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MACMILLAN'S MAGAZINE.

SEPTEMBER, 1877.

PRUSSIAN HISTORY.[1]

Do we ever mean to make ourselves acquainted with the modern history of Prussia and Germany? The complete change which has taken place of late years in our estimate of the Germans as politicians might reasonably lead us to consider whether their politics are not worthy to be studied. Half a century ago our estimate of the German literature and philosophy underwent a similar change. We then discovered, to use the language of an Edinburgh Reviewer, that Germany was not "a tract of country peopled only by hussars and editors of Greek plays," but that it had its poets, its critics, its thinkers and philosophers in greater excellence and abundance, for a time at least, than any other country. But when we had discovered the new German wisdom, we made without delay a serious attempt to master and assimilate it. A considerable part of the literary ability of England has been occupied during the present century with the task of interpreting German thought. After Coleridge, the earliest, and Carlyle, the most industrious, labourer in this field, how many distinguished writers have lent themselves to the work! Is it not time that our second discovery about the Germans should be put to profit as our first was? Then we discovered that "un Allemand peut avoir de l'esprit," but we did not even then imagine that the Germans could have any politics. With the exception of Niebuhr no German politician is ever quoted among us, and the Life of Niebuhr is the only elaborate biography of a German politician (later than Frederick the Great) that is known to the English public. We picture to ourselves Goethe, Schiller, Schleiermacher, Kant, Hegel, not with any background of public institutions or public affairs, but as if they moved like heavenly bodies in the empty sky. And we have had some excuse for doing so. We could hardly disregard their politics much more than the Germans seemed to do themselves. They did not tell us of great German statesmen or great German political doings unjustly neglected by us. Rather they were fond of confessing that they had no political life, or that they were not yet out of their political nonage. In their minds as in ours their philosophers and writers had a great precedence over their statesmen. Two or three years ago, when I inquired of a most accomplished German whether there were any news of the Memoirs of Hardenberg, those very Memoirs which are at last before us, he took it for granted that I must be speaking of Novalis. To be sure Novalis is usually spoken of by his *nom de plume*, but his real name

[1] Suggested by the Memoirs of Prince Hardenberg, edited by Leopold von Ranke.

is materially increased now that he appears as a historian of some of the events in which he had a share.

It is to be observed, however, that he cannot be called the historian of his own achievements. Those achievements began with his assumption of office in 1810, two years after the fall of Stein. From that time to his death in 1822 he remained First Minister. His important legislation belongs mainly to the years 1810 and 1811, and the memorable resurrection of Prussia belongs to 1813. But his original Memoir deals exclusively with the time preceding the Peace of Tilsit, which was concluded in July 1807, a time in which he achieved nothing memorable. It is in fact mainly apologetic in its tone, explaining the reasons why its author was not able, in spite of all his efforts, to prevent, or even in any degree to mitigate, the calamity which fell upon Prussia at the close of that time. Instead of describing the restoration of Prussia, in which he had so large a share, he has described only its fall, which he witnessed and foresaw, but was unable in any degree to prevent. The fall of Prussia, however, is not less interesting, if it is less agreeable to read of, than its restoration, and just at present it may be even more instructive to English people. For in our extreme scarcity of English books on the history of Prussia, in the fragmentary state of our knowledge about it, we are in danger of arriving at erroneous conclusions by piecing arbitrarily together the fragments of knowledge that we have. Thus we are apt to jump from the one book on the subject which we have read, Carlyle's *Frederick*, to those modern Prussian triumphs which we know so well, and to argue—then Carlyle was right after all, and the heroic form of government turns out to be, in the long run, the best! I by no means wish the reader to run hastily into the exactly contrary conclusion, yet it is the exactly contrary conclusion which is really suggested by the facts. Frederick's government did not lead to those modern triumphs, but to the unparalleled catastrophe of Jena, and after that catastrophe the necessity was forced upon the country of radically destroying his system. By a series of changes, scarcely inferior in magnitude to those which France underwent in her first revolution, both government and society in Prussia were reconstructed. A generation later a Parliament was added, and the triumphs which have impressed us so much began nearly twenty years later still. *Post hoc, ergo, propter hoc* is of course a very weak argument; but the slight presumption that it may afford is really a presumption against, and not in favour of, the *régime* of Frederick, for it was not Sedan, but Jena that was *after* it.

This account then of the downfall of the old system we have from Hardenberg himself, and von Ranke's first volume furnishes an excellent introduction to it. His second volume, the fourth of the work, gives some account of the reconstruction. But we should by no means describe it as a complete account. The historical manner of von Ranke is well known; his element is diplomacy and international affairs. In his view of the period between Tilsit and the War of Liberation, he has traced with much care the fluctuations of the long negotiation that went on between Prussia and Napoleon, but the internal reform that went on at the same time does not suit his pen so well, and is therefore not so fully treated. Altogether, though the work before us, if we consider only what it gives, seems to us the most important historical work of recent years, yet it has deficiencies, whether it is considered as a biography of Hardenberg or as an account of the fall and reconstruction of Prussia. As a biography of Hardenberg, besides closing at 1814, instead of 1822, which was the end of Hardenberg's career, it gives no sufficient account of his legislation of 1810, 1811. The same omission, joined to

the slightness of the view given of Stein's legislation, makes it incomplete as a history of the transformation of Prussia.

Nevertheless the appearance of such a book affords a good opportunity of pointing out the vast historical importance of that transformation. We are most of us so ignorant of Prussian history that the very outline of it in our minds wants one of the principal features. Our view of it is such as our view of French history would be if we had never heard of the Revolution of 1789. This may seem a startling statement, but it is possible to imagine that but for one or two very glaring occurrences—such as the execution of the King and Queen, and the positive destruction of monarchy and Church—we might have looked at the events that began in 1789 purely from a military and foreign point of view. We might have overlooked all internal changes, and seen nothing but that France at that time undertook a war against Europe, a war in which she was successful for many years, but afterwards lost again all the advantages she had gained. This is something like what we do with the history of Prussia. We see her neutrality between 1795 and 1806, then her ruin at Jena and Tilsit, then her period of humiliation, then her War of Liberation, and so on; but because Frederick William III. remains quietly seated on the throne through the whole period, we remain totally unaware that a Prussian revolution took place then—a revolution so comprehensive that the old reign and glories of Frederick may fairly be said to belong to another world—to an *ancien régime* that has utterly passed away. It was a revolution which, though it did not touch the actual framework of government in such a way as to substitute one of Aristotle's forms of government for another, yet went so far beyond government, and made such a transformation both in industry and culture, that it deserves the name of revolution far more, for instance, than our English Revolution of the seventeenth century.

Thus the first step which our imaginary student of German politics must take, is to move the battle of Jena out of the life of Napoleon into the history of Prussia. Instead of thinking of it as a military feat, he is to think of it as the beginning of a political revolution. And next remembering that in Prussia two movements go on together, viz., the internal development of the state and its movement towards the headship of Germany outside, he must treat the battle of Austerlitz in the same manner and begin to think of that as the beginning of the revolution which brought down the Old Empire. Thus we get—1805, fall of Old Germany; 1806, fall of Old Prussia. And so in Germany as in France we have an *ancien régime* and a revolution, and, as in the case of France, we ask first, what was the corruption or weakness of the old *régime* which caused it to fall? and what was the nature of the new system which took its place?

The downfall of the old system in Prussia was much less appalling and amazing than in France; but, on the other hand, it was much more unforeseen. Many prophets had prophesied of strange things to happen in France, —*nos enfants verront un beau tapage*— for all the most unmistakable signs of decay met in the Bourbon monarchy. The Hohenzollerns too had been guilty of crimes, but they were the crimes of youthful energy, not of decrepitude; and the ambition of Frederick, if unscrupulous, was patriotic. Considered as an internal administrator, he was a pattern of self-sacrificing industry to all the sovereigns of his time. He and Louis XV. were at the opposite poles of kingship. Was it not strange, then, that a similar catastrophe should await the work of both? that the one system should perish in the rout of Jena, as the other in the Tenth of August? Napoleon is often described as having

vinces. Nevertheless, such a fact as the creation of the Landwehr by a Parliament, and a Parliament not summoned by the king, could not be forgotten. It tolled the knell of the absolute monarchy in Prussia. No wonder that when, a month after, Stein lay at death's door in the hotel Zum Zepter at Breslau, the king, though the Court was in the same town, would know nothing about him, and caused no inquiries to be made after his health.

Parallel with this fall and reconstruction of Prussia we see the fall and reconstruction of Germany. Here too the first step is to create, so to speak, the nation. A great space had to be traversed from the time when Lessing and Herder wrote of the very virtue of patriotism with disapprobation, wondering at the same time what the feeling might be like, to the days of Arndt and Körner. And when the feeling had been awakened the difficulty of expressing it in institutions seemed to have grown greater than ever. The Confederation of the Rhine had thrown half Germany into the foreign camp. New kings had been created, all whose interests were involved in the division of Germany. At the moment of the fall of Napoleon, perhaps, with decision and good fortune, something might have been done. Stein, who is even greater in the history of Germany than he is in the history of Prussia, formed a daring plan of dethroning the princes of the Confederation of the Rhine along with their master, and in this way constituting the unity of Germany, or at least its duality under Austria and Prussia, at the same time that its independence was secured. But Metternich disappointed him. And we have witnessed since the slow and wonderful attainment of the same goal by another path.

This chapter of history has commonly been thought uninviting, partly I suppose because of the intricate appearance which German history always presents from the multitude of small states, partly, perhaps, because the Germans do not write history in a dramatic or epigrammatic style. The first difficulty lies altogether on the surface; as to the second, it must be confessed that the Germans as a nation have not the art of posing like their neighbours. The French contrive to make the long ignominy and decay of Louis XV.'s reign interesting, while the Germans cannot make even the age of Stein and Hardenberg seem so. Nor, I fear, will the two thousand judicious pages in German type, which have suggested this paper, mend the matter. German history will never be read by the novel-reading public. But that it should be read by *nobody* seems a pity. It is quite as instructive and important as other history. And if it does not make a good novel of plot, it makes, at least in the age we are thinking of, a very fair novel of character. It is unfortunate that the only biography of an eminent German politician of that age which is known to the English public is confessedly unsatisfactory from the political point of view. Miss Winkworth, when she translated Niebuhr's life, regretted in her preface that "the account given in it of his public career was very incomplete, and by no means one that enabled the reader to perceive the relation in which Niebuhr stood to his times." Yet Niebuhr's character is so interesting, even when a good part of it is left in shade, that two or three editions of the book have been called for. Let some one put by the side of it a portrait executed on the same scale of the other great scholar-statesman of Prussia, W. von Humboldt, the great educational reformer and founder of the University of Berlin. The life of Arndt, with its wanderings and adventures, might be made even popular. Blücher, Gneisenau, and Yorck, are striking military figures. Scharnhorst is perhaps more important than any of these, but his reserved and unimpassioned character is not much adapted

for biography, at least if we may judge from the admitted failure of Klippel's attempt; but perhaps the rising historian, Max Lehmann, who promises a new life of Scharnhorst, will teach us better. The age too is rich in interesting specimens of more or less perverted character. Such are Dalberg, Prince Primate of the Confederation of the Rhine, Johannes Müller, Gentz, the first King of Würtemberg.

Who, in all this assemblage of characters, holds the regal position? I think it is the proud Reichsfreiherr, Karl von Stein, greater than any by the breadth of his views and the commanding force of his character, even if we should grant that Hardenberg might claim to rival him in the sum of his achievements. Our author closes his work with an elaborate comparison between the two statesmen, in which, as was natural, and perhaps proper, in a Life of Hardenberg, somewhat more than justice is done to him, and somewhat less to Stein. The great superiority of Stein lies in the influence he exerted outside Prussia upon Germany as a whole. In 1813 it was the custom to speak of him as Emperor of Germany; and the phrase was a happy way of marking that, as our author says, he was "the first and grandest representative of the German idea." Who else could write as early as 1812 what Stein wrote to Count Münster?—"I am sorry your Excellency suspects a Prussian in me and betrays a Hanoverian in yourself. I have but one fatherland, and that is Germany; and as under the old constitution I belonged to Germany alone, and not to any part of Germany, so to Germany alone, and not to any part of it, I am devoted with my whole heart." It is the strangest ignorance which pictures this great-hearted man—who had his life in large and simple ideas, and who has been called Germany's political Luther—merely as a successful legislator on land questions.

If we made a commencement by becoming familiar with the lives of a few of these men, we should find the fog which now hides German politics from our view insensibly dissipated, and, I believe, also, we should be astonished at the richness, variety, and interest of the scene which would be disclosed.

J. R. Seeley.

had been ill, and could not bear the noise of the children; and then the squire had been ill, upsetting everybody and everything; and then—the vicar did not know what more to say for himself. He had got out of the way of teaching, out of the habit of exact hours, and Emily had been very poorly, and, on the whole, Randolph was right, and the boy ought to go to school.

Several of these discussions, however, took place before Mary gave way. No one had told Randolph the particulars of the last scene in the library, before the squire had his "stroke." He sincerely believed (though with an uneasy sense of something in it that sounded like truth) that this story was a fabrication to suit a purpose. But, on the other hand, his own intentions were very distinct. The mere fact that such a story had been invented, showed the meaning on the other side. This boy was to be foisted into the place which, for years, he had supposed himself to occupy. John not being possible, who but Randolph could fill that place? Another heir was ridiculous, was shameful, and a wrong to him. He would not suffer it. What right had John, an outlaw and exile, to have a son, if it came to that? He would not allow the child to stay here to be petted and pampered, and made to believe himself the heir. For, in the end, Randolph had made up his mind that the boy could not and should not be admitted to the advantages of heirship without a very different kind of proof of identity from any they possessed. And it would be ruin to the child to be allowed to fill such a false position now. The mere idea of it filled him with suppressed rage. He did not mean the boy any harm—not any real harm. On the contrary, it would be a real advantage to him in any case to be bred up frugally and industriously; and this he would insist upon in spite of every resistance. He would not leave the child to have him wormed into the old man's affections, made a tool of by Mary in John's interests, and to his own detriment. He was determined to get rid of Nello, whatever it cost him: not to do him harm, but to get him out of the way. This idea began to possess him like a mania, to get rid of the child who was more dangerous, a great deal more dangerous, than John himself. And all the circumstances of the house favoured his removal at this moment, when the squire's illness occupied everybody's attention. And then it was a great point to have enlisted on his side the reluctant, and abashed, yet conscientious support of Mr. Pen.

As for the children themselves, a subtle discomfort had stolen into their life. The old gentleman's illness, though it did not affect them, affected the house. The severe and dangerous illness of an important member of any household has always a confusing influence upon domestic life. It changes the centre of existence, so that everything, which once radiated from the cheerful hearth, becomes absorbed in the sick-chamber, making of it the temporary and fictitious centre of the dwelling. In this changed orbit, all the stars of the household firmament shine, and beyond it everything is left cold, and sunless, and neglected. Children are always the first to feel this atmospheric change, which affects them more than it does the watchers and nurses, whose time and minds are absorbed in the new occupation. It was as if the sun had gone out of the sky to the children at Penninghame. They were left free indeed, to go and come as they liked, nobody attempting to hustle them out of the way, to say, "Run, children, some one is coming." All the world might go and come, and it did not matter. Neither did it matter to them now where they went, for every room was equally dreary and empty. Mary, who meant home to them, and to whom they carried all their grievances and pleasures, had disappeared from their view; and Miss Brown, who was their directress in minor matters, had become invisible too, swallowed up by that sick-room,

which absorbed everything. It was no pleasure to roam about the drawing-room, generally forbidden ground, and even through and through the passages from the hall to the dining-room, though they had so often longed to do it, when nobody was to be found there, either to laugh with them, or to find fault. Even Eastwood was swept up in the same whirlpool; and as for Mary, their domestic divinity, all that was seen of her was when she passed from one room to another, crossing the corridor, disappearing within the door of the mysterious room, where doctors, and nurses, and every sort of medicine, and drinks, and appliances of all kinds were being taken. How could the old gentleman want so much? Twice over a new kind of bed was taken into that strange gulf of a sick-room, and all so silently—Eastwood standing on the stairs, deprecating with voice and gesture, "No noise, no noise!" That was what everybody said. Mary would smile at them when she met them, or wave her hand from the end of the corridor, or over the stairs. Sometimes she would pause and stoop down and kiss them, looking very pale and worn out. "No, dear, he is no better," she would say. Except for these encounters, and the accounts which the servants gave them of their grandfather's state, how he was lying, just breathing, knowing nobody, not able to speak, accounts which froze the children's blood in their veins, they had no life at all; only dull meals which they ate under this shadow, and dull hours in which, having nothing to do, they huddled together, weary and lonely, and with nothing before them but to go to bed. Out of doors it was not much better. Mr. Pen had fallen into all the old disorder of his ways, out of which he had made a strenuous effort to wake for their benefit. He never was ready for them when they went with their lessons. "I will hear you to-morrow," he would say, looking at them with painful humility, feeling the grave countenance of Lilias more terrible than that of any judge; and when to-morrow came, there were always a hundred excuses. "Go on to the next page and learn the next lesson. I have had such a press of work—and Mrs. Pennithorne is so poorly," the poor man would say. All this shook the pillars of the earth to Lilias and Nello. They were shaken out of everything they knew, and left to blunder out their life as best they could, without any guide.

