marked peculiarity of trees, when compared with animals or rocks. To persons of active imagination, a tall Gothic tower, with its elongated apertures and clusters of thin projections running from bottom to top, suggests a vague notion of growth.

Of the alleged connexion between inorganic forms and the wholly irregular and the castellated styles of building, we have, I think, some proof in the fact that when an edifice is irregular, the *more* irregular it is the more it pleases us. I see no way of accounting for this fact, save by supposing that the greater the irregularity the more strongly are we reminded of the inorganic forms typified, and the more vividly are aroused the agreeable ideas of rugged and romantic scenery associated with those forms.

Further evidence of these several relationships of styles of architecture to classes of natural objects, is supplied by the kinds of decoration they respectively present. The public buildings of Greece, while characterized in their outlines by the bi-lateral symmetry seen in the higher animals, have their pediments and entablatures covered with sculptured men and beasts. Egyptian temples and Assyrian palaces, while similarly symmetrical in their general plan, are similarly ornamented on their walls and at their doors. In Gothic, again, with its grove-like ranges of clustered columns, we find rich foliated ornaments abundantly employed. And accompanying the totally irregular,

inorganic outlines of old castles, we see neither vegetable nor animal decorations. The bare, rock-like walls are surmounted by battlements, consisting of almost plain blocks, which remind us of the projections on the edge of a rugged cliff.

But perhaps the most significant fact is the harmony that may be observed between each type of architecture and the scenes in which it is indigenous. For what is the explanation of this harmony, unless it be that the predominant character of surrounding things has, in some way, determined the mode of building adopted?

That the harmony exists is clear. Equally in the cases of Egypt, Assyria, Greece, and Rome, town life preceded the construction of the symmetrical buildings that have come down to us. And town life is one in which, as already observed, the majority of familiar objects are symmetrical. We instinctively feel the naturalness of this association. Out amid the fields, a formal house, with a central door flanked by an equal number of windows to right and left, strikes us as unrural—looks as though transplanted from a street; and we cannot look at one of those stuccoed villas, with mock windows carefully arranged to balance the real ones, without being reminded of the suburban residence of a retired tradesman.

In styles indigenous in the country, we not only find the general irregularity characteristic of surrounding things, but we may trace some kinship between each kind of irregularity and the local circumstances. We see the broken rocky masses amid which castles are commonly placed, mirrored in their stern, inorganic forms. In abbeys, and such-like buildings, which are commonly found in comparatively sheltered districts, we find no such violent dislocations of masses and outlines; and the nakedness appropriate to the fortress is replaced by decorations reflecting the neighbouring woods. Between a Swiss cottage and a Swiss view there is an evident relationship. The angular roof, so bold and so disproportionately large when compared to other roofs, reminds one of the adjacent mountain peaks; and the broad overhanging eaves

have a sweep and inclination like those of the lower branches of a pine tree. Consider, too, the apparent kinship between the flat roofs that prevail in Eastern cities, interspersed with occasional minarets, and the plains that commonly surround them, dotted here and there by palm trees. You cannot contemplate a picture of one of these places, without being struck by the predominance of horizontal lines, and their harmony with the wide stretch of the landscape.

That the congruity here pointed out should hold in every case must not be expected. The Pyramids, for example, do not seem to come under this generalization. Their repeated horizontal lines do indeed conform to the flatness of the neighbouring desert; but their general contour seems to have no adjacent analogue. Considering, however, that migrating races, carrying their architectural systems with them, would naturally produce buildings having no relationship to their new localities; and that it is not always possible to distinguish styles which are indigenous, from those which are naturalized; numerous anomalies must be looked for.

The general idea above illustrated will perhaps be somewhat misinterpreted. Possibly some will take the proposition to be that men *intentionally* gave to their buildings the leading characteristics of neighbouring objects. But this is not what is meant. I do not suppose that they did so in times past, any more than they do so now. The hypothesis is, that in their choice of forms men are unconsciously influenced by the forms encircling them. That flat-roofed, symmetrical architecture should have originated in the East, among pastoral tribes surrounded by their herds and by wide plains, seems to imply that the builders were swayed by the horizontality and symmetry to which they were habituated. And the harmony which we have found to exist in other cases between indigenous styles and their localities, implies the general action of like influences. Indeed, on considering the matter psychologically, I do not see how it could well be otherwise. For as all conceptions must be made up of images, and parts of images, received through the senses

—as it is impossible for a man to conceive any design save one of which the elements have come into his mind from without ; and as his imagination will most readily run in the direction of his habitual perceptions ; it follows, almost necessarily, that the characteristic which predominates in these habitual perceptions must impress itself on his design.

NO. IV.—A THEORY OF TEARS AND LAUGHTER.

THERE can be little doubt that the various bodily acts which we class as “the natural language of the passions,” have each a biological meaning. The changes of face and voice which we are apt to regard simply as indices of certain mental states, and as having no purpose but to express these states, are probably all of them results of necessary vital acts. In the blush of shame, and in the sudden pallor accompanying fear or great anger, the physiological student at once recognises disturbances of the circulation, consequent on the sudden rush of blood to the brain, or on the control which the brain exercises over the heart. A sigh he understands as a supplementary act of respiration : possibly suspecting also that the previous slow breathing it implies, serves as a sedative to painful emotion by diminishing vital activity. And so with frowns, and grindings of the teeth, and tremblings ; all of which may be more or less distinctly traced to certain functional requirements.

Assuming that Tears and Laughter come within this category, we shall at once greatly narrow the inquiry respecting their physiological nature, if we remember that, like other results of emotion, they depend on states of the brain ; but that, unlike other such results, they depend on generic, and not upon specific, states of it. Neither of them is peculiar to any feeling ; but either, and sometimes both, may occur when any feeling be-

comes intense. We do not laugh only from a perception of the ludicrous : great joy, proceeding from the gratification of whatever desire, may produce the same effect as a *bon mot*. The miser chuckles over his treasures ; and the cunning schemer over a successful piece of dishonesty. The delight of a little girl presented with a handsome doll, ends in a giggle. The salutations of attached friends, meeting after long separation, are broken by short laughs. A fine poetical image will raise a smile ; and probably many will recollect, as I do myself, laughing over the solutions of puzzling mathematical problems. Similarly with tears. Not only are they produced by all kinds of painful emotion—by sorrow, however caused ; by vexation ; sometimes by rage—but by many pleasurable emotions also, when very intense. We have tears of joy, as well as tears of grief ; and these accompany, not one species of joy only, but various species. Further, it should be remarked, as showing the common relationship of tears and laughter to great mental excitement, that either, when carried to an extreme, is accompanied by the other. We may laugh till our eyes run over ; and we may cry, or, at least, women may, till hysterical laughter is produced.

Connected, then, as both these phenomena are with extreme cerebral activity of various kinds, both pleasurable and painful, we may reasonably suspect that they are directly related to some constant pre-requisite of extreme cerebral activity ; and the constant pre-requisite which at once suggests itself is—a large supply of blood. With the brain, as with every other organ, the circulation of blood varies, within certain limits, as the amount of function performed. Failure of the cerebral circulation causes fainting, that is, a suspension of cerebral action ; while, up to a certain point, excess of circulation produces delirium. And between these extremes, every exaltation of activity demands, other things equal, an increased supply of blood. Let us, then, inquire whether tears and laughter are not in some way caused by distension of the cerebral blood-vessels.

