

## DARWIN'S THEORY OF PANGENESIS.

Seven years ago, Mr. Charles Darwin first presented the theory of pangenesis. After continued study during the interval, he now reaffirms the hypothesis, and once more submits it, remodeled and fortified by a host of new facts and observations, in the recently issued second edition of "Animals and Plants under Domestication." The doctrine of natural selection presupposes variability as a necessary characteristic of every organism, and this theory has been substantiated by a vast aggregation of observed facts. Of this accumulation, the work above referred to forms no inconsiderable part, since it deals with observations showing the amount and nature of the changes which animals and plants have undergone while under man's dominion, or which bear on the general principal of variation. It is in order to bring all the phenomena of diversity in growth under one law that Mr. Darwin enunciates a supposition which implies that every separate part of the whole organization reproduces itself. So that ovules, spermatozoa, and pollen grains, the fertilized egg or seed, as well as buds, include and consist of a multitude of germs thrown off from each separate part or unit. This connects and serves to explain a series of phenomena otherwise isolated and inexplicable; and of these a brief analysis is necessary to the proper comprehension of this very important and far-reaching theory.

Reproduction may be divided into two classes, namely, sexual and asexual. The latter is effected in many ways, by the formation of buds of various kinds, and by fissiparous generation, that is, by spontaneous or artificial division. Between the production by fissiparous generation of two or more complete individuals and the repair of even a very slight injury, there is so perfect a gradation that it is impossible to doubt that the two processes are connected; and thus the several forms of budding, fissiparous generation, the repair of injuries, and development are all essentially the results of one and the same power. From well understood cases of parthenogenesis and a variety of other instances, the distinction between sexual and non-sexual generation is proved to be not nearly so great as hitherto supposed, and in fact they do not essentially differ; and therefore Mr. Darwin concludes that, with the power of regrowth and development, they are parts of the same law.

A few of the more striking phenomena, coördinated under this law, may first be examined. A multitude of the lower animals and vertebrates possess the wonderful power of reproduction of amputated parts. Spallanzani cut off the legs and tail of the same salamander six times successively. Tadpoles are capable of reproducing lost members, though full grown frogs are not. A crab regains lost legs; and gasteropod mollusks, whose heads are likely to be bitten off by fishes, have the power of reproducing those important members. In the case of those animals which may be bisected and chopped to pieces, and of which every fragment will reproduce the whole, power of regrowth must be diffused throughout the whole body.

It is well known that buds may be inserted into a stock, and that plants thus raised are not affected in a greater degree than can be accounted for by changed nutrition. From this every-day, though little understood, operation of grafting is deduced the very important fact that formative elements capable of blending with those of a distinct individual (and this is the chief characteristic of sexual generation) are not confined to the reproductive organs, but are present in the buds and cellular tissue of plants.

A marvelous series of phenomena grow out of the circumstance that in the case of plants the male element may affect in a direct manner the tissues of the mother, and with animals may lead to a modification of her future progeny. Galesio fertilized an orange flower with pollen from the lemon, and the fruit bore stripes of perfectly characterised lemon peel. Not merely is the ovule affected, but the partially developed tissues of a distinct species, as is exemplified in a case where an Arabian mare bore a hybrid to a quagga. Subsequent colts by an Arabian horse were more striped even than the quagga itself, and presented other marked characteristics of that animal. Another well known instance is that of a fine bred slut, which, when once crossed by a mongrel, frequently thereafter bears none but tainted offspring, and is thus ruined for breeding purposes. Among human beings, the children of a woman by her second marriage often exhibit traits peculiar to her first husband.

We next reach the question of development, which is either slight and slowly effected, as in human beings, or great and sudden, like the metamorphoses of insects. By several distinct groups of facts, Mr. Darwin is led to the belief in the independence of parts successively developed. Again, physiologists agree that the whole organism consists of a multitude of elemental parts, which are to a great extent independent of each other; and a most curious array of facts may be adduced to support this view. The spur of a cock, after being inserted into the ear of an ox, lived for eight years, became nine inches long, and acquired a weight of nearly fourteen ounces. The tail of a pig has been grafted into the middle of its back, and reacquired sensibility. Ollier inserted a piece of periosteum from the bone of a young dog under the skin of a rabbit, and true bone was developed. A French zouave once drove a thriving trade in Paris by selling marvelous rhinoceros rats. He imitated the horn of the rhinoceros by grafting a freshly removed rat's tail to the forehead of a second rat.