And this was hardest upon the one who understood it least. Lilias, whose mind was open to everything, and who sat looking out as from a door, making observations, keenly interested in all that went on, and at the same time with a reserve of imagination to fall back upon, was fully occupied at least if nothing more. Every day she watched for "Mr. Geoff," with news of her father. The suspense was too visionary to crush her with that sickening depression which affects elder minds. All had a softening vagueness and confusion to the child. She hoped and hoped, and cried with imaginative misery, then dried her eyes and hoped again. She thought everything would come right if Mr. Geoff would only bring papa; and Mr. Geoff's ability sooner or later to find and bring papa she never doubted. It was dreadful to have to wait so long—so long; but still every morning, any morning he might come. This hope in her mind absorbed Lilias, and made her silent, indisposed for play. At other times she would talk eagerly, demanding her brother's interest and response to things he did not understand. Children can go on a long time without understanding, each carrying on his or her monologue, two separate streams, which, flowing tranquilly together, feel like something mutual, and answer all the ends of intercourse; and in this way neither of them was aware how far apart they were. But Nello was dull; he had so little to do. He had no pony, he could not play cricket as Johnny Pen did with the village boys. He was small, even

to speak to Miss Mary. "But trouble is always soon enough when it comes," they said, shaking their heads. Then Eastwood would come and join them, his shadow wavering over the staircase. When the privileged persons who had the *entrée* went or came, Miss Brown or the nurse, or even Mary herself, there was a little thrill and universal movement.

"Change! no, there's no change—there never will be but one change," Miss Brown said, standing solemnly by the table, with the light on her grave face; and it was upon this Rembrandtish group that Randolph came, as he wandered about in a similar frame of mind, glad to find himself in company with others, though these others were only the maids of the house.

"Is my father worse?" he asked, pausing, with his arm upon the bannisters. Such a group of eager, pale faces! and the darkness all round in which others still might be lurking unseen.

"No change, sir," said Miss Brown, shaking her head. She was impatient, too, like the rest, but yet felt a sort of superior resignation, as one who was in the front of affairs. And she had something to say besides. She gave a glance at the other women, who responded with secret nods of encouragement, then cleared her throat and delivered her soul—"Mr. Randolph, sir, might I make so bold as to say a word?"

"Say whatever you like," said Randolph. He could not help but give a little glance round him, to make sure that there was no one else about.

"It is just this, sir—when you see him lying there, that white, as if he was gone already, and knows that better he can't be—oh, it brings a many thoughts into the mind. I've stood by dying beds before now, and seen them as were marked for death, but I never saw it more clear. And oh, Mr. Randolph, if there were things that might lie on his mind, and keep him from going quiet, as an old gentleman ought! If there were folks he ought to see afore all's over——!"

"I don't see what you are driving at," Randolph said, hastily. "Speak out if you've anything to say."

"Oh, sir," said Miss Brown, "don't you think —— I am not one that likes to interfere, but I am an old servant, and when a body has been long about a place, it's natural to feel an interest. If it wasn't your family at all—if it was another that your advice was asked for—shouldn't you say that Mr. John ought to know?"

This appeal startled Randolph. He had not been looking for it; and he gave an uncomfortable look round him. Then he felt a strange irritation and indignation that were more easy to express. "Am I my brother's keeper?" he said. "I don't know where Mr. John is, that I should go and hunt for him to let him know."

"Oh, sir," said Miss Brown, "don't you be angry! Cook here is like me: she thinks it's only his due. I would say it to Miss Mary, not troubling you that are 'most a stranger, but she's night and day, she never will leave her father; she has a deal upon her. And a gentleman knows ways that womanfolk don't think of. If you would be but that kind, Mr. Randolph! Oh, where there's a will there's always a way!"

"It is none of my business," said Randolph; "and I don't know where he is," he added, looking round him once more. He might be here already in the dark, waiting till the breath was out of his father's body—waiting to seize possession of the house, felon as he was. And if Randolph was the means of betraying him into the hands of justice, what would everybody say? He went abruptly away down the uncarpeted, polished stairs, on which his hasty step rang and slid. John, always John! he seemed to be in the air. Even Eastwood, when he attended him with his bed-candle, could not refrain from adding a word. "The doctor looks very serious, sir," Eastwood said; "and if there's any telegraph to be sent, I'll keep the groom ready to go at a moment's

notice. It would be well to send for all friends, the doctor said."

"I don't know any one to send for," said Randolph, peremptorily. "Let the groom go to bed." And he went to bed himself sooner than usual, to get rid of these appeals and of equally imperative thoughts. He went to bed, but he could not go to sleep, and kept his candle burning half the night. He heard the watchers moving about in his father's room, which was overhead, all the night through. Sometimes there would be a little rush of steps, and then he held his breath, thinking this might be at last the "change" which was looked for. But then everything grew still again, and he dozed, with the one poor candle, feeble but steadfast watcher, burning on till it became a pale intruder into the full glory of day.

Randolph, however, slept deeply in the morning, and got up with the greater part of those cobwebs blown away. John lost his hold upon the imagination in daylight, and he was able to laugh at his foolish alarm. How could it be John whom he had seen? He durst not show himself in the country where still his crime was so well remembered, and the sentence out against him. And as for the appearance being anything more than mortal, or less than human, Randolph laughed at the state of his own nerves which rendered such an idea tenable for a moment. He was a materialist by nature—as so many are; though he said his creed without any intrusive doubts; and the absurdity was too patent after he had slept and been refreshed. But no doubt it was bad for his health, bad for his *morale*, to stay here. There was something in the atmosphere that was demoralising; the air had a creeping sensation in it as of something more than met the eye. Death was in it; death, creeping on slowly, silently—loitering about with faint odours of mortality and sickening stillness. Randolph felt that he must escape into a more natural and wholesome air before further harm was done.

As for Mary, the occupations of the sick-room, and the sudden problems of the hereafter thus thrust upon her, were enough to fill her mind, and make her even comparatively indifferent to the departure of Nello, though it was against her judgment. It was not the hereafter of the spirit, which thus lay death-bound on the verge of the unseen, which occupied her. We must all die, everybody knows; but who thinks it true in their own case until it comes? Mary had known very well that a man much over seventy could not live very much longer; but it was only when her father fell back in his chair unconscious, his body motionless, his mind veiled within blinding mists, that she felt the real weight of all that was to follow. It was for her to act as soon as the breath should be out of his body. She did not trust her younger brother, and she did not know what to do for her elder brother. The crisis had arrived while she was still unprepared. She went down mechanically to see Randolph go away, her eyes seeing many other things more clearly than she saw the two figures actually before her; the man suspicious as usual, and putting no faith in her—the boy in a subdued excitement, his eyes sparkling with the light of novelty and adventure. Randolph had gone into his father's room that morning, and had walked suspiciously round the bed, making quite sure that the "no change" was true. "I suppose he may last like this for weeks yet," he said, in a querulous undertone—and yet not so low but that everybody heard it—to the doctor. "Oh, hush, for Heaven's sake, Randolph! How can you tell that he does not hear?" said Mary. "Pshaw! how can he hear?" Randolph replied, turning with a certain contempt from the helpless and powerless frame which lay there making no sign, yet living when it would be so much better that he should die. The awe of such a presence gives way to familiarity and weariness even with the most reverent watcher; but Randolph, though he had

V.

TRAGEDY AND COMEDY DURING THE SEVENTEENTH AND EIGHTEENTH CENTURIES; MONTI, GOLDONI, ETC.

A.D. 1600—1800.

VICENZO MONTI followed close upon the footsteps of Alfieri in the *terribil via* struck out by that Michael Angelo of the Italian drama. The *Aristodemo*, Monti's best tragedy, was inspired by the recital of Alfieri's *Virginia* in Rome (1782). Deeply impressed with the beauty and vigour of that play, Monti, immediately on his return home, sketched out the plot of *Aristodemo, King of Messenia*, which appeared to him an equally fine subject for a tragedy. The discussion among the *litterati* of the day as to the merits and defects of Alfieri's style stimulated Monti to improve upon the rugged asperities and strained inversions which occasionally mar the grand passages of his fellow-tragedian. And his success was signal; for Signorelli, an eminent critic, remarks that when Alfieri's noble conceptions are illustrated by Monti's polished style, Italian tragedy at last attains to the summit of perfection. *Aristodemo* carried away the gold medal offered by the Duke of Parma for the best drama, a distinction which, owing to the general inferiority of tragical composition, had not been claimed for two years. The style is noble and sustained, the versification fluent, the dialogue easy and polished, the plot clearly and rapidly unfolds itself; but, above all, the passions are delineated with the hand of a master. The anguish of Aristodemo, soothed by the tender compassion of Cesina, to whom, while still unaware that she is his daughter, he feels drawn with the strong chain of parental affection; the attachment shown by the faithful servant Gonippo—all these, in the hands of an author who writes as if entranced with his subject, make a series of beautiful and pathetic pictures; so that the interest is wrought up to the highest pitch by those alternations of terror and compassion which are the great elements of a well-sustained tragedy. It is an awful drama; and if the mere perusal of it is sufficient to stir the strongest emotions, the effect when represented on the stage can easily be imagined. In the third Act (Scene 7) there is a remarkable discourse upon suicide between Gonippo and Aristodemo, and the same scene contains the description of the apparition of the spectre to the unhappy king, one of the most powerful passages in the drama. The accessories of spectres and tombs have since been objected to as a kind of tragic terror too hackneyed for use; and the entrance of Cesira into the tomb has been censured as an unnatural act of courage on her part; but Monti urges in her defence that the desire to save her father is sufficient to outweigh all the ordinary fears such an action would inspire; and we must here observe that, like *Merope*, the whole interest of *Aristodemo* centres in filial affection. *Aristodemo* is looked upon as undoubtedly the best of Monti's three dramas, although the other two—*Caio Gracco* and *Galeotto Manfredi*—have also obtained distinguished laurels. The *Gracco* owed its reputation in some measure to its patriotic sentiment, which was in accordance with the spirit of the age. It has besides great intrinsic merit, showing a vigour and power in depicting the Roman character which can only have been derived from deep study of the classics. It would seem as if the ardent spirits of this century in Italy looked back fondly to the past, as though to learn from their Roman ancestors how to gain that liberty for which they sighed in vain. But Monti is careful to draw the distinction between the true liberty established on the basis of truth and justice and the

lawless license at that time so vividly portrayed in France, founded on crime, and only maintained by the daily perpetration of new atrocities. This "*libertà di ladroni e d'assassini*" is sternly condemned by the Mother of the Gracchi. "They have," she says, "their country's name for ever on their lips, and never in their hearts" (Act i. Scene 3). In his description of the assassinated Consul (Act iv. Scene 6), Monti has literally borrowed the well-known forcible language in which Shakspeare paints the murdered corpse of Gloucester.

"But see, his face is black, and full of blood."

"Ma qui, il vedete? tutto quanto il viso
Dell' infelice n'è ricolmo e nero."

"His eyeballs farther out than when he lived,
Staring full ghastly like a strangled man."

"Mirate le pupille
Travolte, oblique, e per lo sforzo quasi
Fuor dell' orbita lor."

"His hair upreared, his nostrils stretched with struggling."

"Notate il varco
Delle narici dilatato, indizio di compres respiro."

"His hands abroad displayed, as one that grasped
And tugged for life, and was by strength subdued."

"equeste braccia
Stese quanto son lunghe, equeste dita
Pur tutte aperte, come d'uom che sente
Afferrarsi alla gola, e si dibatte
Finchè forza il soggioga."[1]

The Italian tragedian does not attempt to render the

"Well-proportioned beard made rough and rugged,
Like to the summer's corn by tempest lodged;"

but he concludes his description with a beautiful contrast which diverts the thoughts from the preceding horrors. An English translation can scarcely convey the soft and peaceful picture presented by the Italian:—

"Not thus, not thus, my friends, a just man's soul
Parts from its earthly home. It flees not thence,
Like some invading foe whose iron tread
Leaves ruthless footmarks in the trampled soil,
But gently lays its mortal burthen down,
With lingering looks of love. So have I seen
One who has travelled o'er some distant way,
Reaching the goal at last, take tender leave
Of the beloved companion of his toils,
Bidding him fond farewell."

The imitation of Shakspeare again appears in *Galeotto Manfredi, Principe di Faënza*, Monti's third and last tragedy, the character of Zambrino, the wicked courtier, resembling closely the Iago of *Othello*. But he is also painted from the life as a portrait of the author's personal enemy. By the character of Ubaldo, the contrast to Zambrino, Monti intended to represent himself; and it is said that on one occasion when the tragedy was being played the allusion struck the spectators so forcibly that they insisted upon the repetition of the whole scene between the faithful and false courtiers.[2] The argument of the tragedy, the author tells us, is taken from Tenducci's *Storia di Faënza*.[3] It had a great attraction for Monti, who had spent much of his time in that brilliant and cultivated city, and had seen with his own eyes the chamber where Manfredi was murdered. Monti was born in Alfonsina, near Ravenna, in 1754; he was educated at Faënza. His talents early procured him the notice of the papal legate at Ferrara, Cardinal Borghese, under whose protection he went to Rome. There he resided some years, and became secretary to the Duca di Nemi, nephew to Pius VI. He obtained a high reputation as a poet some time previous to the appearance of those tragedies already mentioned; but the limits of our subject will not admit of the mention, except by name, of his famous poem, *La Bassvigliana*, written in the "terza rima" of Dante, and of the same visionary character as the *Divina Commedia*. The subject was the

[1] *King Henry VI.*, Part II. Act iii. Sc. 2; *Caio Gracco*, Att. iv. Sc. 6.

[2] *Galeotto Manfredi*, Act iv. Sc. 6.

[3] Also to be found in Roscoe's *Life of Lorenzo de' Medici*, vol. ii. pp. 168–172.

THE COLOURS OF ANIMALS AND PLANTS.

I.—THE COLOURS OF ANIMALS.

THERE is probably no one quality of natural objects, from which we derive so much pure and intellectual enjoyment as from their colours. The "heavenly" blue of the firmament, the glowing tints of sunset, the exquisite purity of the snowy mountains, and the endless shades of green presented by the verdure-clad surface of the earth, are a never-failing source of pleasure to all who enjoy the inestimable gift of sight. Yet these constitute, as it were, but the frame and background of a marvellous and ever-changing picture. In contrast with these broad and soothing tints, we have presented to us in the vegetable and animal worlds, an infinite variety of objects adorned with the most beautiful and most varied hues. Flowers, insects, and birds, are the organisms most generally ornamented in this way; and their symmetry of form, their variety of structure, and the lavish abundance with which they clothe and enliven the earth, cause them to be objects of universal admiration. The relation of this wealth of colour to our mental and moral nature is indisputable. The child and the savage alike admire the gay tints of flower, bird, and insect; while to many of us their contemplation brings a solace and enjoyment which is both intellectually and morally beneficial. It can then hardly excite surprise that this relation was long thought to afford a sufficient explanation of the phenomena of colour in nature; and although the fact that—

> "Full many a flower is born to blush unseen,
> And waste its sweetness on the desert air—"

might seem to throw some doubt on the sufficiency of the explanation, the answer was easy,—that in the progress of discovery, man would, sooner or later, find out and enjoy every beauty that the hidden recesses of the earth have in store for him. This theory received great support, from the difficulty of conceiving any other use or meaning in the colours with which so many natural objects are adorned. Why should the homely gorse be clothed in golden raiment, and the prickly cactus be adorned with crimson bells? Why should our fields be gay with buttercups, and the heather-clad mountains be clad in purple robes? Why should every land produce its own peculiar floral gems, and the alpine rocks glow with beauty, if not for the contemplation and enjoyment of man? What could be the use to the butterfly of its gaily-painted wings, or to the humming bird of its jewelled breast, except to add the final touches to a world-picture, calculated at once to please and to refine mankind? And even now, with all our recently acquired knowledge of this subject, who shall say that these old-world views were not intrinsically and fundamentally sound; and that, although we now know that colour has "uses" in nature that we little dreamt of, yet the relation of those colours to our senses and emotions may be another, and perhaps more important use which they subserve in the great system of the universe?