All the tissues of the body are fed by the serum which filters

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through the walls of the capillary arteries. No longer surrounded by the muscular and protective layers which cover the larger arteries, these hair-like tubes consist of the pellucid, structureless membrane forming the lining of the larger tubes, out of which they branch; and through this delicate membrane continually oozes the nutritive portion of the blood, to be thereupon assimilated by the neighbouring tissues. In health, and under an ordinary state of the circulation, this oozing goes on uniformly; but it may be accelerated from either of two causes: diminution in the thickness of the blood, or increase in the quantity of it. Every one who has used a filter knows that a thin fluid percolates faster than a thick one; and every one will perceive that a porous tube, like a capillary artery, when in a relaxed distended state, will admit of a more rapid percolation than in its ordinary contracted state. The excess of capillary filtration produced by undue thinness of the blood, is most markedly seen in dropsy; which arises either when the digestive system has finally failed to do its work, or when the waste has been temporarily much in excess of the nutrition, as in scarlet-fever, which is frequently followed by dropsy. A minor phenomenon having the same essential nature, is seen in that puffiness under the eyes which accompanies old age, and debility, and the fatigue of strong people. On the other hand, that excess of capillary filtration caused by increased quantity of blood, occurs wherever there is great local excitement of the circulation. Up to a certain point, the more rapid oozing of serum consequent upon a greater distension of the ultimate blood-vessels, is merely proportionate to the extra demand of the muscle, or gland, or viscus, as the case may be; but when, as always happens if the local excitement is excessive, the ultimate blood-vessels entirely lose their power of contracting, the oozing goes on at an abnormal rate, and, continuing after the demand has ceased, produces an accumulation of fluid in the adjacent tissues. The simplest example of this is a blister, which, whether caused by friction, or by the sun, or by an irritating application, is always preceded by distension of the neighbouring capillaries.

Similarly is it with the exudations of serum that accompany inflammation; whether seen in the tumefaction attending local injuries, or in the effusion consequent on such a disease as pleurisy. And thus, too, arise those local accumulations of serum which follow over-excited states of the brain.

The cause and function of tears will now be readily comprehended. They are due to a temporary cerebral congestion; and they have the effect of diminishing that congestion and its accompanying dangers. On referring to anatomical plates of the vascular system, it will be seen, that just before its entrance into the brain, each internal carotid artery gives off a branch—the ophthalmic artery—to supply the eye and its appendages, including the lachrymal gland. Hence it happens that when there is great cerebral excitement, and when as a consequence the blood-vessels of the head in general are unusually distended, the ophthalmic arteries and their branches participate in the distension; and thus the capillaries of the lachrymal glands are implicated with the capillaries of the brain. Under ordinary circumstances, the lachrymal glands secrete no more fluid than is needful for lubricating the eyes; but, as with other glands, an unusual supply of blood causes them to exude their secretion at an unusual rate. And thus at times of high cerebral activity, when, as we have seen, they are subject to this unusual supply, they permit a rapid filtration of modified serum or tears; and, by doing this, lessen the distension of the blood-vessels of the brain, and the accompanying liability to bursting or serous effusion. The lachrymal glands thus serve, not metaphorically but literally, as safety-valves; and tears may be regarded as a spontaneous and economical kind of blood-letting.

Hence we see why tears accompany both pleasurable and painful emotions when they become intense. We may perceive also how it happens that during periods of much excitement, some persons shed tears without any assignable cause; and that an involuntary flow of tears is one of the signs of actual congestion of the brain. And, further, it becomes clear that there

is truth in the common notion, that grief is relieved by having "a good cry."

Passing now to the physiological meaning of laughter, it is in the first place to be remarked that it is one of the countless illustrations of the general principle, that feeling is a stimulus to motion—that sensations and emotions tend to produce muscular contractions. From the contortions of agony and the dancings of joy, down to the smile and the frown, there is a constant relationship between excitement of the sensibilities and excitement of the muscles: the two varying together in intensity.* Inasmuch, therefore, as laughing is a muscular action, it is generally explicable as a consequence of this universal law.

But there still remains the question—Whence this special kind of muscular action which constitutes laughter? Why should these muscles be excited more than others? Before venturing what seems a possible explanation, it must be premised that all variations in the action of the lungs, of which laughter forms one, have a direct relation to the oxygenation of the blood; and there are many familiar facts which illustrate the need for, and the effect of, this relation. For instance, the deep breathing consequent upon exertion. All exertion implies increased oxidation of tissue; this demands a greater supply of oxygen; and this pre-supposes more rapid respiration. So that only by virtue of such relationship is continuous exertion possible. A parallel fact is seen in the effect produced on the lungs by change of temperature. A certain bodily heat is necessary to the maintenance of the vital processes. This heat is maintained by the action of oxygen upon the elements of the body. Any great abstraction of heat from the system must consequently be followed by increased absorption of oxygen to make up the loss. Hence those convulsive inspirations produced by a shower-bath, or by walking into the sea; hence the remedy for asphyxia from

* For numerous instances of this, see essay on "The Origin and Function of Music."

carbonic acid—deluging the patient with cold water; hence the use of sprinkling in the face to revive those who have fainted.

Now, the action of the lungs in laughter is essentially the reverse of that produced by cold or by exertion. The effort made is, not to take in more air, but to take in less. By a series of convulsive muscular contractions, the contained air is, as far as possible, expelled; a short inspiration follows, and then another series of expulsive movements; and so on till the laughter ends: we being then, as we often significantly say, "out of breath." The result of this must be a temporary falling off in the absorption of oxygen; a corresponding diminution of vital activity; and, by implication, a decrease of that high cerebral excitement of which laughter is a consequence. In crying too, which, as shown, is accompanied by excess of cerebral circulation, the action of the lungs is in essence the same. The long and forcible expirations, and the short inspirations, which characterize it, must similarly cause deficient oxygenation and its results. The liability of crying to run into hysterical laughter thus becomes comprehensible: the one being simply a less intense form of the other.

It seems probable then, that laughter and tears are both caused by excess of cerebral circulation, and have alike the effect of lessening that excess. When the arteries supplying the brain are considerably distended from pleasurable emotion, laughter results; when considerably distended from painful emotion, tears result; when extremely distended from either cause, we have tears and laughter simultaneously. The importance of these two checks to the cerebral circulation will be seen on remembering the liability to be paralyzed by strong shocks of grief or joy; and, further, on remembering that those kinds of mental excitement which are not accompanied by tears or laughter—as great anxiety or intense intellectual action—are common causes of paralysis.

No. V.—GRACEFULNESS.

THE doctrine that Beauty is our general name for certain qualities of things which are habitually associated with our gratifications, and that thus our idea of beauty is a result of accumulated pleasurable experiences—a doctrine with which, under an expanded form, I wholly agree—has not, I think, been applied to that quality of form and movement which we term Grace.

The attribute to which we apply this term clearly implies some perfection in the thing possessing it. We do not ascribe this attribute to cart-horses, tortoises, and hippopotami, in all of which the powers of movement are imperfectly developed; but we do ascribe it to greyhounds, antelopes, racehorses, all of which have highly efficient locomotive organs. What, then, is this distinctive peculiarity of structure and action which we call Grace?

One night while watching a dancer, and inwardly condemning her *tours de force* as barbarisms which would be hissed, were not people such cowards as always to applaud what they think it the fashion to applaud, I remarked that the truly graceful motions occasionally introduced, were those performed with comparatively little effort. And remembering sundry confirmatory facts, I presently came to the general conclusion, that, given a certain change of attitude to be gone through—a certain action to be achieved, then it is most gracefully achieved when achieved with the least expenditure of force. In other words, grace, as applied to motion, describes motion that is effected with an economy of muscular power; grace, as applied to animal forms, describes forms capable of this economy; grace, as applied to postures, describes postures that may be maintained with this economy; and grace, as applied to inanimate objects, describes such as exhibit certain analogies to these attitudes and forms.