Lastly, we meet the phenomena of variability and inheritance. Variability is not a principle coördinate with life or reproduction, but results generally from changed conditions acting during successive generations. By inheritance a multitude of newly acquired characters are acquired by offspring. A horse becomes trained to certain paces, and the colt inherits

similar consensual movements. A retriever taught to fetch and carry will transmit its endowments to its descendants. On the whole it may be concluded that inheritance is the rule and non-inheritance the anomaly. Reversion is not a rare event, but occurs so regularly that it is evidently an essential part of the principle of inheritance. In fine, in every living creature we may feel assured that a host of long-lost characters lie, ready to be evolved under proper conditions.

It is clear that, through all of these phenomena, there may be traced a possible action of the innumerable elements composing every organism, each possessing its own attributes and to a certain extent independent of all the others. Now it remains to connect all under the law. It is universally admitted that the units of the body increase by self-division or proliferation, retaining the same nature, and that they may ultimately become converted into the various tissues and substances of the body. But besides this means of increase, Mr. Darwin assumes that the units throw off minute granules which are dispersed throughout the whole system; that these, when supplied with proper nutriment, multiply by self-division, and are ultimately developed into units like those from which they were originally derived. These granules may be called gemmules. They are collected from all parts of the system, to constitute the sexual elements, and their development in the next generation forms a new being; but they are likewise capable of transmission in a dormant state to future generations, and may there be developed. Their development depends on their union with other partially developed cells, which precede them in the regular course of growth. Gemmules are supposed to be thrown off by every unit, not only during the adult state, but during each stage of development of every organism: but not necessarily during the continued existence of the same unit. Lastly, it is assumed that the gemmules in their dormant state have a mutual affinity for each other, leading to their aggregation into buds or into sexual elements. Hence it is not the reproductive organs or buds which generate new organisms, but the units of which each individual is composed. These assumptions constitute the provisional hypothesis, to which Mr. Darwin has given the name pangenesis.

## ANOTHER DASTARDLY ATTACK!

The Chicago *Tribune* says: "The wrongs of women and negroes have monopolized public attention for many years. Serious as some of them are or have been, the wrongs of boys are as bad, if not worse. For a series of years, the boys of America have been shut out, more and more completely with each year's advance, from the chance of learning a trade. The trade unions, with almost incredible blindness, have adopted rules which prevent the employment of any except a very limited number of apprentices. These rules forbid a master to employ an apprentice unless he employs a certain number of journeymen; and in some trades, the proportion is one boy to twenty men. The few places left vacant by apprentices becoming journeymen are soon filled. Tens of thousands of boys are thus deprived of the opportunity to become reputable and self-supporting artisans. When they leave school and try to do something for themselves, they find the doors shut in their faces. Instead of becoming blacksmiths, silversmiths, carpenters, compositors, cabinet makers, coachmakers, hatters, machinists, bakers, tanners, tinners, tailors, masons, shoemakers, stonecutters, plasterers, bricklayers, weavers, they have to become boot-blacks, newsboys, errand boys, loafers, dead-beats, paupers, thieves, etc. No one of the occupations open to them offers any education, except in a sort of cunning which is often a curse. If the members of the so-called liberal professions, the journalists, lawyers, teachers, doctors, and ministers, should successfully combine to prevent the education of boys and young men in any of their specialties, there would be a universal howl of complaint. A far greater wrong is committed, however, when trade education is prevented. Many more boys are affected, for one thing, and most of them must go to work at once and labor constantly in order to live. If they do not this, and do not steal, they must starve."

When will respectable papers, like the Chicago *Tribune*, learn to cease such dastardly attacks as the above upon the workmen of our country and their trade societies? The workers comprise the vast majority of the population. Is not all the wealth of the country the result of their labors? Do they not pay the taxes? Do they not support the government, as well as their own families? If they prefer to do all the family work in person, shall they not enjoy the privilege? To be sure, their boys would be benefited by industry; their mothers and sisters would be rendered more comfortable and happier if the family income were increased by the earnings of the lads. But if the fathers, who form and govern the societies, prefer to do all the work, and exclude the young fellows, it is their privilege, and the Chicago *Tribune* need not complain about it.

Not long ago, the legislature of this State passed a bill requiring that felons and other criminals in certain prisons should be compelled to work. It costs, say, \$2 a day to support each one of these rogues, which expense, as everybody knows, is paid, indirectly, out of the earnings of the working people. But strange to say, the moment the bill passed, the Governor was waited upon by officers of trade societies, representatives of the working masses, the voters, requesting that the bill should be vetoed. Labor, they argued, is so scarce that, if the thieves are allowed to work, we honest people will have nothing to do. "Very well," perhaps thought the Governor, "it is your own affair. You may continue, since you prefer it, to tax your earnings and distress your families, in order to support these wretches in idleness." So the bill was vetoed.