We now propose to lay before our readers a general account of the more recent discoveries on this interesting subject; and in doing so, it will be necessary first to give an outline of the more important facts as to the colours of organised beings; then to point out the cases in which it has been shown that colour is of use; and lastly, to endeavour to throw some light on its nature, and the general laws of its development.

Among naturalists, colour was long thought to be of little import, and to

be quite untrustworthy as a specific character. The numerous cases of variability of colour led to this view. The occurrence of white blackbirds, white peacocks, and black leopards; of white blue-bells, and of white, blue, or pink milkworts, led to the belief that colour was essentially unstable, that it could therefore be of little or no importance, and belonged to quite a different class of characters from form or structure. But it now begins to be perceived that these cases, though tolerably numerous, are, after all, exceptional; and that colour, as a rule, is a constant character. The great majority of species, both of animals and plants, are each distinguished by peculiar tints which vary very little, while the minutest markings are often constant in thousands or millions of individuals. All our field buttercups are invariably yellow, and our poppies red, while many of our butterflies and birds resemble each other in every spot and streak of colour through thousands of individuals. We also find that colour is constant in whole genera and other groups of species. The Genistas are all yellow, the Erythrinas all red, many genera of Carabidæ are entirely black, whole families of birds—as the Dendrocolaptidæ—are brown, while among butterflies the numerous species of Lycæna are all more or less blue, those of Pontia white, and those of Callidryas yellow. An extensive survey of the organic world thus leads us to the conclusion that colour is by no means so unimportant or inconstant a character as at first sight it appears to be; and the more we examine it the more convinced we shall become that it must serve some purpose in nature, and that besides charming us by its diversity and beauty it must be well worthy of our attentive study, and have many secrets to unfold to us.

In order to group the great variety of facts relating to the colours of the organic world in some intelligible way, it will be best to consider how far the chief theories already proposed will account for them. One of the most obvious and most popular of these theories, and one which is still held, in part at least, by many eminent naturalists, is, that colour is due to some direct action of the heat and light of the sun, thus at once accounting for the great number of brilliant birds, insects, and flowers, which are found between the tropics. But here we must ask whether it is really the fact that colour is more developed in tropical than in temperate climates, in proportion to the whole number of species; and even if we find this to be so, we have to inquire whether there are not so many and such striking exceptions to the rule, as to indicate some other causes at work than the direct influence of solar light and heat. As this is a most important question, we must go into it somewhat fully.

It is undoubtedly the case that there are an immensely greater number of richly-coloured birds and insects in tropical than in temperate and cold countries; but it is by no means so certain that the *proportion* of coloured to obscure species is much or any greater. Naturalists and collectors well know that the majority of tropical birds are dull-coloured; and there are whole families, comprising hundreds of species, not one of which exhibits a particle of bright colour. Such are the Timaliidæ of the Eastern and the Dendrocolaptidæ of the Western hemispheres. Again, many groups of birds, which are universally distributed, are no more adorned with colour in the tropical than in the temperate zone; such are Thrushes, Wrens, Goatsuckers, Hawks, Grouse, Plovers, and Snipe; and if tropical light and heat have any direct colouring effect, it is certainly most extraordinary that in groups so varied in form, structure, and habits as those just mentioned, the tropical should be in no wise distinguished in this respect from the temperate species. The brilliant tropical birds mostly belong to groups which are wholly or almost wholly tropical—as the chatterers, toucans,

trogons, and pittas; but as there are perhaps an equal number of groups which are wholly dull-coloured, while others contain dull and bright-coloured species in nearly equal proportions, the evidence is by no means strong that tropical light or heat has anything to do with the matter. But there are also groups in which the cold and temperate zones produce finer-coloured species than the tropics. Thus the arctic ducks and divers are handsomer than those of the tropical zone, while the King-duck of temperate America and the Mandarin-duck of N. China are the most beautifully coloured of the whole family. In the pheasant family we have the gorgeous gold and silver pheasants in N. China and Mongolia; and the superb Impeyan pheasant in the temperate N. W. Himalayas, as against the peacocks and fire-backed pheasants of tropical Asia. Then we have the curious fact that most of the bright-coloured birds of the tropics are denizens of the forests, where they are shaded from the direct light of the sun, and that they abound near the equator where cloudy skies are very prevalent; while, on the other hand, places where light and heat are at a maximum have often dull-coloured birds. Such are the Sahara and other deserts where almost all the living things are sand-coloured; but the most curious case is that of the Galapagos islands, situated under the equator, and not far from South America where the most gorgeous colours abound, but which are yet characterised by prevailing dull and sombre tints in birds, insects, and flowers, so that they reminded Mr. Darwin of the cold and barren plains of Patagonia. Insects are wonderfully brilliant in tropical countries generally, and any one looking over a collection of South American or Malayan butterflies would scout the idea of their being no more gaily-coloured than the average of European species, and in this they would be undoubtedly right. But on examination we should find that all the more brilliantly-coloured groups were exclusively tropical, and that, where a genus has a wide range, there is little difference in coloration between the species of cold and warm countries. Thus the European Vanessides, including the beautiful "peacock," "Camberwell beauty," and "red admiral" butterflies, are quite up to the average of tropical beauty in the same group, and the remark will equally apply to the little "blues" and "coppers;" while the alpine "apollo" butterflies have a delicate beauty that can hardly be surpassed. In other insects, which are less directly dependent on climate and vegetation, we find even greater anomalies. In the immense family of the Carabidæ or predaceous ground-beetles, the northern forms fully equal, if they do not surpass, all that the tropics can produce. Everywhere, too, in hot countries, there are thousands of obscure species of insects which, if they were all collected, would not improbably bring down the average of colour to much about the same level as that of temperate zones.

But it is when we come to the vegetable world that the greatest misconception on this subject prevails. In abundance and variety of floral colour the tropics are almost universally believed to be pre-eminent, not only absolutely, but relatively to the whole mass of vegetation and the total number of species. Twelve years of observation among the vegetation of the eastern and western tropics has, however, convinced me that this notion is entirely erroneous, and that, in proportion to the whole number of species of plants, those having gaily-coloured flowers are actually more abundant in the temperate zones than between the tropics. This will be found to be not so extravagant an assertion as it may at first appear, if we consider how many of the choicest adornments of our greenhouses and flower-shows are really temperate as opposed to tropical plants. The masses of colour produced by our Rhododendrons, Azaleas, and Camellias, our Pelargoniums, Calceo-

larias, and Cinerarias,—all strictly temperate plants — can certainly not be surpassed, if they can be equalled, by any productions of the tropics.[1] But we may go further, and say that the hardy plants of our cold temperate zone equal, if they do not surpass, the productions of the tropics. Let us only remember such gorgeous tribes of flowers as the Roses, Peonies, Hollyhocks, and Antirrhinums, the Laburnum, Wistaria, and Lilac; the Lilies, Irises, and Tulips, the Hyacinths, Anemones, Gentians, and Poppies, and even our humble Gorse, Broom, and Heather; and we may defy any tropical country to produce masses of floral colour in greater abundance and variety. It may be true that individual tropical shrubs and flowers do surpass everything in the rest of the world, but that is to be expected, because the tropical zone comprises a much greater land-area than the two temperate zones, while, owing to its more favourable climate, it produces a still larger proportion of species of plants, and a great number of peculiar natural orders.

Direct observation in tropical forests, plains, and mountains, fully supports this view. Occasionally we are startled by some gorgeous mass of colour, but as a rule we gaze upon an endless expanse of green foliage, only here and there enlivened by not very conspicuous flowers. Even the orchids, whose gorgeous blossoms adorn our stoves, form no exception to this rule. It is only in favoured spots that we find them in abundance; the species with small and inconspicuous flowers greatly preponderate; and the flowering season of each kind being of short duration, they rarely produce any marked effect of colour amid the vast masses of foliage which surround them. An experienced collector in the Eastern tropics once told me, that although a single mountain in Java had produced three hundred species of Orchideæ, only about 2 per cent. of the whole were sufficiently ornamental or showy to be worth sending home as a commercial speculation. The alpine meadows and rock-slopes, the open plains, of the Cape of Good Hope or of Australia, and the flower-prairies of North America, offer an amount and variety of floral colour which can certainly not be surpassed, even if it can be equalled, between the tropics.

It appears, therefore, that we may dismiss the theory that the development of colour in nature is directly dependent on, and in any way proportioned to the amount of solar heat and light, as entirely unsupported by facts. Strange to say, however, there are some rare and little-known phenomena, which prove that, in exceptional cases, light does directly affect the colours of natural objects, and it will be as well to consider these before passing on to other matters.

A few years ago Mr. T. W. Wood called attention to the curious changes in the colour of the chrysalis of the small cabbage butterfly (*Pontia rapæ*) when the caterpillars were confined

[1] It may be objected that most of the plants named are choice cultivated *varieties*, far surpassing in colour the original stock, while the tropical plants are mostly unvaried wild *species*. But this does not really much affect the question at issue. For our florists' gorgeous varieties have all been produced under the influence of our cloudy skies, and with even a still further deficiency of light, owing to the necessity of protecting them under glass from our sudden changes of temperature; so that they are themselves an additional proof that tropical light and heat are not needed for the production of intense and varied colour. Another important consideration is, that these cultivated *varieties* in many cases displace a number of wild *species* which are hardly, if at all, cultivated. Thus there are scores of *species* of wild hollyhocks varying in colour almost as much as the cultivated varieties, and the same may be said of the pentstemons, rhododendrons, and many other flowers; and if these were all brought together in well-grown specimens, they would produce a grand effect. But it is far easier, and more profitable, for our nurserymen to grow *varieties* of one or two species, which all require a very similar culture, rather than fifty distinct *species*, most of which would require special treatment; the result being that the varied beauty of the temperate flora is even now hardly known, except to botanists and to a few amateurs.

in boxes lined with different tints. Thus in black boxes they were very dark, in white boxes nearly white; and he further showed that similar changes occurred in a state of nature, chrysalises fixed against a white-washed wall being nearly white, against a red brick wall reddish, against a pitched paling nearly black. It has also been observed that the cocoon of the emperor moth is either white or brown, according to the surrounding colours. But the most extraordinary example of this kind of change is that furnished by the chrysalis of an African butterfly (*Papilio Nireus*), observed at the Cape by Mrs. Barber, and described (with a coloured plate) in the *Transactions of the Entomological Society*, 1874, p. 519. The caterpillar feeds on the orange tree, and also on a forest tree (*Vepris lanceolata*) which has a lighter green leaf, and its colour corresponds with that of the leaves it feeds upon, being of a darker green when it feeds on the orange. The chrysalis is usually found suspended among the leafy twigs of its food-plant, or of some neighbouring tree; but it is probably often attached to larger branches, and Mrs. Barber has discovered that it has the property of acquiring the colour, more or less accurately, of any natural object it may be in contact with. A number of the caterpillars were placed in a case with a glass cover, one side of the case being formed by a red brick wall, the other sides being of yellowish wood. They were fed on orange leaves, and a branch of the bottle-brush tree (*Banksia, sp.*) was also placed in the case. When fully fed, some attached themselves to the orange twigs, others to the bottle-brush branch; and these all changed to green pupæ; but each corresponded exactly in tint to the leaves around it, the one being dark the other a pale faded green. Another attached itself to the wood, and the pupa became of the same yellowish colour; while one fixed itself just where the wood and brick joined, and became one side red, the other side yellow! These remarkable changes would perhaps not have been credited, had it not been for the previous observations of Mr. Wood; but the two support each other, and oblige us to accept them as actual phenomena. It is a kind of natural photography, the particular coloured rays to which the fresh pupa is exposed in its soft, semi-transparent condition, effecting such a chemical change in the organic juices as to produce the same tint in the hardened skin. It is interesting, however, to note that the range of colour that can be acquired seems to be limited to those of natural objects to which the pupa is likely to be attached; for when Mrs. Barber surrounded one of the caterpillars with a piece of scarlet cloth no change of colour at all was produced, the pupa being of the usual green tint, but the small red spots with which it is marked were brighter than usual.

In these caterpillars and pupæ, as well as in the great majority of cases in which a change of colour occurs in animals, the action is quite involuntary; but among some of the higher animals the colour of the integument can be modified at the will of the animal, or at all events by a reflex action dependent on sensation. The most remarkable case of this kind occurs with the Chameleon, which has the power of changing its colour from dull white to a variety of tints. This singular power has been traced to two layers of pigment deeply seated in the skin, from which minute tubes, or capillary vessels, rise to the surface. The pigment-layers are bluish and yellowish, and by the pressure of suitable muscles these can be forced upwards either together or separately. When no pressure is exerted the colour is dirty white, which changes to various tints of bluish, green, yellow, or brown, as more or less of either pigment is forced up and rendered visible. The animal is excessively sluggish and defenceless, and its power of changing its colour to harmonise with surrounding objects is essential to its existence.

Here too, as with the pupa of *Papilio Nireus*, colours such as scarlet or blue, which do not occur in the immediate environment of the animal, cannot be produced. Somewhat similar changes of colour occur in some prawns and flat-fish, according to the colour of the bottom on which they rest. This is very striking in the Chameleon Shrimp (*Mysis Chamæleon*), which is grey when on sand, but brown or green when among sea-weed of these two colours. Experiment shows, however, that when blinded the change does not occur, so that here too we probably have a voluntary or reflex sense-action. Many cases are known among insects in which the same species has a different tint according to its surroundings, this being particularly marked in some South African locusts which correspond with the colour of the soil wherever they are found; while several caterpillars which feed on two or more plants vary in colour accordingly. Several such changes are quoted by Mr. R. Meldola, in a paper on Variable Protective Colouring in Insects (*Proceedings of the Zoological Society of London*, 1873, p. 153), and some of them may perhaps be due to a photographic action of the reflected light. In other cases, however, it has been shown that green chlorophyll remains unchanged in the tissues of leaf-eating insects, and being discernible through the transparent integument produces the same colour as that of the food plant.

These peculiar powers of change of colour and adaptation, are however rare and quite exceptional. As a rule there is no direct connection between the colours of organisms and the kind of light to which they are usually exposed. This is well seen in most fishes, and in such marine animals as porpoises, whose backs are always dark, although this part is exposed to the blue and white light of the sky and clouds, while their bellies are very generally white, although these are constantly subjected to the deep blue or dusky green light from the bottom. It is evident, however, that these two tints have been acquired for concealment and protection. Looking *down* on the dark back of a fish it is almost invisible, while to an enemy looking *up* from below the light undersurface would be equally invisible against the light of the clouds and sky. Again, the gorgeous colours of the butterflies which inhabit the depths of tropical forests bear no relation to the kind of light that falls upon them, coming as it does almost wholly from green foliage, dark brown soil, or blue sky; and the bright underwings of many moths which are only exposed at night, contrast remarkably with the sombre tints of the upper wings which are more or less exposed to the various colours of surrounding nature.

We find, then, that neither the general influence of solar light and heat, nor the special action of variously tinted rays, are adequate causes for the wonderful variety, intensity, and complexity, of the colours that everywhere meet us in the animal and vegetable world. Let us therefore take a wider view of these colours, grouping them into classes determined by what we know of their actual uses or special relations to the habits of their possessors. This, which may be termed the functional or biological classification of the colours of living organisms, seems to be best expressed by a division into five groups as follows:—

- Animals
  - 1. Protective colours.
  - 2. Warning colours.
    - *a.* Of creatures specially protected.
    - *b.* Of defenceless creatures, mimicking *a*.
  - 3. Sexual colours.
  - 4. Typical colours.
- Plants
  - 5. Attractive colours.