That this generalization, if not the whole truth, contains at

least a large part of it, will, I think, become obvious, on considering how habitually we couple the words *easy* and *graceful*; and still more, on calling to mind some of the facts on which this association is based. The attitude of a soldier, drawing himself bolt upright when his serjeant shouts "attention," is more remote from gracefulness than when he relaxes at the words "stand at ease." The *gauche* visitor sitting stiffly on the edge of his chair, and his self-possessed host, whose limbs and body dispose themselves as convenience dictates, are contrasts as much in effort as in elegance. When standing, we commonly economise power by throwing the weight chiefly on one leg, which we straighten to make it serve as a column, while we relax the other; and to the same end, we allow the head to lean somewhat on one side. Both these attitudes are imitated in sculpture as elements of grace.

Turning from attitudes to movements, our current remarks will be found to imply the same relationship. No one praises as graceful, a walk that is irregular and jerking, and so displays waste of power; no one sees any beauty in the waddle of a fat man, or the trembling steps of an invalid, in both of which effort is visible. But the style of walking we admire is moderate in velocity, perfectly rhythmical, unaccompanied by violent swinging of the arms, and giving us the impression that there is no conscious exertion, and, at the same time, that there is no force thrown away. In dancing, again, the prevailing difficulty—the proper disposal of the hands and arms—well illustrates the same truth. Those who fail in overcoming this difficulty give the spectator the impression that their arms are a trouble to them; they are held stiffly in some meaningless attitude, at an obvious expense of power; they are checked from swinging in the directions in which they would naturally swing; or they are so moved, that, instead of helping to maintain the equilibrium, they endanger it. A good dancer, on the contrary, makes us feel that, so far from the arms being in the way, they are of great use. Each motion of them, while it seems naturally to result from a previous motion of the body, is turned to

some advantage. We perceive that it has facilitated instead of hindered the general action; or, in other words—that an economy of effort has been achieved. Any one wishing to distinctly realize this fact, may readily do so by studying the action of the arms in walking. Let him place his arms close to his sides, and there keep them, while walking with some rapidity. He will unavoidably fall into a backward and forward motion of the shoulders, of a wriggling, ungraceful character. After persevering in this for a space, until he finds, as he will do, that the action is not only ungraceful but fatiguing, let him suddenly allow his arms to swing as usual. The wriggling of the shoulders will cease; the body will be found to move equably forward; and comparative ease will be felt. On analyzing this fact, he may perceive that the backward motion of each arm is simultaneous with the forward motion of the corresponding leg; and, if he will attend to his muscular sensations, he will find (what if a mathematician he will recognise as a consequence of the law that action and reaction are equal and opposite) that this backward swing of the arm is a counterbalance to the forward swing of the leg; and that it is easier to produce this counterbalance by moving the arm than by contorting the body, as he otherwise must do.*

The action of the arms in walking being thus understood, it

* A parallel fact, further elucidating this, is supplied by every locomotive engine. On looking at the driving wheel, there will be found besides the boss to which the connecting rod is attached, a corresponding mass of metal on the opposite side of the wheel, and equidistant from the centre; or, if the engine be one having inside cylinders, then, on looking between the spokes of the driving-wheel, it will be seen that against each crank is a block of iron, similar to it in size, but projecting from the axle in the reverse direction. Evidently, being placed on opposite sides of the centre of motion, each crank and its counterbalance move in opposite directions relatively to the axle; and by so doing, neutralize each other's perturbing effects, and permit a perfectly smooth rotation. Just the same relationship that exists between the motions of the counterbalance and the crank, exists between the motions of the arms and legs in walking; and in the early days of railway locomotion, before these counterbalance weights were used, locomotive driving-wheels were subject to violent oscillations, strictly analogous to those jerkings of the shoulders that arise when we walk fast without moving our arms.

will be manifest that the graceful employment of them in dancing is simply a complication of the same thing ; and that a good dancer is one having so acute a muscular sense as at once to feel in what direction the arms should be moved to most readily counterbalance any motion of the body or legs.

This connexion between gracefulness and economy of force, will be most vividly recognised by those who skate. They will remember that all early attempts, and especially the first timid experiments in figure skating, are alike awkward and fatiguing ; and that the acquirement of skill is also the acquirement of ease. The requisite confidence, and a due command of the feet having been obtained, those twistings of the trunk and gyrations of the arms, previously used to maintain the balance, are found needless ; the body is allowed to follow without control the impulse given to it ; the arms to swing where they will ; and it is clearly felt that the graceful way of performing any evolution is the way that costs least effort. Spectators can scarcely fail to see the same fact, if they look for it. Perhaps there is no case in which they may so distinctly perceive that the movements called graceful are those which fulfil a given end with the smallest expenditure of force.

The reference to skating suggests, that graceful motion might be defined as motion in curved lines. Certainly, straight and zig-zag movements are excluded from the conception. The sudden stoppages and irregularities which angular movements imply, are its antithesis : for a leading element of grace is continuity, flowingness. It will be found, however, that this is merely another aspect of the same truth ; and that motion in curved lines is economical motion. Given certain successive positions to be assumed by a limb, then if it be moved in a straight line to the first of these positions, suddenly arrested, and then moved in another direction straight to the second position, and so on, it is clear that at each arrest, the momentum previously given to the limb must be destroyed at a certain cost of force, and a new momentum given to it at a further cost of force ; whereas, if, instead of arresting the limb at its

first position, its motion be allowed to continue, and a lateral force be impressed upon it to make it diverge towards the second position, a curvilinear motion is the necessary result : and by making use of the original momentum, force is economized.

If the truth of these conclusions respecting graceful movement be admitted, it cannot, I think, be doubted, that graceful form is that kind of form which both impresses us with the small effort required for self-support, and the small effort required for movement. Were it otherwise, there would arise the incongruity that graceful form would either not be associated at all with graceful movement, or that the one would habitually occur in the absence of the other ; both which alternatives being quite at variance with our experience, we are compelled to conclude that there exists the relationship indicated. Any one hesitating to admit this, will, I think, do so no longer on remembering that the animals which we consider graceful, are those so slight in build as not to be burdened by their own weight, and those noted for fleetness and agility ; while those we class as ungraceful, are those which are alike cumbrous and have the faculty of locomotion but little developed. In the case of the greyhound, especially, we see that the particular modification of the canine type in which the economy of weight is the most conspicuous, and in which the facility of muscular motion has been brought by habit to the greatest perfection, is the one which we call most graceful.

How trees and inanimate objects should ever come to have this epithet applied to them, will seem less obvious. But the fact that we commonly, and perhaps unavoidably, regard all objects under a certain anthropomorphic aspect, will, I think, help us to understand it. The stiff branch of an oak tree standing out at right angles to the trunk, gives us a vague notion of great force expended to keep it in that position ; and we call it ungraceful, under the same feeling that we call the holding out an arm at right angles to the body ungraceful. Conversely, the lax drooping boughs of a weeping-willow are

vaguely associated with limbs in easy attitudes—attitudes requiring little effort to maintain them : and the term graceful, by which we describe these, we apply by metaphor to the willow.

I may as well here, in a few lines, venture the hypothesis, that this notion of Grace has its subjective basis in Sympathy. The same faculty which makes us shudder on seeing another in danger—which sometimes causes motion of our own limbs on seeing another struggle or fall, gives us a vague participation in all the muscular sensations which those around us are experiencing. When their motions are violent or awkward, we feel in a slight degree the disagreeable sensations which we should have were they our own. When they are easy, we sympathize with the pleasant sensations they imply in those exhibiting them.