The nature of the two first groups, Protective and Warning colours, has been so fully detailed and illustrated in my chapter on "Mimicry and other Protective Resemblances among Animals," (*Contributions to the Theory of Natural Selection*, p. 45), that very little need be added here except a few words of general explanation. Protective colours are exceedingly preva-

lent in nature, comprising those of all the white arctic animals, the sandy-coloured desert forms, and the green birds and insects of tropical forests. It also comprises thousands of cases of special resemblance—of birds to the surroundings of their nests, and especially of insects to the bark, leaves, flowers, or soil, on or amid which they dwell. Mammalia, fishes, and reptiles, as well as mollusca and other marine invertebrates, present similar phenomena; and the more the habits of animals are investigated, the more numerous are found to be the cases in which their colours tend to conceal them, either from their enemies or from the creatures they prey upon. One of the last-observed and most curious of these protective resemblances has been communicated to me by Sir Charles Dilke. He was shown in Java a pink-coloured *Mantis*, which, when at rest, exactly resembled a pink orchis-flower. The Mantis is a carnivorous insect which lies in wait for its prey, and by its resemblance to a flower the insects it feeds on would be actually attracted towards it. This one is said to feed especially on butterflies, so that it is really a living trap and forms its own bait! All who have observed animals, and especially insects, in their native haunts and attitudes, can understand how it is that an insect which in a cabinet looks exceedingly conspicuous, may yet, when alive in its peculiar attitude of repose and with its habitual surroundings, be perfectly well concealed. We can hardly ever tell by the mere inspection of an animal, whether its colours are protective or not. No one would imagine the exquisitely beautiful caterpillar of the Emperor-Moth, which is green with pink star-like spots, to be protectively coloured; yet when feeding on the heather it so harmonises with the foliage and flowers as to be almost invisible. Every day fresh cases of protective colouring are being discovered even in our own country, and it is becoming more and more evident that the need of protection has played a very important part in determining the actual coloration of animals.

The second class — the warning colours — are exceedingly interesting, because the object and effect of these is, not to conceal the object, but to make it conspicuous. To these creatures it is *useful* to be seen and recognised, the reason being that they have a means of defence which, if known, will prevent their enemies from attacking them, though it is generally not sufficient to save their lives if they are actually attacked. The best examples of these specially protected creatures consist of two extensive families of butterflies, the Danaidæ and Acræidæ, comprising many hundreds of species inhabiting the tropics of all parts of the world. These insects are generally large, are all conspicuously and often most gorgeously coloured, presenting almost every conceivable tint and pattern; they all fly slowly, and they never attempt to conceal themselves: yet no bird, spider, lizard, or monkey (all of which eat other butterflies) ever touch them. The reason simply is that they are not fit to eat, their juices having a powerful odour and taste that is absolutely disgusting to all these animals. Now, we see the reason of their showy colours and slow flight. It is good for them to be seen and recognised, for then they are never molested; but if they did not differ in form and colouring from other butterflies, or if they flew so quickly that their peculiarities could not be easily noticed, they would be captured, and though not eaten would be maimed or killed. As soon as the cause of the peculiarities of these butterflies was recognised, it was seen that the same explanation applied to many other groups of animals. Thus bees and wasps and other stinging insects are showily and distinctively coloured; many soft and apparently defenceless beetles, and many gay-coloured moths, were found to be as nauseous as the above-named butterflies; other beetles, whose hard and glossy coats of mail

render them unpalatable to insect-eating birds, are also sometimes showily coloured; and the same rule was found to apply to caterpillars, all the brown and green (or protectively-coloured species) being greedily eaten by birds, while showy kinds which never hide themselves—like those of the magpie-, mullein-, and burnet-moths — were utterly refused by insectivorous birds, lizards, frogs, and spiders. (*Contributions to Theory of Natural Selection*, p. 117.) Some few analogous examples are found among vertebrate animals. I will only mention here a very interesting case not given in my former work. In his delightful book entitled *The Naturalist in Nicaragua*, Mr. Belt tells us that there is in that country a frog which is very abundant, which hops about in the day-time, which never hides himself, and which is gorgeously coloured with red and blue. Now frogs are usually green, brown, or earth-coloured, feed mostly at night, and are all eaten by snakes and birds. Having full faith in the theory of protective and warning colours, to which he had himself contributed some valuable facts and observations, Mr. Belt felt convinced that this frog must be uneatable. He therefore took one home, and threw it to his ducks and fowls; but all refused to touch it except one young duck, which took the frog in its mouth, but dropped it directly, and went about jerking its head as if trying to get rid of something nasty. Here the uneatableness of the frog was predicted from its colours and habits, and we can have no more convincing proof of the truth of the theory than such previsions.

The universal avoidance by carnivorous animals of all these specially protected groups, which are thus entirely free from the constant persecution suffered by other creatures not so protected, would evidently render it advantageous for any of these latter which were subjected to extreme persecution to be mistaken for the former, and for this purpose it would be necessary that they should have the same colours, form, and habits. Strange to say, wherever there is an extensive group of directly-protected forms (division *a* of animals with warning colours), there are sure to be found a few otherwise defenceless creatures which resemble them externally so as to be mistaken for them, and which thus gain protection as it were on false pretences, (division *b* of animals with warning colours). This is what is called "mimicry," and it has already been very fully treated of by Mr. Bates (its discoverer), by myself, by Mr. Trimen, and others. Here it is only necessary to state that the uneatable Danaidæ and Acræidæ are accompanied by a few species of other groups of butterflies (Leptalidæ, Papilios, Diademas, and Moths) which are all really eatable, but which escape attack by their close resemblance to some species of the uneatable groups found in the same locality. In like manner there are a few eatable beetles which exactly resemble species of uneatable groups, and others which are soft, imitate those which are uneatable through their hardness. For the same reason wasps are imitated by moths, and ants by beetles; and even poisonous snakes are mimicked by harmless snakes, and dangerous hawks by defenceless cuckoos. How these curious imitations have been brought about, and the laws which govern them, have been discussed in the work already referred to.

The third class — Sexual Colours — comprise all cases in which the colours of the two sexes differ. This difference is very general, and varies greatly in amount, from a slight divergence of tint up to a radical change of coloration. Differences of this kind are found among all classes of animals in which the sexes are separated, but they are much more frequent in some groups than in others. In mammalia, reptiles, and fishes, they are comparatively rare and not great in amount, whereas among birds they are very frequent and very largely developed. So among

insects, they are abundant in butterflies, while they are comparatively uncommon in beetles, wasps, and hemiptera.

The phenomena of sexual variations of colour, as well as of colour generally, are wonderfully similar in the two analogous yet totally unrelated groups of birds and butterflies; and as they both offer ample materials, we shall confine our study of the subject chiefly to them. The most common case of difference of colour between the sexes, is for the male to have the same general hue as the females, but deeper and more intensified; as in many thrushes, finches, and hawks; and among butterflies in the majority of our British species. In cases where the male is smaller the intensification of colour is especially well pronounced, as in many of the hawks and falcons, and in most butterflies and moths in which the coloration does not materially differ. In another extensive series we have spots or patches of vivid colour in the male which are represented in the female by far less brilliant tints or are altogether wanting; as exemplified in the gold-crest warbler, the green woodpecker, and most of the orange-tip butterflies (*Anthocharis*). Proceeding with our survey we find greater and greater differences of colour in the sexes, till we arrive at such extreme cases as some of the pheasants, the chatterers, tanagers, and birds-of-paradise, in which the male is adorned with the most gorgeous and vivid colours, while the female is usually dull brown, or olive green, and often shows no approximation whatever to the varied tints of her partner. Similar phenomena occur among butterflies; and in both these classes there are also a considerable number of cases in which both sexes are highly coloured in a different way. Thus many woodpeckers have the head in the male red, in the female yellow; while some parrots have red spots in the male, replaced by blue in the female, as in *Psittacula diopthalma*. In many South American Papilios green spots on the male are represented by red on the female; and in several species of the genus *Epicalia*, orange bands in the male are replaced by blue in the female, a similar change of colour as in the small parrot above referred to. For fuller details of the varieties of sexual coloration we refer our readers to Mr. Darwin's *Descent of Man*, chapters x. to xviii., and to chapters iii. iv. and vii. of my *Contributions to the Theory of Natural Selection*.

The fourth group—of Typically-coloured animals—includes all species which are brilliantly or conspicuously coloured in both sexes, and for whose particular colours we can assign no function or use. It comprises an immense number of showy birds, such as Kingfishers, Barbets, Toucans, Lories, Tits, and Starlings; among insects most of the largest and handsomest butterflies, innumerable bright-coloured beetles, locusts, dragon-flies, and hymenoptera; a few mammalia, as the zebras; a great number of marine fishes; thousands of striped and spotted caterpillars; and abundance of mollusca, star-fish, and other marine animals. Among these we have included some, which like the gaudy caterpillars have warning colours; but as that theory does not explain the particular colours or the varied patterns with which they are adorned, it is best to include them also in this class. It is a suggestive fact, that all the brightly coloured birds mentioned above build in holes or form covered nests, so that the females do not need that protection during the breeding season, which I believe to be one of the chief causes of the dull colour of female birds when their partners are gaily coloured. This subject is fully argued in my *Contributions*, &c., chapter vii.

As the colours of plants and flowers are very different from those of animals both in their distribution and functions, it will be well to treat them separately: we will therefore now consider how the general facts of colour

here sketched out can be explained. We have first to inquire what is colour, and how it is produced; what is known of the causes of change of colour; and what theory best accords with the whole assemblage of facts.

The sensation of colour is caused by vibrations or undulations of the etherial medium of different lengths and velocities. The whole body of vibrations caused by the sun is termed radiation, and consists of sets of waves which vary considerably in their dimensions and their rate of vibration, but of which the middle portion only is capable of exciting in us sensations of light and colour. Beginning with the largest and slowest rays or wave-vibrations, we have first those which produce heat-sensations only; as they get smaller and quicker, we perceive a dull red colour; and as the waves increase in rapidity of vibration and diminish in size, we get successively sensations of orange, yellow, green, blue, indigo, and violet, all fading imperceptibly into each other. Then come more invisible rays, of shorter wave-length and quicker vibration, which produce, solely or chiefly, chemical effects. The red rays, which first become visible, have been ascertained to vibrate at the rate of 458 millions of millions of times in a second, the length of each wave being $\frac{1}{36000}$th of an inch; while the violet rays, which last remain visible, vibrate 727 millions of millions of times per second, and have a wave-length of $\frac{1}{64516}$th of an inch. Although the waves vibrate at different rates, they are all propagated through the ether with the same velocity (192,000 miles per second), just as different musical sounds, which are produced by waves of *air* of different lengths and rates of vibration, travel at the same rate, so that a tune played several hundred yards off reaches the ear in correct time. There are, therefore, an almost infinite number of different colour-producing vibrations, and these may be combined in an almost infinite variety of ways, so as to excite in us the sensation of all the varied colours and tints we are capable of perceiving. When all the different kinds of rays reach us in the proportion in which they exist in the light of the sun, they produce the sensation of white. If the rays which excite the sensation of any one colour are prevented from reaching us, the remaining rays in combination produce a sensation of colour often very far removed from white. Thus green rays being abstracted leave purple light; blue, orange-red light; violet, yellowish green light, and so on. These pairs are termed complementary colours. And if portions of differently coloured lights are abstracted in various degrees, we have produced all those infinite gradations of colours, and all those varied tints and hues which are of such use to us in distinguishing external objects, and which form one of the great charms of our existence. Primary colours would therefore be as numerous as the different wave-lengths of the visible radiations if we could appreciate all their differences, while secondary or compound colours caused by the simultaneous action of any combination of rays of different wave-lengths must be still more numerous. In order to account for the fact that all colours appear to us capable of being produced by combinations of three primary colours—red, green, and violet—it is believed that we have three sets of nerve fibres in the retina, each of which is capable of being excited by all rays, but that one set is excited most by the larger or red waves, another by the medium or green waves, and the third set chiefly by the violet or smallest waves of light; and when all three sets are excited together in proper proportions we see white. This view is supported by the phenomena of colour-blindness, which are explicable on the theory that one of these sets of nerve-fibres (usually that adapted to perceive red) has lost its sensibility, causing all colours to appear as if the red rays were abstracted from them. It is

another property of these various radiations, that they are unequally refracted or bent in passing obliquely through transparent bodies, the longer waves being least refracted, the shorter most. Hence it becomes possible to analyse white or any other light into its component rays; a small ray of sunlight, for example, which would produce a round white spot on a wall, if passed through a prism is lengthened out into a band of coloured light exactly corresponding to the colours of the rainbow. Any one colour can thus be isolated and separately examined, and by means of reflecting mirrors the separate colours can be again compounded in various ways, and the resulting colours observed. This band of coloured light is called a *spectrum*, and the instrument by which the *spectra* of various kinds of light are examined is called a *spectroscope*. This branch of the subject has, however, no direct bearing on the mode in which the colours of living things are produced, and it has only been alluded to in order to complete our sketch of the nature of colour.

The colours which we perceive in material substances are produced either by the absorption or by the interference of some of the rays which form white light. Pigmental or absorption-colours are the most frequent, comprising all the opaque tints of flowers and insects, and all the colours of dyes and pigments. They are caused by rays of certain wave-lengths being absorbed, while the remaining rays are reflected and give rise to the sensation of colour. When all the colour-producing rays are reflected in due proportion the colour of the object is white, when all are absorbed the colour is black. If blue rays only are absorbed the resulting colour is orange-red; and generally, whatever colour an object appears to us, it is because the complementary colours are absorbed by it. The reason why rays of only certain refrangibilities are reflected and the rest of the incident light absorbed by each substance, is supposed to depend upon the molecular structure of the body. Chemical action almost always implies change of molecular structure, hence chemical action is the most potent cause of change of colour. Sometimes simple solution in water effects a marvellous change, as in the case of the well-known aniline dyes; the magenta and violet dyes exhibiting, when in the solid form, various shades of golden or bronzy metallic green. Heat again often produces change of colour, and this without effecting any chemical change. Mr. Ackroyd has recently investigated this subject,[1] and has shown that a large number of bodies are changed by heat, returning to their normal colour when cooled, and that this change is almost always in the direction of the less refrangible rays or longer wave-lengths; and he connects the change with molecular expansion caused by heat. As examples may be mentioned mercuric-oxide, which is orange-yellow, but which changes to orange, red, and brown when heated; chromic-oxide, which is green, and changes to yellow; cinnabar, which is scarlet, and changes to puce; and metaborate of copper, which is blue, and changes to green and greenish yellow. The colouring matters of animals are very varied. Copper has been found in the red of the wing of the turaco, and Mr. Sorby has detected no less than seven distinct colouring matters in birds' eggs, several of which are chemically related to those of blood and bile. The same colours are often produced by quite different substances in different groups, as shown by the red of the wings of the burnet-moth changing to yellow with muriatic acid, while the red of the red-admiral-butterfly undergoes no such change.

These pigmental colours have a different character in animals according to their position in the integument. Following Dr. Hagen's classification, epidermal colours are those which exist in the external chitinised skin of insects, in the hairs of mammals, and, partially,

[1] "Metachromatism, or Colour-Change," *Chemical News*, August, 1876.

in the feathers of birds. They are often very deep and rich, and do not fade after death. The hypodermal colours are those which are situated in the inferior soft layer of the skin. These are often of lighter and more vivid tints, and usually fade after death. Many of the reds and yellows of butterflies and birds belong to this class, as well as the intensely vivid hues of the naked skin about the heads of many birds. These colours sometimes exude through the pores, forming an evanescent bloom on the surface.

Interference colours are less frequent in the organic world. They are caused in two ways: either by reflection from the two surfaces of transparent films, as seen in the soap-bubble and in thin films of oil on water; or by fine striæ which produce colours either by reflected or transmitted light, as seen in mother-of-pearl and in finely-ruled metallic surfaces. In both cases colour is produced by light of one wave-length being neutralised, owing to one set of such waves being caused to be half a wave length behind the other set, as may be found explained in any treatise on physical optics. The result is, that the complementary colour of that neutralised is seen; and as the thickness of the film or the fineness of the striæ undergo slight changes almost any colour can be produced. This is believed to be the origin of many of the glossy or metallic tints of insects, as well as of those of the feathers of some birds. The iridescent colours of the wings of dragon-flies are caused by the superposition of two or more transparent lamellæ; while the shining blue of the Purple-Emperor and other butterflies, and the intensely metallic colours of humming-birds are probably due to fine striæ.