NO. VI.—THE VALUE OF EVIDENCE.

WITH Spirit-rappings and Table-movings still the rage, and with the belief in Spontaneous Combustion still unextinguished, it seems desirable that something should be said in justification of that general scepticism with which the philosophical meet the alleged wonders that periodically turn the heads of the nation. Nothing less than a good-sized octavo would be needed to contain all that might be written on the matter : and unfortunately such an octavo, when written, would be little read by those most requiring it. A brief hint or two, however, may find listeners among them.

“I tell you I saw it myself,” is the so-thought conclusive assertion with which many a controversy is abruptly ended. Commonly those who make this assertion think that after it nothing remains to be urged ; and they are astonished at the unreasonableness of those who still withhold their belief. Though they reject many tales of witchcraft, many ghost

stories whose marvels were attested by eye-witnesses—though they have repeatedly seen stage conjurors seem to do things which they do not believe were really done—though they have heard of the Automaton Chess-player and the Invisible Girl, and have perhaps seen explanations of the modes in which the public were deluded by them—though in all these cases they know that the facts were other than the spectators supposed them to be; yet they cannot imagine that their own perceptions have been vitiated by influences like those which vitiated the perceptions of others. Or, to put the thing more charitably and perhaps more truly, they forget that such vitiations are constantly occurring.

To observe correctly, though popularly thought very easy, every man of science knows to be extremely difficult. Our faculties are liable to report falsely from two opposite causes—the presence of hypothesis, and the absence of hypothesis. To the dangers arising from one or other of these, every observation we make is necessarily exposed; and between the two it is scarcely possible to see any fact *quite* truly. A few illustrations of the extreme distortions arising from the one cause, and the extreme inaccuracy consequent upon the other, will justify this seeming paradox.

Nearly every one is familiar with the myth prevalent on our sea-coasts, respecting the Barnacle Goose. The popular belief was, and indeed is still in some places, that the fruit of trees whose branches hang into the sea becomes changed into certain shell-covered creatures called barnacles, which are found incrusting these submerged branches; and further, that these barnacles are in process of time transformed into the birds known as barnacle geese. This belief was not confined to the vulgar; it was received among naturalists. Nor was it with them simply an adopted rumour. It was based on observations that were recorded and approved by the highest scientific authorities, and published with their countenance. In a paper contained in the *Philosophical Transactions*, Sir Robert Moray, describing these barnacles, says:—"In every shell that I opened

I found a perfect sea-fowl ; the little bill like that of a goose, the eyes marked, the head, neck, breast, wings, tail, and feet formed, the feathers everywhere perfectly shaped and blackish coloured, and the feet like those of other water-fowl, to the best of my remembrance." Now this myth respecting the barnacle goose has been exploded for some century and a half. To a modern zoologist who examines one of these cirrhipeds, as the barnacles are called, it seems scarcely credible that it could ever have been thought a chick ; and what Sir Robert Moray could have taken for "head, neck, breast, wings, tail, feet, and feathers," he cannot imagine. Under the influence of a preconception, here is a man of education describing as "a perfect sea-fowl" what is now seen to be a modified crustacean—a creature belonging to a remote part of the animal kingdom.

A still more remarkable instance of perverted observation exists in an old book entitled *Metamorphosis Naturalis*, &c., published at Middleburgh in 1662. This work, in which is attempted for the first time a detailed description of insect-transformation, contains numerous illustrative plates, in which are represented the various stages of evolution—larva, pupa, and imago. Those who have any knowledge of Entomology will recollect that the chrysalises of all our common butterflies exhibit at the anterior end a number of pointed projections, producing an irregular outline. Have they ever observed in this outline a resemblance to a man's face? For myself, I can say that though in early days I kept brood after brood of butterfly larvæ through all their changes, I never perceived any such likeness ; nor can I see it now. Nevertheless, in the plates of this *Metamorphosis Naturalis*, each chrysalis has its projections so modified as to represent a burlesque human head—the respective species having different profiles given them. Whether the author was a believer in metempsychosis, and thought he saw in the chrysalis a disguised humanity ; or whether, swayed by the false analogy which Butler makes so much of, between the change from chrysalis to butterfly and that from mortality to immortality, he considered the chrysalis as typical of man ;

does not appear. Here, however, is the fact, that influenced by some pre-conception or other, he has made his drawings quite different from the actual forms. It is not that he simply thinks this resemblance exists—it is not that he merely says he can see it; but his pre-conception so possesses him as to swerve his pencil, and make him produce representations laughably unlike the realities.

These, which are extreme cases of distorted perception, differ only in degree from the distorted perceptions of daily life; and so strong is the distorting influence, that even the coolest man of science cannot escape its effects. Every microscopist knows, that if they have conflicting theories respecting its nature, two observers shall look through the same instrument at the same object, and give quite different descriptions of its appearance.

From the dangers of hypothesis let us now turn to the dangers of no hypothesis. Little recognised as is the fact, it is nevertheless true that we cannot make the commonest observation correctly without beforehand having some notion of what we are to observe. You are asked to listen to a faint sound, and you find that without a pre-conception of the *kind* of sound you are to hear, you cannot hear it. Provided that it is not strong, an unusual flavour in your food may pass quite unperceived, unless some one draws attention to it, when you taste it distinctly. After knowing him for years, you shall suddenly discover that your friend's nose is slightly awry, and wonder that you never remarked it before. Still more striking becomes this inability when the facts to be observed are complex. Of a hundred people who listen to the dying vibrations of a church bell, almost all will fail to perceive the harmonics, and will assert the sound to be simple. Scarcely any one who has not practised drawing, sees, when in the street, that all the horizontal lines in the walls, windows, shutters, roofs, seem to converge to one point in the distance: a fact which, after a few lessons in perspective, becomes visible enough.

Perhaps I cannot more clearly illustrate this necessity for hypothesis as a condition to accurate perception, than by

narrating a portion of my own experience relative to the colours of shadows.

Indian ink was the pigment which, during boyhood, I invariably used for shading. Ask any one who has received no culture in art, or who has given no thought to it, of what colour a shadow is, and the unhesitating reply will be—black. This is uniformly the creed of the uninitiated; and in this creed I undoubtingly remained till about eighteen. Happening, at that age, to come much in contact with an amateur artist, I was told, to my extreme surprise, that shadows are not black but of a neutral tint. This, to me, novel doctrine, I strenuously resisted. I have a pretty distinct recollection of denying it point blank, and quoting all my experience in support of the denial. I remember, too, that the controversy lasted over a considerable period; and that it was only after my friend had repeatedly drawn my attention to instances in Nature, that I finally gave in. Though I must previously have seen myriads of shadows, yet in consequence of the fact that in most cases the tint approaches to black, I had been unable, in the absence of hypothesis, to perceive that in the other cases it is distinctly not black.