This outline sketch of the nature of colour in the animal world, however imperfect, will at least serve to show us how numerous and varied are the causes which perpetually tend to the production of colour in animal tissues. If we consider, that in order to produce white all the rays which fall upon an object must be reflected in the same proportions as they exist in solar light, whereas if rays of any one or more kinds are absorbed or neutralised the resultant reflected light will be coloured, and that this colour may be infinitely varied according to the proportions in which different rays are reflected or absorbed, we should expect that white would be, as it really is, comparatively rare and exceptional in nature. The same observation will apply to black, which arises from the absorption of all the different rays. Many of the complex substances which exist in animals and plants are subject to changes of colour under the influence of light, heat, or chemical change, and we know that chemical changes are continually occurring during the physiological processes of development and growth. We also find that every external character is subject to minute changes, which are generally perceptible to us in closely allied species; and we can therefore have no doubt that the extension and thickness of the transparent lamellæ, and the fineness of the striæ or rugosities of the integuments, must be undergoing constant minute changes; and these changes will very frequently produce changes of colour. These considerations render it probable that colour is a normal and even necessary result of the complex structure of animals and plants, and that those parts of an organism which are undergoing continual development and adaptation to new conditions, and are also continually subject to the action of light and heat, will be the parts in which changes of colour will most frequently appear. Now there is little doubt that the external changes of animals and plants in adaptation to the environment are much more numerous than the internal changes, as seen in the varied character of the integuments and appendages of animals—hair, horns, scales, feathers, &c. &c.—and in plants, the leaves, bark, flowers, and fruit, with their various appendages,—compared with the comparative uniformity of the texture and compo-

sition of their internal tissues; and this accords with the uniformity of the tints of blood, muscle, nerve, and bone throughout extensive groups, as compared with the great diversity of colour of their external organs. It seems a fair conclusion that colour *per se* may be considered to be normal, and to need no special accounting for, while the absence of colour (that is, either *white* or *black*), or the prevalence of certain colours to the constant exclusion of others, must be traced, like other modifications in the economy of living things, to the needs of the species. Or, looking at it in another aspect, we may say, that amid the constant variations of animals and plants colour is ever tending to vary and to appear where it is absent, and that natural selection is constantly eliminating such tints as are injurious to the species, or preserving and intensifying such as are useful.

This view is in accordance with the well-known fact, of colours which rarely or never appear in the species in a state of nature continually occurring among domesticated animals and cultivated plants; showing us that the capacity to develop colour is ever present, so that almost any required tint can be produced which may, under changed conditions, be useful, in however small a degree.

Let us now see how these principles will enable us to understand and explain the varied phenomena of colour in nature, taking them in the order of our functional classification of colours (p. 389).

Theory of Protective Colours.—We have seen that obscure or protective tints in their infinitely varied degrees are present in every part of the animal kingdom, whole families or genera being often thus coloured. Now the various brown, earthy, ashy, and other neutral tints are those which would be most readily produced, because they are due to an irregular mixture of many kinds of rays; while pure tints require either rays of one kind only, or definite mixtures in proper proportions of two or more kinds of rays. This is well exemplified by the comparative difficulty of producing definite pure tints by the mixture of two or more pigments, while a hap-hazard mixture of a number of these will be almost sure to produce browns, olives, or other neutral or dirty colours. An indefinite or irregular absorption of some rays and reflection of others would, therefore, produce obscure tints; while pure and vivid colours would require a perfectly definite absorption of one portion of the coloured rays, leaving the remainder to produce the true complementary colour. This being the case we may expect these brown tints to occur when the need of protection is very slight or even when it does not exist at all, always supposing that bright colours are not in any way useful to the species. But whenever a pure colour is protective, as green in tropical forests or white among arctic snows, there is no difficulty in producing it, by natural selection acting on the innumerable slight variations of tint which are ever occurring. Such variations may, as we have seen, be produced in a great variety of ways; either by chemical changes in the secretions or by molecular changes in surface structure, and may be brought about by change of food, by the photographic action of light, or by the normal process of generative variation. Protective colours therefore, however curious and complex they may be in certain cases, offer no real difficulties.

Theory of Warning Colours.—These differ greatly from the last class, inasmuch as they present us with a variety of brilliant hues, often of the greatest purity, and combined in striking contrasts and conspicuous patterns. Their use depends upon their boldness and visibility, not on the presence of any one colour; hence we find among these groups some of the most exquisitely-coloured objects in nature. Many of the uneatable caterpillars are strikingly beautiful; while the Danaidæ, Heliconidæ, and protected groups of Papilionidæ com-

prise a series of butterflies of the most brilliant and contrasted colours. The bright colours of many of the sea-anemones and sea-slugs will probably be found to be in this sense protective, serving as a warning of their uneatableness. On our theory none of these colours offer any difficulty. Conspicuousness being useful, every variation tending to brighter and purer colours was selected, the result being the beautiful variety and contrast we find.

But when we come to those groups which gain protection solely by being mistaken for some of these brilliantly coloured but uneatable creatures, a difficulty really exists, and to many minds is so great as to be insuperable. It will be well therefore to endeavour to explain how the resemblance in question may have been brought about. The most difficult case, which may be taken as a type of the whole, is that of the genus *Leptalis* (a group of South American butterflies allied to our common white and yellow kinds), many of the larger species of which are still white or yellow, and which are all eatable by birds and other insectivorous creatures. But there are also a number of species of *Leptalis*, which are brilliantly red, yellow, and black, and which, band for band and spot for spot, resemble some one of the Danaidæ or Heliconidæ which inhabit the same district and which are nauseous and uneatable. Now the common objection is, that a slight approach to one of these protected butterflies would be of no use, while a greater sudden variation is not admissible on the theory of gradual change by indefinite slight variations. This objection depends almost wholly on the supposition that when the first steps towards mimicry occurred, the South American Danaidæ were what they are now, while the ancestors of the Leptalides were like the ordinary white or yellow Pieridæ to which they are allied. But the danaioid butterflies of South America are so immensely numerous and so greatly varied, not only in colour but in structure, that we may be sure they are of vast antiquity and have undergone great modification. A large number of them, however, are still of comparatively plain colours, often rendered extremely elegant by the delicate transparency of the wing-membrane, but otherwise not at all conspicuous. Many have only dusky or purplish bands or spots, others have patches of reddish or yellowish brown —perhaps the commonest colour among butterflies; while a considerable number are tinged or spotted with yellow, also a very common colour, and one especially characteristic of the Pieridæ, the family to which *Leptalis* belongs. We may therefore reasonably suppose that in the early stages of the development of the Danaidæ, when they first began to acquire those nauseous secretions which are now their protection, their colours were somewhat plain, either dusky with paler bands and spots, or yellowish with dark borders, and sometimes with reddish bands or spots. At this time they had probably shorter wings and a more rapid flight, just like the other unprotected families of butterflies. But as soon as they became decidedly unpalatable to any of their enemies, it would be an advantage to them to be readily distinguished from all the eatable kinds; and as butterflies were no doubt already very varied in colour, while all probably had wings adapted for pretty rapid or jerking flight, the best distinction might have been found in outline and habits; whence would arise the preservation of those varieties whose longer wings, bodies, and antennæ, and slower flight rendered them noticeable, — characters which now distinguish the whole group in every part of the world. Now it would be at this stage that some of the weaker-flying Pieridæ which happened to resemble some of the Danaidæ around them in their yellow and dusky tints and in the general outline of their wings, would be sometimes mistaken for them by the common enemy, and would thus gain an advantage in the struggle for exist-

ence. Admitting this one step to be made, and all the rest must inevitably follow from simple variation and survival of the fittest. So soon as the nauseous butterfly varied in form or colour to such an extent that the corresponding eatable butterfly no longer closely resembled it, the latter would be exposed to attacks, and only those variations would be preserved which kept up the resemblance. At the same time we may well suppose the enemies to become more acute and able to detect smaller differences than at first. This would lead to the destruction of all adverse variations, and thus keep up in continually increasing complexity the outward mimicry which now so amazes us. During the long ages in which this process has been going on, many a *Leptalis* may have become extinct from not varying sufficiently in the right direction and at the right time to keep up a protective resemblance to its neighbour; and this will accord with the comparatively small number of cases of true mimicry as compared with the frequency of those protective resemblances to vegetable or inorganic objects whose forms are less definite and colours less changeable. About a dozen other genera of butterflies and moths mimic the Danaidæ in various parts of the world, and exactly the same explanation will apply to all of them. They represent those species of each group which at the time when the Danaidæ first acquired their protective secretions happened outwardly to resemble some of them, and have by concurrent variation, aided by a rigid selection, been able to keep up that resemblance to the present day.[1]

[1] For fuller information on this subject the reader should consult Mr. Bates's original paper, "Contributions to an Insect-fauna of the Amazon Valley," in *Transactions of the Linnean Society*, vol. xxiii. p. 495; Mr. Trimen's paper in vol. xxvi. p. 497; the author's essay on "Mimicry," &c., already referred to; and, in the absence of collections of butterflies, the plates of Heliconidæ and Leptalidæ, in Hewitson's *Exotic Butterflies*, and Felder's *Voyage of the "Novara,"* may be examined.

Theory of Sexual Colours.—In Mr. Darwin's celebrated work, *The Descent of Man and Selection in Relation to Sex*, he has treated of sexual colour in combination with other sexual characters, and has arrived at the conclusion that all or almost all the colours of the higher animals (including among these insects and all vertebrates) are due to voluntary sexual selection; and that diversity of colour in the sexes is due, primarily, to the transmission of colour-variations either to one sex only or to both sexes, the difference depending on some unknown law, and not being due to natural selection.

I have long held this portion of Mr. Darwin's theory to be erroneous, and have argued that the primary cause of sexual diversity of colour was the need of protection, repressing in the female those bright colours which are normally produced in both sexes by general laws; and I have attempted to explain many of the more difficult cases on this principle ("A Theory of Birds' Nests," in *Contributions*, &c., p. 231). As I have since given much thought to this subject, and have arrived at some views which appear to me to be of considerable importance, it will be well to sketch briefly the theory I now hold, and afterwards show its application to some of the detailed cases adduced in Mr. Darwin's work.

The very frequent superiority of the male bird or insect in brightness or intensity of colour, even when the general tints and coloration are the same, now seem to me to be due to the greater vigour and activity and the higher vitality of the male. The colours of an animal usually fade during disease or weakness, while robust health and vigour adds to their intensity. This intensity of coloration is most manifest in the male during the breeding season, when the vitality is at a maximum. It is also very manifest in those cases in which the male is smaller than the female, as in the hawks and in most butterflies and moths. The same phenomena occur, though in a less marked degree, among

mammalia. Whenever there is a difference of colour between the sexes the male is the darker or more strongly marked, and difference of intensity is most visibled uring the breeding season; (*Descent of Man*, p. 533). Numerous cases among domestic animals also prove, that there is an inherent tendency in the male to special developments of dermal appendages and colour, quite independently of sexual or any other form of selection. Thus, "the hump on the male zebu cattle of India, the tail of fat-tailed rams, the arched outline of the forehead in the males of several breeds of sheep, and the mane, the long hairs on the hind-legs, and the dewlap of the male of the Berbura goat," are all adduced by Mr. Darwin as instances of characters peculiar to the male, yet not derived from any parent ancestral form. Among domestic pigeons the character of the different breeds is often most strongly manifested in the male birds; the wattle of the carriers and the eye-wattles of the barbs are largest in the males, and male pouters distend their crops to a much greater extent than do the females, and the cock fantails often have a greater number of tail-feathers than the females. There are also some varieties of pigeons of which the males are striped or spotted with black while the females are never so spotted (*Animals and Plants under Domestication*, I. 161); yet in the parent stock of these pigeons there are no differences between the sexes either of plumage or colour, and artificial selection has not been applied to produce them.

The greater intensity of coloration in the male—which may be termed the normal sexual difference, would be further developed by the combats of the males for the possession of the females. The most vigorous and energetic usually being able to rear most offspring, intensity of colour, if dependent on, or correlated with vigour, would tend to increase. But as differences of colour depend upon minute chemical or structural differences in the organism, increasing vigour acting unequally on different portions of the integument, and often producing at the same time abnormal developments of hair, horns, scales, feathers, &c., would almost necessarily lead also to variable distribution of colour, and thus to the production of new tints and markings. These acquired colours would, as Mr. Darwin has shown, be transmitted to both sexes or to one only, according as they first appeared at an early age, or in adults of one sex, and thus we may account for some of the most marked differences in this respect. With the exception of butterflies, the sexes are almost alike in the great majority of insects. The same is the case in mammals and reptiles, while the chief departure from the rule occurs in birds, though even here in very many cases the law of sexual likeness prevails. But in all cases where the increasing development of colour became disadvantageous to the female, it would be checked by natural selection, and thus produce those numerous instances of protective colouring in the female only, which occur in these two groups of animals.

There is also, I believe, a very important purpose and use of the varied colours of the higher animals, in the facility it affords for recognition by the sexes or by the young of the same species; and it is this use which probably fixes and determines the coloration in many cases. When differences of size and form are very slight, colour affords the only means of recognition at a distance or while in motion, and such a distinctive character must therefore be of especial value to flying insects which are continually in motion, and encounter each other, as it were, by accident. This view offers us an explanation of the curious fact, that among butterflies the females of closely-allied species in the same locality sometimes differ considerably, while the males are much alike; for as the males are the swiftest and the highest fliers and seek the females, it would evidently be advantageous

for them to be able to recognize their true partners at some distance off. This peculiarity occurs with many species of *Papilio*, *Diadema*, *Adolias*, and *Colias*. In birds such marked differences of colour are not required, owing to their higher organisation and more perfect senses, which render recognition easy by means of a combination of very slight differential characters. This principle may, perhaps, however, account for some anomalies of coloration among the higher animals. Thus, Mr. Darwin, while admitting that the hare and the rabbit are coloured protectively, remarks that the latter, while running to its burrow, is made conspicuous to the sportsman, and no doubt to all beasts of prey, by its upturned white tail. But this very conspicuousness while running away, may be useful as a signal and guide to the young, who are thus enabled to escape danger by following the older rabbits, directly and without hesitation, to the safety of the burrow; and this may be the more important from the semi-nocturnal habits of the animal. If this explanation is correct, and it certainly seems probable, it may serve as a warning of how impossible it is, without exact knowledge of the habits of an animal and a full consideration of all the circumstances, to decide that any particular coloration cannot be protective or in any way useful. Mr. Darwin himself is not free from such assumptions. Thus, he says: "The zebra is conspicuously striped, and stripes cannot afford any protection on the open plains of South Africa." But the zebra is a very swift animal, and, when in herds, by no means void of means of defence. The stripes therefore *may* be of use by enabling stragglers to distinguish their fellows at a distance, and they *may* be even protective when the animal is at rest among herbage—the only time when it would need protective colouring. Until the habits of the zebra have been observed with special reference to this point, it is surely somewhat hasty to declare that the stripes "cannot afford any protection."

The wonderful display and endless variety of colour in which butterflies and birds so far exceed all other animals, seems primarily due to the excessive development and endless variations of the integumentary structures. No insects have such widely expanded wings in proportion to their bodies as butterflies and moths; in none do the wings vary so much in size and form, and in none are they clothed with such a beautiful and highly-organized coating of scales. According to the general principles of the production of colour already explained, these long-continued expansions of membranes and developments of surface-structures must have led to numerous colour-changes, which have been sometimes checked, sometimes fixed and utilised, sometimes intensified, by natural selection, according to the needs of the animal. In birds, too, we have the wonderful clothing of plumage—the most highly organised, the most varied, and the most expanded of all dermal appendages. The endless processes of growth and change during the development of feathers, and the enormous extent of this delicately-organised surface, must have been highly favourable to the production of varied colour-effects, which, when not injurious, have been merely fixed for purposes of specific identification, but have often been modified or suppressed whenever different tints were needed for purposes of protection.

To voluntary sexual selection, that is, the actual choice by the females of the more brilliantly-coloured males, I believe very little if any effect is directly due. It is undoubtedly proved that in birds the females do sometimes exert a choice; but the evidence of this fact collected by Mr. Darwin (*Descent of Man*, chap. xiv.) does not prove that colour determines that choice, while much of the strongest evidence is directly opposed to this view. All the facts appear to be con-

sistent with the choice depending on a variety of male characteristics, with some of which colour is often correlated. Thus it is the opinion of some of the best observers that vigour and liveliness are most attractive, and these are no doubt usually associated with intensity of colour. Again, the display of the various ornamental appendages of the male during courtship may be attractive, but these appendages, with their bright colours or shaded patterns, are due probably to general laws of growth and to that superabundant vitality which we have seen to be a cause of colour. But there are many considerations which seem to show that the possession of these ornamental appendages and bright colours in the male is not an important character functionally, and that it has not been produced by the action of voluntary sexual selection. Amid the copious mass of facts and opinions collected by Mr. Darwin as to the display of colour and ornaments by the male birds, there is a total absence of any evidence that the females admire or even notice this display. The hen, the turkey, and the peafowl go on feeding while the male is displaying his finery, and there is reason to believe that it is his persistency and energy rather than his beauty which wins the day. Again, evidence collected by Mr. Darwin himself proves that each bird finds a mate under any circumstances. He gives a number of cases of one of a pair of birds being shot, and the survivor being always found paired again almost immediately. This is sufficiently explained on the assumption that the destruction of birds by various causes is continually leaving widows and widowers in nearly equal proportions, and thus each one finds a fresh mate; and it leads to the conclusion that permanently unpaired birds are very scarce; so that, speaking broadly, every bird finds a mate and breeds. But this would almost or quite neutralize any effect of sexual selection of colour or ornament, since the less highly-coloured birds would be at no disadvantage as regards leaving healthy offspring. If, however, heightened colour is correlated with health and vigour, and these healthy and vigorous birds provide best for their young, and leave offspring which, being equally healthy and vigorous, can best provide for themselves, then natural selection becomes a preserver and intensifier of colour. Another most important consideration is, that male butterflies rival or even excel the most gorgeous male birds in bright colours and elegant patterns; and among these there is literally not one particle of evidence that the female is influenced by colour or even that she has any power of choice, while there is much direct evidence to the contrary (*Descent of Man*, p. 318). The weakness of the evidence for sexual selection among these insects is so palpable that Mr. Darwin is obliged to supplement it by the singularly inconclusive argument that, "Unless the females prefer one male to another, the pairing must be left to mere chance, and this does not appear probable (*l.c.*, p. 317)." But he has just said—"The males sometimes fight together in rivalry, and many may be seen pursuing or crowding round the same female;" while in the case of the silk-moths, "the females appear not to evince the least choice in regard to their partners." Surely the plain inference from all this is, that males fight and struggle for the almost passive female, and that the most vigorous and energetic, the strongest-winged or the most persevering, wins her. How can there be chance in this? Natural selection would here act, as in birds, in perpetuating the strongest and most vigorous males, and as these would usually be the more highly coloured of their race, the same results would be produced as regards the intensification and variation of colour in the one case as in the other.

Let us now see how these principles will apply to some of the cases

adduced by Mr. Darwin in support of his theory of voluntary sexual selection.

In *Descent of Man*, 2nd ed., pp. 307-316, we find an elaborate account of the various modes of colouring of butterflies and moths, proving that the coloured parts are always more or less displayed, and that they have some evident relation to an observer. Mr. Darwin then says—"From the several foregoing facts it is impossible to admit that the brilliant colours of butterflies, and of some few moths, have commonly been acquired for the sake of protection. We have seen that their colours and elegant patterns are arranged and exhibited as if for display. Hence I am led to believe that the females prefer or are most excited by the more brilliant males; for on any other supposition the males would, as far as we can see, be ornamented to no purpose" (*l.c.*, p. 316). I am not aware that any one has ever maintained that the brilliant colours of butterflies have "commonly been acquired for the sake of protection," yet Mr. Darwin has himself referred to cases in which the brilliant colour is so placed as to serve for protection; as for example, the eye-spots on the hind wings of moths, which are pierced by birds and so save the vital parts of the insect, while the bright patch on the orange-tip butterflies which Mr. Darwin denies are protective, may serve the same purpose. It is in fact somewhat remarkable how very generally the black spots, ocelli, or bright patches of colour are on the tips, margins, or discs of the wings; and as the insects are necessarily visible while flying, and this is the time when they are most subject to attacks by insectivorous birds, the position of the more conspicuous parts at some distance from the body may be a real protection to them. Again, Mr. Darwin admits that the white colour of the male Ghost-moth may render it more easily seen by the female while flying about in the dusk, and if to this we add that it will be also more readily distinguished from allied species, we have a reason for diverse ornamentation in these insects quite sufficient to account for most of the facts, without believing in the selection of brilliant males by the females, for which there is not a particle of evidence. The facts given to show that butterflies and other insects can distinguish colours and are attracted by colours similar to their own, are quite consistent with the view that colour, which continually tends to appear, is utilised for purposes of identification and distinction, when not required to be modified or suppressed for purposes of protection. The cases of the females of some species of *Thecla*, *Callidryas*, *Colias*, and *Hipparchia*, which have more conspicuous markings than the male, may be due to several causes: to obtain greater distinction from other species, for protection from birds, as in the case of the yellow-underwing moths, while sometimes—as in *Hipparchia*—the lower intensity of colouring in the female may lead to more contrasted markings. Mr. Darwin thinks that here the males have selected the more beautiful females, although one chief fact in support of his theory of voluntary sexual selection is, that throughout the whole animal kingdom the males are usually so ardent that they will accept any female, while the females are coy, and choose the handsomest males, whence it is believed the general brilliancy of males as compared with females has arisen.

Perhaps the most curious cases of sexual difference of colour are those in which the female is very much more gaily coloured than the male. This occurs most strikingly in some species of *Pieris* in South America, and of *Diadema* in the Malay islands, and in both cases the females resemble species of the uneatable Danaidæ and Heliconidæ, and thus gain a protection. In the case of *Pieris pyrrha*, *P. malenka*, and *P. lorena*, the males are plain white and black, while the females are orange, yellow, and black, and so banded and spotted as exactly to

resemble species of Heliconidæ. Mr. Darwin admits that these females have acquired these colours as a protection; but as there is no apparent cause for the strict limitation of the colour to the female, he believes that it has been kept down in the male by its being *unattractive* to her. This appears to me to be a supposition opposed to the whole theory of sexual selection itself. For this theory is, that minute variations of colour in the male are *attractive* to the female, have always been selected, and that thus the brilliant male colours have been produced. But in this case he thinks that the female butterfly had a constant aversion to every trace of colour, even when we must suppose it was constantly recurring during the successive variations which resulted in such a marvellous change in herself. But if we consider the fact that the females frequent the forests where the Heliconidæ abound, while the males fly much in the open, and assemble in great numbers with other white and yellow butterflies on the banks of rivers, may it not be possible that the appearance of orange stripes or patches would be as injurious to the male as it is useful to the female, by making him a more easy mark for insectivorous birds among his white companions? This seems a more probable supposition, than the altogether hypothetical choice of the female, sometimes exercised in favour of and sometimes against every new variety of colour in her partner.

The full and interesting account given by Mr. Darwin of the colours and habits of male and female birds (*Descent of Man*, chapters xiii. and xiv.), proves that in most, if not in all cases, the male birds fully display their ornamental plumage, before the females and in rivalry with each other; but on the essential point of whether the female's choice is determined by minute differences in these ornaments or in their colours, there appears to be an entire absence of evidence. In the section on "*Preference for particular Males by the Females*," the facts quoted show indifference to colour, except that some colour similar to their own seems to be preferred. But in the case of the hen canary, who chose a greenfinch in preference to either chaffinch or goldfinch, gay colours had evidently no preponderating attraction. There is some evidence adduced that female birds may, and probably do, choose their mates, but none whatever that the choice is determined by difference of colour; and no less than three eminent breeders informed Mr. Darwin that they "did not believe that the females prefer certain males on account of the beauty of their plumage." Again, Mr. Darwin himself says: "as a general rule colour appears to have little influence on the pairing of pigeons." The oft-quoted case of Sir R. Heron's peahens which preferred an "old pied cock" to those normally coloured, is a very unfortunate one, because pied birds are just those that are not favoured in a state of nature, or the breeds of wild birds would become as varied and mottled as our domestic varieties. If such irregular fancies were not rare exceptions the production of definite colours and patterns by the choice of the female birds, or in any other way, would be impossible.

We now come to such wonderful developments of plumage and colour as are exhibited by the peacock and the Argus-pheasant; and I may here mention that it was the case of the latter bird, as fully discussed by Mr. Darwin, which first shook my belief in "sexual," or more properly "female" selection. The long series of gradations, by which the beautifully shaded ocelli on the secondary wing-feathers of this bird have been produced, are clearly traced out, the result being a set of markings, so exquisitely shaded as to represent "balls lying loose within sockets,"—purely artificial objects of which these birds could have no possible knowledge. That this result should have been attained through thousands and tens

of thousands of female birds all preferring those males whose markings varied slightly in this one direction, this uniformity of choice continuing through thousands and tens of thousands of generations, is to me absolutely incredible. And, when further, we remember that those which did not so vary would also, according to all the evidence, find mates and leave offspring, the actual result seems quite impossible of attainment by such means.

Without pretending to solve completely so difficult a problem, I would point out a circumstance which seems to afford a clue. It is, that the most highly-coloured and most richly-varied markings, occur on those parts of the plumage which have undergone the greatest modification, or have acquired the most abnormal development. In the peacock, the tail-coverts are enormously developed, and the "eyes" are situated on the greatly dilated ends. In the birds of paradise, breast, or neck, or head, or tail-feathers, are greatly developed and highly coloured. The hackles of the cock, and the scaly breasts of humming-birds are similar developments; while in the Argus-pheasant the secondary quills are so enormously lengthened and broadened as to have become almost useless for flight. Now it is easily conceivable, that during this process of development, inequalities in the distribution of colour may have arisen in different parts of the same feather, and that spots and bands may thus have become broadened out into shaded spots or ocelli, in the way indicated by Mr. Darwin, much as the spots and rings on a soap bubble increase with increasing tenuity. This is the more probable, as in domestic fowls varieties tend to become symmetrical, quite independently of sexual selection. (*Descent of Man*, p. 424.)

If now we accept the evidence of Mr. Darwin's most trustworthy correspondents, that the choice of the female, so far as she exerts any, falls upon the "most vigorous, defiant, and mettlesome male;" and if we further believe, what is certainly the case, that these are as a rule the most brightly coloured and adorned with the finest developments of plumage, we have a real and not a hypothetical cause at work. For these most healthy, vigorous, and beautiful males will have the choice of the finest and most healthy females, will have the most numerous and healthy families, and will be able best to protect and rear those families. Natural selection, and what may be termed male selection, will tend to give them the advantage in the struggle for existence, and thus the fullest plumage and the finest colours will be transmitted, and tend to advance in each succeeding generation.

There remains, however, what Mr. Darwin evidently considers his strongest argument — the display by the male of each species of its peculiar beauties of plumage and colour. We have here, no doubt, a very remarkable and very interesting fact; but this too may be explained by general principles, quite independent of any choice or volition of the female bird. During pairing-time, the male bird is in a state of great excitement, and full of exuberant energy. Even unornamented birds flutter their wings or spread them out, erect their tails or crests, and thus give vent to the nervous excitability with which they are overcharged. It is not improbable that crests and other erectile feathers may be primarily of use in frightening away enemies, since they are generally erected when angry or during combat. Those individuals who were most pugnacious and defiant, and who brought these erectile plumes most frequently and most powerfully into action, would tend to increase them by use, and to leave them further developed in some of their descendants. If, in the course of this development, colour appeared, we have every reason to believe it would be most vivid in these most pugnacious and energetic

individuals, and as these would always have the advantage in the rivalry for mates (to which advantage the excess of colour and plumage might sometimes conduce), there seems nothing to prevent a progressive development of these ornaments in *all dominant races*, that is, wherever there was such a surplus of vitality, and such complete adaptation to conditions, that the inconvenience or danger produced by them, was so comparatively small as not to affect the superiority of the race over its nearest allies. If then those portions of the plumage, which were originally erected and displayed, became developed and coloured, the actual display, under the influence of jealousy or sexual excitement becomes intelligible. The males, in their rivalry with each other, would see what plumes were most effective, and each would endeavour to excel his enemy as far as voluntary exertion could effect it, just as they endeavour to rival each other in song, even sometimes to the point of causing their own destruction.

There is also a general argument against Mr. Darwin's views on this question, founded on the nature and potency of "natural" as opposed to "sexual" selection, which appears to me to be itself almost conclusive of the whole matter at issue. Natural selection, or the survival of the fittest, acts perpetually and on an enormous scale. Taking the offspring of each pair of birds as, on the average, only six annually, one-third of these at most will be preserved, while the two-thirds which are least fitted will die. At intervals of a few years, whenever unfavourable conditions occur, five-sixths, nine-tenths, or even a greater proportion of the whole yearly production are weeded out, leaving only the most perfect and best adapted to survive. Now unless these survivors are on the whole the most ornamental, this rigid selective power must neutralise and destroy any influence that may be exerted by female selection. For the utmost that can be claimed for this is, that a small fraction of the least ornamented do not obtain mates, while a few of the most ornamented may leave more than the average number of offspring. Unless, therefore, there is the strictest correlation between ornament and general perfection, the former can have no permanent advantage; and if there is (as I maintain) such a correlation, then the sexual selection of ornament for which there is little or no evidence becomes needless, because natural selection which is an admitted *vera causa* will itself produce all the results. In the case of butterflies the argument becomes even stronger, because the fertility is so much greater, and the weeding out of the unfit takes place, to a great extent, in the egg and larvæ state. Unless the eggs and larva which escaped to produce the next generation were those which would produce the more highly-coloured butterflies, it is difficult to perceive how the slight preponderance of colour sometimes selected by the females, should not be wholly neutralised by the extremely rigid selection for other qualities to which the offspring in every stage are exposed. The only way in which we can account for the observed facts is, by the supposition that colour and ornament are strictly correlated with health, vigour, and general fitness to survive. We have shown that there is reason to believe that this is the case, and if so, voluntary sexual selection becomes as unnecessary as it would certainly be ineffective.

There is one other very curious case of sexual colouring among birds—that, namely, in which the female is decidedly brighter or more strongly marked than the male; as in the fighting quails (*Turnix*), painted snipe (*Rhynchæa*), two species of phalarope (*Phalaropus*), and the common cassowary (*Casuarius galeatus*). In all these cases, it is known that the males take charge of and incubate the eggs, while the females are almost always larger and more pugnacious. In my "Theory of Birds' Nests" (*Natural Selection*,

p. 251), I imputed this difference of colour to the greater need for protection by the male bird while incubating, to which Mr. Darwin has objected that the difference is not sufficient, and is not always so distributed as to be most effective for this purpose, and he believes that it is due to reversed sexual selection, that is, to the female taking the usual *rôle* of the male, and being chosen for her brighter tints. We have already seen reason for rejecting this latter theory in every case, and I also admit that my theory of protection is, in this case, only partially if at all applicable. But the general theory of intensity of colour being due to general vital energy is quite applicable; and the fact that the superiority of the female in this respect is quite exceptional, and is therefore probably not of very ancient date in any one case, will account for the difference of colour thus produced being always comparatively slight.

Theory of Typical Colours.—The remaining kinds of animal colours—those which can neither be classed as protective, warning, nor sexual, are for the most part readily explained on the general principles of the development of colour which we have now laid down. It is a most suggestive fact, that, in cases where colour is required only as a warning, as among the uneatable caterpillars, we find, not one or two glaring tints only but every kind of colour disposed in elegant patterns, and exhibiting almost as much variety and beauty as among insects and birds. Yet here, not only is sexual selection out of the question, but the need for recognition and identification by others of the same species, seems equally unnecessary. We can then only impute this variety to the normal production of colour in organic forms, when fully exposed to light and air and undergoing great and rapid developmental modification. Among more perfect animals, where the need for recognition has been added, we find intensity and variety of colour at its highest pitch among the South American butterflies of the families Heliconidæ and Danaidæ, as well as among the Nymphalidæ and Erycinidæ, many of which obtain the necessary protection in other ways. Among birds also, wherever the habits are such that no special protection is needed for the females, and where the species frequent the depths of tropical forests and are thus naturally protected from the swoop of birds of prey, we find almost equally intense coloration; as in the trogons, barbets, and gapers.