I continued to hold this amended doctrine for some years. It is true that from time to time I observed that the tone of the neutral tint varied very considerably in different shadows; but still the divergencies were not such as to shake my faith in the dogma. By-and-bye, however, in a popular work on Optics, I met with the statement, that the colour of a shadow is always the complement of the colour of the light casting it. Not seeing the wherefore of this alleged law, which seemed moreover to conflict with my established belief, I was led to study the matter as a question of causation. *Why* are shadows coloured? and what determines the colour? were the queries that suggested themselves. In seeking answers, it soon became manifest, that as a space in shadow is a space from which the *direct* light alone is excluded, and into which the *indirect* light (namely, that re-

flected by surrounding objects, by the clouds and the sky) continues to fall, the colour of a shadow must partake of the colour of everything that can either radiate or reflect light into it. Hence, the colour of a shadow must be *the average colour of the diffused light*; and must vary, as that varies, with the colours of all surrounding things. Thus was at once explained the inconstancy I had already noticed; and I presently recognised in Nature that which the theory implies—namely, that a shadow may have any colour whatever, according to circumstances. Under a clear sky, and with no trees, hedges, houses, or other objects at hand, shadows are of a pure blue. During a red sunset, the mixture of the yellow light from the upper part of the western sky with the blue light from the eastern sky, produces green shadows. Go near to a gas lamp on a moonlight night, and a pencil-case placed at right angles to a piece of paper will be found to cast a purple-blue shadow and a yellow-grey shadow, produced by the gas and the moon respectively. And there are conditions it would take too long here to describe, under which two parts of the same shadow are differently coloured. All which facts became obvious to me as soon as I knew that they must exist.

Here, then, respecting certain simple phenomena that are hourly visible, are three successive convictions; each of them based on years of observation; each of them held with unhesitating confidence; and yet only one—as I now believe—true. But for the help of an hypothesis, I should probably have remained in the common belief that shadows are black. And but for the help of another hypothesis, I should probably have remained in the half-true belief that they are neutral tint.

Is it not clear, therefore, that to observe correctly is by no means easy? On the one hand, if we have a pre-conception, we are liable to see things not quite as they are, but as we think them. On the other hand, without a pre-conception, we are liable to pass over much that we ought to see. Yet we must have either a pre-conception or no pre-conception. Evi-

dently, then, all our observations, save those guided by true theories already known, are in danger either of distortion or incompleteness.

It remains but to remark, that if this be so with *statical* phenomena, how much more must it be so with *dynamical* ones ! If our observations are imperfect in cases like the foregoing, where the things seen are persistent, and may be again and again looked at or continuously contemplated ; how much more imperfect must they be where the things seen are complex processes, changes, or actions, each presenting successive phases, which, if not truly observed at the moments they severally occur, can never be truly observed at all. Here the chances of error become immensely multiplied. And when, in addition, there exists some moral excitement,—when, as in these Spirit-rapping and Table-moving experiments, the intellect is partially paralysed by fear or wonder, correct observation becomes next to an impossibility.

No. VII.—PERSONAL BEAUTY.

It is a commonly expressed opinion that beauty of character and beauty of aspect are unrelated. I have never been able to reconcile myself to this opinion. Indeed, even those who hold it do so in a very incomplete sense ; for it is observable that notwithstanding their theory they continue to manifest surprise when they find a mean deed committed by one of noble countenance—a fact clearly implying that underneath their professed induction lies a still living conviction at variance with it.

Whence this conviction ? How is it that a belief in the connexion between worth and beauty primarily exists in all ? It cannot be innate. Must it not, then, be from early experiences ? And must it not be that in those who continue to believe in this

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connexion, spite of their reasonings, the early and wide experiences outweigh the later and exceptional ones ?

Avoiding, however, the metaphysics of the question, let us consider it physiologically.

Those who do not admit the relationship between mental and facial beauty, usually remark that the true connexion is between character and expression. While they doubt, or rather deny, that the *permanent* forms of the features are in any way indices of the forms of the mind, they assert that the *transitory* forms of the features are such indices. These positions are inconsistent. For is it not clear that the transitory forms, by perpetual repetition, register themselves on the face, and *produce* permanent forms ? Does not an habitual frown by-and-by leave ineffaceable marks on the brow ? Is not a chronic scornfulness presently followed by a modified set in the angles of the mouth ? Does not that compression of the lips significant of great determination, often stereotype itself ; and so give a changed form to the lower part of the face ? And if there be any truth in the doctrine of hereditary transmission, must there not be a tendency to the re-appearance of these modifications as new types of feature in the offspring ? In brief, may we not say that *expression is feature in the making* ; and that if expression means something, the form of feature produced by it means something ?

Possibly it will be urged, in reply, that changes of expression affect only the muscles and skin of the face ; that the permanent marks they produce can extend but to these ; that, nevertheless, the beauty of a face is mainly dependent upon the form of its bony framework ; that hence, in this chief respect, there cannot take place such modifications as those described ; and that, therefore, the relationship of aspect to character, while it may hold in the details, does not hold in the generals.

The rejoinder is, that the framework of the face is modified by modifications in the tissues which cover it. It is an established doctrine in physiology, that throughout the skeleton the greater or less development of bones is dependent on the

greater or less development, that is, on the exercise, of the attached muscles. Hence, permanent changes in the muscular adjustments of the face will be followed by permanent changes in its osseous structure.

Not to dwell in general statements, however, which with most weigh but little, I will cite a few cases in which the connexion between organic ugliness and mental inferiority, and the converse connexion between organic beauty and comparative perfection of mind, are distinctly traceable.

It will be admitted that the projecting jaw, characteristic of the lower human races, is a facial defect—is a trait which no sculptor would give to an ideal bust. At the same time, it is an ascertained fact that prominence of jaw is associated in the mammalia generally with comparative lack of intelligence. This relationship, it is true, does not hold good uniformly. It is not a direct but an indirect one; and is thus liable to be disturbed. Nevertheless, it holds good among all the higher tribes; and on inquiry we shall see why it must hold good. In conformity with the great physiological law that organs develop in proportion as they are exercised, the jaws must be relatively large where the demands made upon them are great; and must diminish in size as their functions become less numerous and less onerous. Now, in all the lower classes of animals the jaws are the sole organs of manipulation—are used not only for mastication, but for seizing, carrying, gnawing, and, indeed, for everything save locomotion, which is the solitary office performed by the limbs. Advancing upwards, we find that the fore-limbs begin to aid the jaws, and gradually to relieve them of part of their duties. Some creatures use them for burrowing; some, as the felines, for striking; many, to keep steady the prey they are tearing; and when we arrive at the quadrumana, whose fore-limbs possess so complete a power of prehension that objects can not only be seized, but carried and pulled to pieces by them, we find that the jaws are used for little else than to break down the food. Accompanying this series of changes, we see a double change in the form of the

head. The increased complexity of the limbs, the greater variety of actions they perform, and the more numerous perceptions they give, imply a greater development of the brain and of its bony envelope. At the same time, the size of the jaws has diminished in correspondence with the diminution of their functions. And by this simultaneous protrusion of the upper part of the cranium and recession of its lower part, what is called the *facial angle* has increased.

Well, these co-ordinate changes in functions and forms have continued during the civilization of the human race. On contrasting the European and the Papuan, we see that what the one cuts in two with knife and fork, the other tears with his jaws; what the one softens by cooking, the other eats in its hard, raw state; the bones which the one utilises by stewing, the other gnaws; and for sundry of the mechanical manipulations which the one has tools for, the other uses his teeth. From the Bushman state upwards, there has been a gradual increase in the complexity of our appliances. We not only use our hands to save our jaws, but we make implements to save our hands; and in our engine factories may be found implements for the making of implements. This progression in the arts of life has had intellectual progression for its necessary correlative. Each new complication requires a new increment of intelligence for its production; and the daily use of it develops the intelligence of all still further. Thus that simultaneous protrusion of the brain and recession of the jaws, which among lower animals has accompanied increase of skill and sagacity, has continued during the advance of Humanity from barbarism to civilization; and has been throughout, the result of a discipline involving increase of mental power. And so it becomes manifest that there exists an organic relationship between that protuberance of the jaws which we consider ugly, and a certain inferiority of nature.

Again, that lateral jutting-out of the cheek-bones, which similarly characterises the lower races of men, and which is similarly thought by us a detraction from beauty, is similarly

related to lower habits and lower intelligence. The jaws are closed by the temporal muscles; and these are consequently the chief active agents in biting and mastication. In proportion as the jaws have much work, and correspondingly large size, must the temporal muscles be massive. But the temporal muscles pass between the skull and the zygomatic arches, or lateral parts of the cheek-bones. Consequently, where the temporal muscles are massive, the spaces between the zygomatic arches and the skull must be great; and the lateral projection of the zygomatic arches great also, as we see it in the Mongolian and other uncivilized races. Like large jaws, therefore, of which it is an accompaniment, excessive size of the cheek-bones is both an ugliness and an index of imperfection.

Certain other defects of feature, between which and mental defects it is not thus easy to trace the connexion, may yet be fairly presumed to have such connexion in virtue of their constant co-existence with the foregoing ones: alike in the uncivilized races and in the young of the civilized races. Peculiarities of face which we find regularly associated with those just shown to be significant of intellectual inferiority, and which like them disappear as barbarism grows into civilization, may reasonably be concluded to have like them a psychological meaning. Thus is it with depression of the bridge of the nose; which is a characteristic both of barbarians and of our babes, possessed by them in common with the higher quadrumana. Thus, also, is it with that forward opening of the nostrils, which renders them conspicuous in a front view of the face—a trait alike of infants, savages, and apes. And the same may be said of wide-spread alæ to the nose, of great width between the eyes, of long mouth, of large mouth,—indeed of all those leading peculiarities of feature which are by general consent called ugly.

And then mark how, conversely, the type of face usually admitted to be the most beautiful, is one that is not simply free from these peculiarities, but possesses opposite ones. In

the ideal Greek head, the forehead projects so much, and the jaws recede so much, as to render the facial angle larger than we ever find it in fact. The cheek-bones are so small as scarcely to be traceable. The bridge of the nose is so high as to be almost or quite in a line with the forehead. The alæ of the nose join the face with but little obliquity. In the front view the nostrils are almost invisible. The mouth is small, and the upper lip short and deeply concave. The outer angles of the eyes, instead of keeping the horizontal line, as is usual, or being directed upwards, as in the Mongolian type, are directed slightly downwards. And the form of the brow indicates an unusually large frontal sinus—a characteristic entirely absent in children, in the lowest of the human races, and in the allied genera.

If, then, recession of the forehead, protuberance of the jaws, and largeness of the cheek-bones, three leading elements of ugliness, are demonstrably indicative of mental inferiority—if such other facial defects as great width between the eyes, flatness of the nose, spreading of its alæ, frontward opening of the nostrils, length of the mouth, and largeness of the lips, are habitually associated with these, and disappear along with them as intelligence increases, both in the race and in the individual; is it not a fair inference that all such faulty traits of feature signify deficiencies of mind? If, further, our ideal of human beauty is characterized not simply by the absence of these traits, but by the presence of opposite ones—if this ideal, as found in sculptures of the Greek gods, has been used to represent superhuman power and intelligence—and if the race so using it were themselves distinguished by a mental superiority, which, if we consider their disadvantages, produced results unparalleled; have we not yet stronger reasons for concluding that the chief components of beauty and ugliness are severally connected with perfection and imperfection of mental nature? And when, lastly, we remember that the variations of feature constituting expression are confessedly significant of character—when we remember that these tend

by repetition to organize themselves, to affect not only the skin and muscles but the bones of the face, and to be transmitted to offspring—when we thus find that there is a psychological meaning alike in each passing adjustment of the features, in the marks that habitual adjustments leave, in the marks inherited from ancestors, and in those main outlines of the facial bones and integuments indicating the type or race; are we not almost forced to the conclusion that all forms of feature are related to forms of mind, and that we consider them admirable or otherwise according as the traits of nature they imply are admirable or otherwise? In the extremes the relationship is demonstrable. That transitory aspects of face accompany transitory mental states, and that we consider these aspects ugly or beautiful according as the mental states they accompany are ugly or beautiful, no one doubts. That those permanent and most marked aspects of face dependent on the bony framework, accompany those permanent and most marked mental states which express themselves in barbarism and civilization; and that we consider as beautiful those which accompany mental superiority, and as ugly those which accompany mental inferiority, is equally certain. And if this connexion unquestionably holds in the extremes—if, as judged by average facts, and by our half-instinctive convictions, it also holds more or less visibly in intermediate cases, it becomes an almost irresistible induction, that the aspects which please us are the outward correlatives of inward perfections, while the aspects which displease us are the outward correlatives of inward imperfections.

I am quite aware that when tested in detail this induction seems not to be borne out. I know that there are often grand natures behind plain faces; and that fine countenances frequently hide small souls. But these anomalies do not destroy the general truth of the law, any more than the perturbations of planets destroy the general ellipticity of their orbits. Some of them, indeed, may be readily accounted for. There are many faces spoiled by having one part perfectly developed while

the rest of the features are ordinary ; others by the disproportion of features that are in themselves good ; others, again, by defects of skin, which, though they indicate defects of visceral constitution, have manifestly no relationship to the higher parts of the nature. Moreover, the facts that have been assigned afford reason for thinking that the leading elements of facial beauty are not directly associated with *moral* characteristics, but with *intellectual* ones—are the results of long-continued civilized habits, long cessation of domestic barbarism, long culture of the manipulative powers ; and so may co-exist with emotional traits not at all admirable. It is true that the highest intellectual manifestations imply a good balance of the higher feelings ; but it is also true that great quickness, great sagacity in ordinary affairs, great practical skill, can be possessed without these, and very frequently are so. The prevalent beauty of the Italians, co-existing though it does with a low moral state, becomes, on this hypothesis, reconcileable with the general induction ; as do also many of the anomalies we see around us.

There is, however, a more satisfactory explanation to be offered than any of these—an explanation which I think renders it possible to admit the seeming contradictions which the detailed facts present, and yet to hold by the theory. But as more space will be required for showing this than can here be spared, I must defer going further until next week. In the meantime, my own conviction may be expressed in a formula in which I have often before uttered it:—The saying that beauty is but skin-deep, is but a skin-deep saying.

No. VIII.—PERSONAL BEAUTY CONCLUDED.

ALL the civilized races, and probably also the uncivilized ones, are of mixed origin ; and, as a consequence, have physical and mental constitutions in which are mingled several aboriginal constitutions more or less differing from each other. This

heterogeneity of constitution seems to me the chief cause of the incongruities between aspect and nature which we daily meet with. Given a pure race, subject to constant conditions of climate, food, and habits of life, and there is every reason to believe that between external appearance and internal structure there will be a constant connexion. Unite this race with another equally pure, but adapted to different conditions and having a correspondingly different physique, face, and morale, and there will occur in the descendants, not a homogeneous mean between the two constitutions, but a seemingly irregular combination of characteristics of the one with characteristics of the other—one feature traceable to this race, a second to that, and a third uniting the attributes of both; while in disposition and intellect there will be found a like medley of the two originals.

The fact that the forms and qualities of any offspring are not a mean between the forms and qualities of its parents, but a mixture of them, is illustrated in every family. The features and peculiarities of a child are separately referred by observers to father and mother respectively—nose and mouth to this side; colour of the hair and eyes to that—this moral peculiarity to the first; this intellectual one to the second—and so with contour and idiosyncrasies of body. Manifestly if each organ or faculty in a child was an average of the two developments of such organ or faculty in the parents, it would follow that all brothers and sisters should be alike; or should, at any rate, differ no more than their parents differed from year to year. So far, however, from finding that this is the case, we find not only that great irregularities are produced by intermixture of traits, but that there is no constancy in the mode of intermixture, or the extent of variation produced by it.