Of the mode of action of the general principles of colour-development among animals, we have an excellent example in the humming-birds. Of all birds these are at once the smallest, the most active, and the fullest of vital energy. When poised in the air their wings are invisible, owing to the rapidity of their motion, and when startled they dart away with the rapidity of a flash of light. Such active creatures would not be an easy prey to any rapacious bird; and if one at length was captured, the morsel obtained would hardly repay the labour. We may be sure, therefore, that they are practically unmolested. The immense variety they exhibit in structure, plumage, and colour, indicates a high antiquity for the race, while their general abundance in individuals shows that they are a dominant group, well adapted to all the conditions of their existence. Here we find everything necessary for the development of colour and accessory plumes. The surplus vital energy shown in their combats and excessive activity, has expended itself in ever-increasing developments of plumage, and greater and greater intensity of colour, regulated only by the need for specific identification which would be especially required in such small and mobile creatures. Thus may be explained those remarkable differences of colour between closely-allied species, one having a

crest like the topaz, while in another it resembles the sapphire, The more vivid colours and more developed plumage of the males, I am now inclined to think may be wholly due to their greater vital energy, and to those general laws which lead to such superior developments even in domestic breeds; but in some cases the need of protection by the female while incubating, to which I formerly imputed the whole phenomenon, may have suppressed a portion of the ornament which she would otherwise have attained.

Another real, though as yet inexplicable cause of diversity of colour, is to be found in the influence of locality. It is observed that species of totally distinct groups are coloured alike in one district, while in another district the allied species all undergo the same change of colour. Cases of this kind have been adduced by Mr. Bates, by Mr. Darwin, and by myself, and I have collected all the more curious and important examples in my Address to the Biological Section of the British Association at Glasgow in 1876. The most probable cause for these simultaneous variations would seem to be the presence of peculiar elements or chemical compounds in the soil, the water, or the atmosphere, or of special organic substances in the vegetation; and a wide field is thus offered for chemical investigation in connection with this interesting subject. Yet, however we may explain it, the fact remains of the same vivid colours in definite patterns being produced in quite unrelated groups, which only agree, so far as we yet know, in inhabiting the same locality.

Let us now sum up the conclusion at which we have arrived, as to the various modes in which colour is produced or modified in the animal kingdom.

The various causes of colour in the animal world are, molecular and chemical change of the substance of their integuments, or the action on it of heat, light or moisture. It is also produced by interference of light in superposed transparent lamellæ, or by excessively fine surface striæ. These elementary conditions for the production of colour are found everywhere in the surface-structures of animals, so that its presence must be looked upon as normal, its absence as exceptional.

Colours are fixed or modified in animals by natural selection for various purposes; obscure or imitative colours for concealment—gaudy colours as a warning—and special markings, either for easy recognition by strayed individuals, females, or young, or to direct attack from a vital part, as in the large brilliantly-marked wings of some butterflies and moths.

Colours are produced or intensified by processes of development,—either where the integument or its appendages undergo great extension or modification, or where there is a surplus of vital energy, as in male animals generally, and more especially at the breeding-season.

Colours are also more or less influenced by a variety of causes, such as the nature of the food, the photographic action of light, and also by some unknown local action probably dependent on chemical peculiarities in the soil or vegetation.

These various causes have acted and reacted in a variety of ways, and have been modified by conditions dependent on age or on sex, on competition with new forms, or on geographical or climatic changes. In so complex a subject, for which experiment and systematic inquiry has done so little, we cannot expect to explain every individual case, or solve every difficulty; but it is believed that all the great features of animal coloration and many of the details become explicable on the principles we have endeavoured to lay down.

It will perhaps be considered presumptuous to put forth this sketch of the subject of colour in animals, as a substitute for one of Mr. Darwin's most highly elaborated theories—that of voluntary or perceptive sexual selec-

tion; yet I venture to think that it is more in accordance with the whole of the facts, and with the theory of natural selection itself; and I would ask such of my readers as may be sufficiently interested in the subject, to read again chapters xi. to xvi. of the *Descent of Man*, and consider the whole theory from the point of view here laid down. The explanation of almost all the ornaments and colours of birds and insects as having been produced by the perceptions and choice of the females has, I believe, staggered many evolutionists, but has been provisionally accepted because it was the only theory that even attempted to explain the facts. It may perhaps be a relief to some of them, as it has been to myself, to find that the phenomena can be shown to depend on the general laws of development, and on the action of "natural selection," which theory will, I venture to think, be relieved from an abnormal excrescence, and gain additional vitality by the adoption of my view of the subject.

Although we have arrived at the conclusion that tropical light and heat can in no sense be considered the cause of colour, there remains to be explained the undoubted fact that all the more intense and gorgeous tints are manifested by the animal life of the tropics, while in some groups, such as butterflies and birds, there is a marked preponderance of highly-coloured species. This is probably due to a variety of causes, some of which we can indicate, while others remain to be discovered. The luxuriant vegetation of the tropics throughout the entire year, affords so much concealment, that colour may there be safely developed to a much greater extent than in climates where the trees are bare in winter, during which season the struggle for existence is most severe, and even the slightest disadvantage may prove fatal. Equally important, probably, has been the permanence of favourable conditions in the tropics, allowing certain groups to continue dominant for long periods, and thus to carry out in one unbroken line whatever developments of plumage or colour may once have acquired an ascendency. Changes of climatal conditions, and pre-eminently the glacial epoch, probably led to the extinction of a host of highly-developed and finely-coloured insects and birds in temperate zones, just as we know that it led to the extinction of the larger and more powerful mammalia which formerly characterised the temperate zone in both hemispheres. This view is supported by the fact, that it is amongst those groups only which are now exclusively tropical, that all the more extraordinary developments of ornament and colour are found. The local causes of colour will also have acted best in regions where the climatal conditions remained constant, and where migration was unnecessary; while whatever direct effect may be produced by light or heat, will necessarily have acted more powerfully within the tropics. And lastly, all these causes have been in action over an actually greater area in tropical than in temperate zones, while estimated potentially, in proportion to its life-sustaining power, the lands which enjoy a practically tropical climate (extending as they do considerably beyond the geographical tropics), are very much larger than the temperate regions of the earth. Combining the effects of all these various causes we are quite able to understand the superiority of the tropical parts of the globe, not only in the abundance and variety of their forms of life, but also as regards the ornamental appendages and vivid coloration which these forms present.

A. R. Wallace.

To be continued.

THE SMILE AND THE SIGH.

A LONELY Smile, which smiled in sadness,
Once hailed upon the passing breeze
A new-born Sigh, which sighed in gladness
To give a restless mortal ease.

The Smile and Sigh soon formed a union—
A union everlasting, blest—
Whereby, in brotherly communion,
Each worked to give the other rest.

Thus, mutually their toils relieving,
They lived in peaceful light and shade;
No petty jealousies conceiving,
Of nought, not even Death, afraid.

And when, with friendship still unbroken,
Fate caused them for a time to part,
Each of the other kept a token,
To prove the two were one at heart.

For, smiling, the Sigh to Heaven was carried
On angels' golden wings one day,
While, sighing, the Smile on earth still tarried,
And lent its charm to lifeless clay.

Till then, this world was often dreary,
But *since* then (so the legend saith),
Death's sigh gives Life unto the weary
Life's smile itself illumines Death.

GERMAN SOCIETY FORTY YEARS SINCE.

In 1841-3 Mrs. Austin was in Germany, and met most of the celebrated men and women of that epoch. Some of the stories jotted down by her during a prolonged residence in Dresden and Berlin seem too good to be lost, while others show considerable insight into German life. The brothers Grimm appear to have been the most sympathetic people she met in Berlin About Jacob Grimm she writes thus:—

"His exterior is striking and engaging. He has the shyness and simplicity of a German man of letters, but without any of the awkward, uncouth air which is too common among them. His is a noble, refined head, full of intelligence, thought, and benevolence, and his whole exterior is full of grandeur—at the same time perfectly simple. Wilhelm is also a fine-looking man, younger, fatter, and more highly-coloured; less imposing, less refined, but with a charming air of goodnature, *bonhomie* and sense. His wife is also very pleasing. I met him one night at tea, and we began talking of fairy tales; I said, 'Your children appear to me the happiest in the world; they live in the midst of *Mährchen* (fairy tales).' 'Ah,' said he, 'I must tell you about that. When we were at Göttingen somebody spoke to my little son about his father's *Mährchen*. He came running to me and said with an offended air, "Vater, man sagt du hast die *Mährchen* geschrieben—nicht wahr, du hast nicht solches Dummezeug gemacht?" ('Father, people say that you have written the fairy tales—surely you never invented such rubbish?') He thought it below my dignity,' said Grimm. Somehow the child had never seen or attended to the fact of his father's authorship."

Another story of Grimm's:—

"When I was a young man I was walking one day and saw an officer in the old-fashioned uniform. It was under the old Elector. The officers still wore pigtails, cocked hats set over one eye, high neck-cloths, and coats buttoned back. As he was walking stiffly along, a groom came by riding a horse which he appeared to be breaking in. 'What mare is that you are riding?' called out the major with an authoritative, disdainful air. 'She belongs to Prince George,' answered the groom. 'Ah——h!' said the major, raising his hand reverentially to his hat with a military salute, and bowing low to the mare. I told this story," continued Grimm, "to Prince B. thinking to make him laugh. But he looked grave, and said, with quite a tragic tone of voice, 'Ah, that feeling is no longer to be found!'"

"Jacob Grimm told me a *Volksmährchen* too:—

"'St. Anselm was grown old and infirm, and lay on the ground among thorns and thistles. *Der liebe Gott* said to him, "You are very badly lodged there; why don't you build yourself a house?" "Before I take the trouble," said Anselm, "I should like to know how long I have to live." "About thirty years," said *der liebe Gott*. "Oh, for so short a time," replied he, "it's not worth while," and turned himself round among the thistles.'

"Bettina von Arnim called, and we had a *tête-à-tête* of two hours. Her conversation is that of a clever woman, with some originality, great conceit, and vast unconscious ignorance. Her sentiments have a bold and noble character. We talked about crime, punishment, prisons, education, law of divorce, &c., &c. Gleams of truth and sense, clouds of nonsense—all tumbled out with equally undoubting confidence. Occasional great fidelity of expression. Talking of the so-called happiness and security of ordinary marriages in Germany, she said, 'Qu'est que cela me fait? Est-ce que je me soucie de

ces nids qu'on arrange pour propager?' I laughed out; one must admit that the expression is most happy. She talked of the ministers with great contempt, and said, 'There is not a *man* in Germany; have you seen one for whom you could feel any enthusiasm? They are all like frogs in a big pond;—well, well, let them splash their best. What have we to do with their croaking?' Some things she said about the folly of attacking full-grown, habitual vice, by legislation, prison discipline, &c., were very true, and showed a great capacity for just thought. But what *did* she mean, or what did Schleiermacher mean, for she quoted him, by saying, 'la péché est une grâce de Dieu?' These are things people say to make one stare.—Among other divorce cases we talked of was the following:—Herr S——, a distinguished man, between fifty and sixty, with grown-up children and a wife who for five-and-twenty years had stood by his side a true and faithful partner through good and evil fortune—especially a great deal of the latter. A certain Madame A——, a woman about thirty, *bien conservée*, rather pretty, and extremely coquettish, made it her business to please Mr. S——, and succeeded so well that he soon announced to his wife his desire to be divorced from her, and to marry Madame A——, who on her side was to divorce her husband. Poor Madame S—— could hardly believe her senses. She was almost stupefied. She expostulated, resisted, pleaded their children—marriageable daughters—all in vain. Mr. S—— said he could not be happy without Madame A——. In short, as may be imagined, he wore out his wife's resistance, and the blameless, repudiated, and heart-broken wife took her children and retired into Old Prussia. Madame A—— then became Madame S——. But the most curious thing was that the *ci-devant* husband remained on terms of the greatest intimacy, and became the tame cat of the house. When Mr. S—— went a journey his wife accompanied him a certain way, and Mr. A—— went with them to escort her back, as a matter of course.

"At a ball given at C——, Mr. and Madame S—— were invited. He came alone, and apologised to the lady of the house about his wife's absence. She hoped Madame S—— was not ill. 'Oh no; but Mr. A—— has just arrived, and you understand she could not leave him alone the first evening.'

"My maid Nannie told me a curious illustration of the position of servants here. The maid belonging to the master of the house, has, it seems, a practice of running out, and being gone for hours without leave. On Sunday last she had leave; Monday, ditto; Tuesday, ditto; and was out the whole of those evenings. Wednesday she took leave, and did not return till after ten. Her mistress asked her where she had been; she refused to answer, on which her mistress pressed her. 'Well,' she said, 'if I won't tell you, you can't hang me for it.' With which answer the lady went away content. Another day the master, who is lame, came down into the kitchen and said, 'I have left my spectacles; I wish you would run up for them.' 'Oh,' said she, 'I am washing dishes.' The droll thing is that they say they are only too glad to have this steady and obliging person, because she is honest—a thing almost unknown here.

"A great many ladies in Berlin have evenings on which they receive—especially the ministers' wives—not their friends, but all the world. If you don't go for two or three weeks, they tell you of it—the number of omissions is chalked up against you. Nor, except in two or three of the more exotic, can you look in for half-an-hour and come away. People ask you why you go, and where you are going to. In many houses you are expected to take leave. Then you have the satisfaction of being told where you were last night, and what you said; who sat next you, and especially that you did not admire Berlin, or something in it. Of course you deny, equivocate, palliate, lie. If you have the

smallest pretension to be *vornehm* (fine), you can only live Unter den Linden, or in the Wilhelms-strasse.

"Social life does not exist in Berlin, though people are always in company, and one is, as Ranke said, *gehetzt* (hunted). In the fashionable parties one always sees the same faces—faces possessed by *ennui*. The great matter is for the men to show their decorations and the women their gowns, and to be called *excellency*. Generally speaking, it strikes me that the Prussians have no confidence in their own individual power of commanding respect. Much as they hold to all the old ideas and distinctions about birth, even that does not enable them to assume an upright independent attitude, not even when combined with wealth. Count G——, a man of old Saxon nobility, with large estates and the notions and feelings of an English aristocrat, tells me that he is completely *shouldered* in Berlin society, because he neither has nor will have any official title, wears no orders, and, in short, stands upon his own personal distinctions. The idea of going about the world stark naked to one's mere name. Mr. Pitt, Mr. Fox, Mr. Canning—a German would be ashamed!

"The other day I went up three pair of stairs to call on a nice little professor's wife. Arrived at the top, I rang the bell, and out comes a great hulking maid, who looks down upon me from a height of three or four steps. 'Is Madame G—— at home?' Answer (stereotype) 'I don't know;' after a pause—'Do you mean the Frau Professorin?' 'Yes, Madame G——.' On this out rushes a second maid, looks half stupid, half indignant—'What, do you mean the Frau Geheimräthin?' The joke was now too good to drop. I said again, 'I mean Madame G——, as it seems you do not hear distinctly; take my card to Madame G——.' I was admitted with the usual words, 'most agreeable,' and found the very pleasant Frau Professorin Geheimräthin, for she is both, whose servants seem ashamed of her name. Yet it is a name very illustrious in learning.

"Till a man is *accroché* on the court by some title, order, office, or what not, he may be fairly said not to exist. The Germans are becoming clamorous for freer institutions, but how much might they emancipate themselves. A vast deal of this servility is perfectly voluntary, but it seems in the blood. They dislike the King of Hanover as much as we do; but when Madame de L—— whispered to me at a ball, 'Voilà votre Prince et Seigneur,' and I replied in no whisper, 'Prince oui, mais grâce à Dieu, Seigneur non.' She looked frightened, and so did all the ladies round her—and why? He could do them no more harm than me.

"In Dresden I met the Grand Duke of Saxe Weimar, who told me the following anecdote on the authority of his mother-in-law the Empress of Russia:—'When Paul and his wife went to Paris, they were called, as is well-known, le Comte and la Comtesse du Nord. The Comtesse du Nord accompanied Marie Antoinette to the theatre at Versailles. Marie Antoinette pointed out, behind her fan, *aussi honnêtement que possible*, all the distinguished persons in the house. In doing this she had her head bent forward; all of a sudden she drew back with such an expression of terror and horror that the Comtesse said, "Pardon, madame, mais je suis sûre que vous avez vu quelque chose qui vous agite." The queen, after she had recovered herself, told her that there was about the court, but not of right belonging to it, a woman who professed to read fortunes on cards. One evening she had been displaying her skill to several ladies, and at length the queen desired to have her own destiny told. The cards were arranged in the usual manner, but when the woman had to read the result, she looked horror-struck and stammered out some generalities. The queen insisted on her saying what she saw, but she declared she could not. "From that time," said Marie Antoinette, "the sight of that woman produces in me a feeling, I cannot describe, of aversion and horror, and she seems

studiously to throw herself in my way!"'