This imperfect union of parental constitutions in the constitution of offspring, is yet more clearly illustrated by the re-appearance of peculiarities traceable to bygone generations. Forms, dispositions, and diseases, possessed by distant progenitors, habitually come out from time to time in descendants.

Some single feature, or some solitary tendency, will again and again show itself, after being apparently lost. It is notoriously thus with gout, scrofula, and insanity. On some of the monumental brasses in our old churches are engraved heads having traits still persistent in the same families. Wherever, as in portrait galleries, a register of ancestral faces has been kept, the same fact is more or less apparent. The pertinacity with which particular characteristics re-produce themselves is well exemplified in America, where traces of negro blood can be detected in the finger nails, when no longer visible in the complexion. Among breeders of animals it is well known that, after several generations in which no visible modifications were traceable, the effects of a cross will suddenly make their appearance. In all which facts we see the general law that an organism produced from two organisms constitutionally different, is not a homogeneous mean ; but is made up of separate elements, taken in variable manner and proportion from the originals.

In a recent number of the *Quarterly Journal of the Agricultural Society* were published some facts respecting the mixture of French and English races of sheep, bearing collaterally on this point. Sundry attempts had been made to improve the poor French breeds by our fine English ones. For a long time these attempts failed. The hybrids bore no trace of their English ancestry ; but were as dwarfed and poverty-stricken as their French dams. Eventually the cause of failure was found to lie in the relative heterogeneity and homogeneity of the two constitutions. The superior English sheep were of mixed race ; the French sheep, though inferior, were of pure race ; and the compound, imperfectly co-ordinated constitution of the one could not maintain itself against the simple and completely balanced constitution of the other. This, at first an hypothesis, was presently demonstrated. French sheep of mixed constitution having been obtained by uniting two of the pure French breeds, it was found that these hybrid French sheep, when united with the English ones, produced a cross in which the English charac-

teristics were duly displayed. Now, this inability of a mixed constitution to stand its ground against an unmixed one, quite accords with the above induction. An unmixed constitution is one in which all the organs are exactly fitted to each other—are perfectly balanced; the system, as a whole, is in stable equilibrium. A mixed constitution, on the contrary, being made up of organs belonging to two separate sets, cannot have them in exact fitness—cannot have them perfectly balanced; and a system in comparatively unstable equilibrium results. But in proportion to the stability of the equilibrium will be the power to resist disturbing forces. Hence, when two constitutions, in stable and unstable equilibrium respectively, become disturbing forces to each other, the unstable one will be overthrown, and the stable one will assert itself unchanged.

This imperfect co-ordination of parts in a mixed constitution, and this consequent instability of its equilibrium, are intimately connected with the vexed question of genera, species, and varieties; and, with a view partly to the intrinsic interest of this question, and partly to the further elucidation of the topic in hand, I must again digress.

The current physiological test of distinct species is the production of a non-prolific hybrid. The ability of the offspring to reproduce itself is held to indicate that its parents are of the same species, however widely they may differ in appearance; and its inability to do this is taken as proof that, nearly allied as its parents may seem, they are distinct in kind. Of late, however, facts have been accumulating that tend more and more to throw doubt on this generalization. Cattle breeders have established it as a general fact, that the offspring of two different breeds of sheep or oxen dwindle away in a few generations if allied with themselves; and that a good result can be obtained only by mixing them with one or other of the original breeds—a fact implying that what is true of so-called species, is, under a modified form, true of varieties also. The same phenomena are observable in the mixtures of different races of men. They, too, it is alleged, cannot maintain themselves as

separate varieties ; but die out unless there is intermarriage with the originals. In brief, it seems that the hybrids produced from two distinct races of organisms may die out in the first, second, third, fourth, fifth, &c., generation, according as the constitutional difference of the races is greater or less. Now, the experience of the French sheep-breeders, above quoted, suggests a rationale of these various results. For if it be true that an organism produced by two unlike organisms is not a mean between them, but a mixture of parts of the one with parts of the other—if it be true that these parts belonging to two different sets are of necessity imperfectly co-ordinated ; then it becomes manifest that in proportion as the difference between the parent organisms is greater or less, the defects of co-ordination in the offspring will be greater or less. Whence it follows, that according to the degree of organic incongruity between the parents, we may have every gradation in the offspring, from a combination of parts so incongruous that it will not work at all, up to a combination complete enough to subsist permanently as a race. And this is just what we find in fact. Between organisms widely differing in character, no intermediate organism is possible. When the difference is less, a non-prolific hybrid is produced—an organism so badly co-ordinated as to be capable only of incomplete life. When the difference is still less, there results an organism capable of reproducing itself ; but not of bequeathing to its offspring complete constitutions. And as the degrees of difference are further diminished, the incompleteness of constitution is longer and longer in making its appearance ; until we come to those varieties of the same species which differ so slightly that their offspring are as permanent as themselves. Even in these, however, the organic equilibrium seems less perfect ; as illustrated in the case I have quoted. And in connexion with this inference, it would be interesting to inquire whether pure constitutions are not superior to mixed ones, in their power of maintaining the balance of vital functions under disturbing conditions. Is it not a fact, that the pure breeds are *hardier* than the mixed ones ? Are not

the mixed ones, though superior in size, less capable of resisting unfavourable influences—extremes of temperature, bad food, &c. ? And is not the like true of mankind ?

Returning to the topic in hand, it is manifest that these facts and reasonings serve further to enforce the general truth, that the offspring of two organisms not identical in constitution is a heterogeneous mixture of the two, and not a homogeneous mean between them.

If, then, bearing in mind this truth, we remember the composite character of the civilized races—the mingling in ourselves, for example, of Celt, Saxon, Norman, Dane, with sprinklings of other tribes ; if we consider the complications of constitution that have arisen from the union of these, not in any uniform manner, but with utter irregularity ; and if we recollect that the incongruities thus produced pervade the whole nature, mental and bodily—nervous tissue and other tissues ; we shall see that there must exist in all of us an imperfect correspondence between parts of the organism that are really related ; and that as one manifestation of this, there must be more or less of discrepancy between the features and those parts of the nervous system with which they have a physiological connexion.

And if this be so, then the difficulties that stand in the way of the belief that beauty of character is related to beauty of face are considerably diminished. It becomes possible at once to admit that plainness may co-exist with nobility of nature, and fine features with baseness ; and yet to hold that mental and facial perfection are fundamentally connected, and will, when the present causes of incongruity have worked themselves out, be ever found united.

No. IX.—THE USE OF ANTHROPOMORPHISM.

THAT long fit of indignation which seizes all generous natures when in youth they begin contemplating human affairs, having fairly spent itself, there slowly grows up a perception that the institutions, beliefs, and forms so vehemently condemned are not wholly bad. This reaction runs to various lengths. In some, merely to a comparative contentment with the arrangements under which they live. In others, to a recognition of the fitness that exists between each people and its government, tyrannical as that may be. In some, again, to the conviction, that hateful though it is to us, and injurious as it would be now, slavery was once beneficial—was one of the necessary phases of human progress. Again, in others, to the suspicion that great benefit has indirectly arisen from the perpetual warfare of past times; insuring as this did the spread of the strongest races, and so providing good raw material for civilization. And in a few this reaction ends in the generalization that all modes of human thought and action subserve, in the times and places in which they occur, some useful function: that though bad in the abstract, they are relatively good—are the best which the then existing conditions admit of.