"The Grand Duke told very curious stories about a sort of second sight; especially of a Princess of S—— who was, I believe, connected with the House of Saxony. It is the custom among them to allow the bodies of their deceased relations to lie in state, and all the members of the family go to look at them. The Princess was a single woman, and not young. She had the faculty, or the curse, of always seeing, not the body actually exposed but the next member of the family who was to die. On one occasion a child died, she went to the bedside and said, 'I thought I came to look at a branch but I see the tree.' In less than three weeks the father was dead. The Grand Duke told me several other instances of the same kind. But this faculty was not confined to deaths. A gentleman whom the Grand Duke knew and named to me, went one day to visit the Princess, as soon as she saw him she said, 'I am delighted to see you, but why have you your leg bound up?' 'Oh,' said her sister, Princess M——, 'it is not bound up; what are you talking of?' '*I* see that it is,' she said. On his way home his carriage was upset and his leg broken.

"I was saying that the Italians would not learn German. Madame de S—— said, 'I perfectly understand that; I had a French *bonne*, and when a child spoke French better than German. When the French were masters in Germany, M. de St. Aignan was resident at the court of Weimar. He and other French officers used to come every evening to my mother's house. I never spoke a word, I never appeared to understand a word. When the news of the battle of Leipsig arrived, M. de St. Aignan escaped through our garden. I was alone when he came to ask permission, and I answered him very volubly in French. "Mais, mademoiselle," said he, astonished, "vous parlez le Français comme l'Allemand. J'ai toujours cru que vous n'en comprenez pas un mot." "C'est que je n'ai pas voulu," replied I.'

"This in a young girl who talked well and liked to talk, shows great resolution, and is a curious proof of the strength of the hatred of French rule.

"I went to see *Figaro's Hochzeit*, not *Le Nozze di Figaro*. If you have a mind to understand why the Italians can never be reconciled to Austrian rulers go to see *Figaro's Hochzeit*. A Herr Dettmer, from Frankfurt, did Figaro, a good singer, I have no doubt, and not a bad, *i.e.*, an absurd, actor. But Figaro, the incarnation of southern vivacity, *espièglerie* and joyous grace! Imagine a square, thick-set man, with blond hair and a broad face, and that peculiar manner of standing and walking with the knees in, the heels stuck into the earth and the toes in the air, which one sees only in Germany. I thought of Piuco, a young Maltese, never, I believe, off his tiny island—whom I last saw in that part. I saw before me his *élancé* and supple figure, his small head clustered round with coal-black hair, his delicately turned jetty moustache, his truly Spanish costume, the sharp knee just covered by the breeches tied with gay ribbons, and the elastic step of the springing foot and high-bounding instep. What a contrast!—and what can Art do against Nature in such a case? Then the women; I had seen] Ronzi de Begnis in the Countess. What a Countess! What a type of southern voluptuous grace, of high and stately beauty and indolent charm! Imagine a long-faced, lackadaisical-looking German woman, lean and high-shouldered, and with that peculiar construction of body which German women now affect. An enormously long waist, laced in to an absurd degree, and owing its equally extravagant rotundity below to the tailor. 'Happy we,' says Countess Hahn-Hahn—'who, with so many ells of muslin or silk, can have a beautiful figure.'

"The Susanna was a pretty waiting-maid. How far that is from a Spanish Susanna, it is beyond me to say.

Cherubino was the best, but he was only an *espiègle* boy playing at being in love—not the page whose head is turned at the sight of a woman. Then the language!

"After all, how immensely does this inaptitude of Germans to represent *Figaro* raise Mozart in our estimation; for he had not only to represent, but to conceive the whole—and what a conception. The sweet breath of the south vibrating in every note. Variety, grace, lightness, passion, *naïveté*, and, above all, a stately elegance which no one ever approached. His *Don Giovanni* and his *Almaviva* contain the most courtly, graceful, stately music that ever was conceived; and nothing like it *was* ever conceived. Only the real grandee, courtier, and fine gentleman could express himself so.

"Now, as a set-off, I must say what Germans can do, and what I am quite sure we English cannot in these days.

"I went to see Schiller's *Braut von Messina*. I expected little. The piece is essentially lyric rather than dramatic. The long speeches, thought I, will be dull, the choruses absurd; the sentiments are pagan. What have Spanish nobles to do with a Nemesis, with oracles, with a curse, like that on the house of Athens—with sustained speeches, the whole purport of which is *incusare Deos?*

"Well, I was wrong. In the opening scene, Mademoiselle Berg has to stand for a quarter-of-an-hour between two straight lines of senators and to make a speech—*rien que cela!* Can anything be more difficult? Yet such was the beauty of her declamation of Schiller's majestic verse, such the solemnity and propriety, grace and dignity of her action, that at every moment one's interest rose. Her acting through the whole of this arduous part gave me the highest idea of her sense and culture. Tenderness and passion were nicely proportioned to the austere character and sculptural beauty of the piece. I cannot at this moment recollect ever to have seen an actress, French or English, who could have done it as well. Mademoiselle Rachel, with all her vast talents as a declaimer, would have been too hard for the heart-stricken mother.

"Emil Devrient's *Don Cesar* was quite as good. His acting in the last scene, where Beatrice entreats him to live, was *frightfully* good. The attempts at paternal tenderness, instantly relapsing into the fatal passion, ignorantly conceived, made one's heart stand still. And yet such was the extreme delicacy of his art, one felt none of the disgust which attends every allusion to such love. One saw before one only the youth vainly struggling with the hereditary curse of his house—the doomed victim and instrument of the vengeance of an implacable destiny.

"Anything more thoroughly heathenish than the play I cannot conceive, and I much question if an English audience would sit it out—on that score—not to mention others. We should find it our duty to be shocked. The audience last night was thin; those who went were probably attracted by Schiller's name, and knew that such "horrid opinions" once existed in Greece, and that a poet imitating Greek tragedy might represent Greek modes of thinking. In short, we did not feel ourselves the least compromised by the Queen of Sicily's attack upon the gods—nor the least more disposed to quarrel with our fate.

"The Chorus is, as in duty bound, *versöhnend* (conciliatory). The amount of the comfort, it is true, often is, 'It can't be helped;' but even this is so nobly and beautifully expressed that one is satisfied. The Chorus has every imaginable claim to be a bore. They deal in good advice, moral reflections, and consolation of the new and satisfactory kind above mentioned. Yet so great is the majestic, harmonious, composed beauty of Schiller's verse, so much greater the eternal beauty of truth and virtue, that the old men's words fall on one's heart like drops of balm, and one feels calmed and invigorated for the struggle with life. The Chorus spoken, and in parts by all the voices at once, can never have a good effect — but somehow or other *cela allait*. Such

are the triumphs of the true poet and artist."

The following anecdote dates from before the Russian emancipation :—

"The Archbishop of Erlau told me that at the time the Russian troops were stationed in Hungary, he and another gentleman were walking in the streets of —— and suddenly heard a woman cry out. In a moment she ran into the street exclaiming that a Russian soldier had robbed or was about to rob her. Such complaints were very frequent and sometimes unfounded. The soldiers could not make themselves understood, and took up things without meaning to rob. Be that as it may, two Russian officers were passing and heard the woman's story. They instantly collared the man, threw him down on the pavement, and, without making the smallest inquiry into the facts, they then and there spurred him to death. This, said the Archbishop, I saw, with infinite horror and disgust."

Here we have a story which, though not absolutely new, is too good to be omitted :—

"Dr. F—— told me the following story of Voltaire, which I never met with before. Voltaire had for some reason or other taken a grudge against the prophet Habakkuk, and affected to find in him things he never wrote. Somebody took the Bible and began to demonstrate to him that he was mistaken. 'C'est égal,' said he, with an air of impatience, 'Habakkuk était capable de tout!'

"Two days before we left Dresden, as I was dressing to go out, Nannie, my maid, came into my room and said two ladies wanted to see me. She said she had never seen them—they said I did not know them. I sent to say that I was sorry but I could not receive them, as Madame de S—— was already waiting for me. Nannie came back with the answer that they would wait in the anteroom—they only wanted to speak to me for a moment. Annoyed at being forced to commit a rudeness, I hurried on my gown and went out. In the anteroom were a middle-aged lady and a young one. I broke out into apologies, &c., upon which the elder lady said, in German, 'Pardon me for being so pressing. I only wished to give my daughter strength for the battle of life.' I was literally confounded at the oddness of this address, and remained dumb. It seemed her daughter wished to translate from the English. After a short explanation she turned to her daughter, and pointing to me, said, 'Now, my dear, you have seen the mistress, so we will not keep her any longer.' And so they went. I threw myself into a chair, and, alone as I was, burst into an uncontrollable fit of laughter. This is as good a piece of Germanism as is to be found in any novel. Even my Dresden friends thought it quite amazing.

"Dr. Waagen and I were talking of the danger of disputing the authenticity of pictures. I said I had rather tell a man he's a rascal than that his pictures are copies. 'Yes,' said Waagen, 'I always compare a man, the genuineness of whose pictures is attacked, to a lioness defending her young.'

"We afterwards came upon intercourse with princes. Waagen said, Wilhelm von Humboldt, who was a great friend and patron of his when a young man, once said to him—'My dear friend, your position will probably bring you into frequent contact with royalty. Take one piece of advice from me; always regard them as wild beasts in cages, and the courtiers as keepers. You see how noble and gentle and beautiful they look. But if you begin to put your hand through the bars and play with them, then you'll feel their claws and fangs. Always ask the keepers first what sort of humour they are in.'

"Countess H——, wife of the Mecklenburg Minister, a Rubens beauty, and a very good-natured woman, told me she was invited to a grand dinner party at V—— to meet an English great lady. The hour was five. After everybody waiting till six, the hosts determined to sit down. Some time after dinner was begun, Lady —— came in.

The hostess began to regret, hoped nothing had happened, &c.

"'Non, madame, c'est que je n'avais pas faim,' was the refined and graceful reply.

"At a dinner party we were talking of Niebuhr, Varnhagen von Ense's article, &c. They spoke of his arrogance and caprice, which they said he had in common with all Holsteiners. He was much disliked by the Germans at Rome, partly for these qualities, partly for his parsimony and want of hospitality.

"Herr von Raumer said—'I went to his house one evening, and we *nearly* succeeded in boiling some hot water for tea, but not quite.' Niebuhr told him that it was a serious thing to associate with Amati the Roman archæologist, because he frequented a certain wine-house called the Sabina, where the wine was dear. Amati was keeper of the Chigi library, and held a post in the Vatican. His learning and judgment were universally acknowledged. He was particularly well known for his transcription and collation of codices, and a man whom any one might be proud to know.

"When the late King was at Rome, Niebuhr did the honours so badly that the King was quite impatient. He showed him little fragments of things in which he could take no interest, and none of the great objects. One day Niebuhr spoke of Palestrina. 'What is that?' said the King. 'What, your Majesty does not know that?' exclaimed Niebuhr in a tone of astonishment. The King was extremely annoyed, and turning round to some one said, 'Stuff and nonsense; it's bad enough never to have learnt anything, without having it proclaimed aloud.'

"Niebuhr's ideas about his own importance, and his excessive cowardice were such, said B——, that at the time of the Carbonari affairs, he actually wrote home to the Prussian Government that the whole of this conspiracy was directed against himself.

"In the steamer from Mainz to Bonn was—*inter alios*—an individual of the genus *Rath*. He sat opposite to us at dinner on the deck, and first attracted my attention by the following reply to his neighbour, a man who appeared to entertain the profoundest admiration for him. 'Oh, yes, there are lots of *theorists* in the world, only too many. *I* represent *den gesunden Menschenverstand* (sound common sense).' Delighted at this declaration, I raised my eyes and saw a face beaming with the most undoubting self-complacency. He went on to detail certain schemes of his for the good of his country—Oldenburg, as it seemed. My husband began to interrogate him about Oldenburg, and I said all I knew of it was from Justus Möser. The worthy Rath looked at me amazed, and said this was the first time he ever heard Justus Möser mentioned by a lady. I said so much the worse, there is an infinity of good sense in his writings. Yes, but he never expected to hear of his being read by a lady, and that I was evidently the second representative of sound common sense in the world, 'worthy to be *my* disciple,' added he with emphasis."

JANET ROSS.

MUTUAL LIFE ASSURANCE.

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is conducted solely in the interest of its own Members who, by moderate payments, secure Benefits to themselves in advanced life, and to their Representatives at Death, whenever that event may happen.

LIBERAL SURRENDER VALUES,

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Scottish Widows' Fund Society.

ANNUAL REVENUE.	EXISTING ASSURANCES.	ASSURANCE FUND.
£800,000.	£20,000,000.	£6,200,000.

ABSTRACT OF 63D ANNUAL REPORT.
YEAR 1876.

IN the course of the year, **2694** Proposals were made to the Society for the assurance of sums amounting to **£1,605,198**. Of these Proposals **2221** were accepted, adding **£1,264,994** to the sums assured by the Society, and **£40,982** to the premium revenue. The Claims occasioned by the death of **379** Members amounted to **£539,387**, including Bonus or Profit Additions, which, on an average, increased the sums assured by **43** per cent. The Funds of the Society, including uninvested balances, yielded an average interest of **£4 : 5 : 7** per cent.

Assurances effected before 31*st December next rank for Four Years' Bonuses at next Division of Profits in* 1880.

BRANCH OFFICES:

London, 28 CORNHILL.—*West End Agency*, 49 PALL MALL.

Dublin, 41 WESTMORELAND STREET.
Glasgow, 114 WEST GEORGE STREET.
Manchester, ALBERT SQUARE.
Liverpool, 48 CASTLE STREET.
Birmingham, 12 BENNETT'S HILL.
Leeds, 21 PARK ROW.
Bristol, 22 COLLEGE GREEN.
Belfast, 2 HIGH STREET.
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HEAD OFFICE,
9 ST. ANDREW SQUARE, EDINBURGH,
May 1877.

SAMUEL RALEIGH, *Manager.*
AW. H. TURNBULL, *Secretary.*

Copies of the last Annual Report with Accounts, Prospectuses, and Forms of Proposals, may be obtained on application at any of the Society's Offices or Agencies.

CLEOPATRA'S NEEDLE is about to be erected in London. Every one ought to endeavour to deserve a monument more enduring than the famous obelisk by doing his best to banish disease—that barrier to all progress—from our midst.

LORD BEACONSFIELD

Justly stated the other day that "the health of the people is really the foundation upon which all their happiness and power as a state depend." For the most practical mode of preventing disease and premature death see a large illustrated sheet given with each bottle of Eno's Fruit Salt. The information is invaluable. As an INVIGORATING Summer Beverage, or as a HEALTH-GIVING, REFRESHING, COOLING, and Invigorating Beverage, or as a gentle laxative and tonic in the various forms of indigestion, use ENO'S FRUIT SALT (prepared from sound ripe fruit). It is the best preventive and cure for Billiousness, Sick Headache, Skin Eruptions, Impure Blood, Pimples on the Face, Giddiness, Feverishness, Feverish Colds, Mental Depression, Want of Appetite, Sourness of the Stomach, Constipation, Vomiting, Thirst, &c., and to remove the effects of errors of eating and drinking.

WHAT EVERYBODY WANTS TO KNOW.

A gentleman writes:—"Since I have used ENO'S Fruit Salt, night and morning, my headaches, &c., have left me, and this after suffering for *above* twenty years. You should make this fact well known."

A lady writes:—"Everything, medicine or food, ceased to act properly for at least three months before I commenced taking it: the little food I could take generally punished me or returned. My life was one of great suffering, so that I must have succumbed before long. To me and our family it has been a great earthly blessing. I feel I cannot say too much for it. The least I can do is to do my best to make the Fruit Salt known to other sufferers. I am getting better rapidly, and expect to totally recover, after spending hundreds of pounds in travelling about for twelve years."

ENO'S FRUIT SALT.—Messrs. Gibson and Son, Chemists, of Hexham, say:—"Since we introduced your Fruit Salt at Hexham, a few months ago, we have sold upwards of 1,000 bottles, and it gives general satisfaction, as customers who get it almost always recommend it to their friends. We have had numerous instances of its great efficacy in the cure of billious headaches, indigestion, or stomach complaints, &c."

"14, Rue de la Paix, Paris, Jan. 16, 1877.

"A gentleman called in yesterday. He is a constant sufferer from chronic dyspepsia, and has taken all sorts of mineral waters. I recommended him to give your Salt a trial, which he did, and received great benefit. He says he never knew what it was to be without pain until he tried your Salt, and for the future shall never be without it in the house. M. Beral."

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