A startling conclusion to which this faith in the essential beneficence of things commits us, is, that the religious creeds through which mankind successively pass, are, during the eras in which they are severally held, the best that could be held; and that this is true, not only of the latest and most refined creeds, but of all, even to the earliest and most gross. Those who regard men's faiths as given to them from without—as having origins either directly divine or diabolical, and who, considering their own as the sole example of the one, class all the rest under the other, will think this a very shocking opinion. I can imagine, too, that many of those who have abandoned current theologies, and now regard religions as so many natural products of human nature—men who, having lost that antagonism towards their old creed which they felt while shaking

themselves free from it, can now see that it was highly beneficial to past generations, and is beneficial still to a large part of mankind;—I can imagine even these hardly prepared to admit that all religions, down to the lowest Fetichism, have, in their places, fulfilled useful functions. If such, however, will consistently develop their ideas, they will find this inference involved.

For if it be true that humanity in its corporate as well as in its individual aspect, is a growth and not a manufacture, it is obvious that during each phase men's theologies, as well as their political and social arrangements, must be determined into such forms as the conditions require. In the one case as in the other, by a tentative process, things from time to time re-settle themselves in a way that best consists with national equilibrium. As out of plots and the struggles of chieftains, it continually results that the strongest gets to the top, and by virtue of his proved superiority ensures a period of quiet, and gives society time to grow; as out of incidental expedients there periodically arise new divisions of labour, which get permanently established only by serving men's wants better than the previous arrangements did; so, the creed which each period evolves is one more in conformity with the needs of the time than the creed which preceded it. Not to rest in general statements, however, let us consider why this must be so. Let us see whether, in the genesis of men's ideas of deity, there is not involved a necessity to conceive of deity under the aspect most influential with them.

It is now generally admitted that a more or less idealized humanity is the form which every conception of a personal God must take. Anthropomorphism is an inevitable result of the laws of thought. We cannot take a step towards constructing an idea of God without the ascription of human attributes. We cannot even speak of a divine will without assimilating the divine nature to our own; for we know nothing of volition save as a property of our own minds.

While this anthropomorphic tendency, or rather necessity, is manifested by themselves with sufficient grossness—a grossness

that is offensive to those more advanced—Christians are indignant at the still grosser manifestations of it seen among uncivilized men. Certainly, such conceptions as those of some Polynesians, who believe that their gods feed on the souls of the dead, or as those of the Greeks, who ascribed to the personages of their Pantheon every vice, from domestic cannibalism downwards, are repulsive enough. But if, ceasing to regard these notions from the outside, we more philosophically regard them from the inside—if we consider how they looked to believers, and observe the relationships they bore to the natures and needs of such; we shall begin to think of them with some tolerance. The question to be answered is, whether these beliefs were beneficent in their effects on those who held them; not whether they would be beneficent for us, or for perfect men: and to this question the answer must be, that while absolutely bad, they were relatively good.

For is it not obvious that the savage man will be most effectually controlled by his fears of a savage deity? Must it not happen, that if his nature requires great restraint, the supposed consequences of transgression, to be a check upon him, must be proportionately terrible; and for these to be proportionately terrible, must not his god be conceived as proportionately cruel and revengeful? Is it not well that the treacherous, thievish, lying Hindoo, should believe in a hell where the wicked are boiled in cauldrons, rolled down mountains bristling with knives, and sawn asunder between flaming iron posts? And that there may be provided such a hell, is it not needful that he should believe in a divinity delighting in human immolations and the self-torture of fakirs? Does it not seem clear that during the earlier ages in Christendom, when men's feelings were so hard that a holy father could describe one of the delights of heaven to be the contemplation of the torments of the damned—does it not seem clear that while the general nature was so unsympathetic, there needed, to keep men in order, all the prospective tortures described by Dante, and a deity implacable enough to inflict them?

And if, as we thus see, it is well for the savage man to believe in a savage god, then we may also see the great usefulness of this anthropomorphic tendency ; or, as before said, necessity. We have in it another illustration of that essential beneficence of things visible everywhere throughout nature. From this inability under which we labour to conceive of a deity save as some idealization of ourselves, it inevitably results that in each age, among each people, and to a great extent in each individual, there must arise just that conception of deity best adapted to the needs of the case. If, being violent and bloodthirsty, the nature be one calling for stringent control, it evolves the idea of a ruler still more violent and bloodthirsty, and fitted to afford this control. When, by ages of social discipline, the nature has been partially humanized, and the degree of restraint required has become less, the diabolical characteristics before ascribed to the deity cease to be so predominant in the conception of him. And gradually, as all need for restraint disappears, this conception approximates towards that of a purely beneficent necessity. Thus, man's constitution is in this, as in other respects, self-adjusting, self-balancing. The mind itself evolves a compensating check to its own movements ; varying always in proportion to the requirement. Its centrifugal and its centripetal forces are necessarily in correspondence, because the one generates the other. And so we find that the forms of both religious and secular rule follow the same law. As an ill-controlled national character produces a despotic terrestrial government, so also does it produce a despotic celestial government—the one acting through the senses, the other through the imagination ; and in the converse case the same relationship holds good.

Organic as this relationship is in its origin, no artificial interference can permanently affect it. Whatever perturbations an external agency may seem to produce, they are soon neutralized in fact, if not in appearance. I was recently struck with this in reading a missionary account of the "gracious visita-

tions of the Holy Spirit at Vewa," one of the Feejee islands. Describing a "penitent meeting," the account says:—

"Certainly the feelings of the Vewa people were not ordinary. They literally roared for hours together for the disquietude of their souls. This frequently terminated in fainting from exhaustion, which was the only respite some of them had till they found peace. They no sooner recovered their consciousness than they prayed themselves first into an agony, and then again into a state of entire insensibility."

Now these Feejee islanders are the most savage of all the uncivilized races. They are given to cannibalism, infanticide, and human sacrifices; they are so bloodthirsty and so treacherous, that members of the same family dare not trust each other; and, in harmony with these characteristics, they have for their aboriginal god, a serpent. Is it not clear then, that these violent emotions which the missionaries describe, these terrors and agonies of despair which they rejoiced over, were nothing but the worship of the old god under a new name? Is it not clear that these Feejees had simply understood those parts of the Christian creed which agree in spirit with their own—the vengeance, the perpetual torments, the diabolism of it; that these, harmonizing with their natural conceptions of divine rule, were realized by them with extreme vividness; and that the extremity of the fear which made them "literally roar for hours together," arose from the fact that while they could fully take in and believe the punitive element, the merciful one was beyond their comprehension? This is the obvious inference. And it carries with it the further one, that in essence their new belief was merely their old one under a new form—the same substantial conception with a different history and different names.

However great, therefore, may be the seeming change adventitiously produced in a people's religion, the anthropomorphic tendency prevents it from being other than a superficial change—insures such modifications of the new religion as to give it all the potency of the old one—obscures whatever higher elements there may be in it until the people have reached the

capability of being acted upon by them : and so, re-establishes the equilibrium between the impulses and the control they need. If any one requires detailed illustrations of this, he will find them in abundance in the history of the modifications of Christianity throughout Europe.

Ceasing then to regard heathen theologies from the personal point of view, and considering them solely with reference to the function they fulfil where they are indigenou, we must recognise them in common with all theologies, as good for their time and places ; and this mental necessity which disables us from conceiving a deity save as some idealization of ourselves, we must recognise as the agency by which harmony is produced and maintained between every phase of human character and its religious creed.

THE END.