

and *Stenobothrus*, etc., 'The Hares of Herts' (with Fuller and many), 1833, and 'The Hibernian Knight,' 1815; Lodge's 'Plants Illustrated with Fossiliferous Strata,' 1850, and 'The Great Continent,' 1856, the volumes of Patrick Murray's 'Practical Works,' 1833, is rarely, but as Mr. David Laing has promised to write an Introduction, it will be kept back all that is relevant. The Oxford list is Lord Bunsford's 'History of Great,' 1839, 'The Mares upon Chester Moors,' 1833, and 'A Sacred Memoir,' 1816. The second of these volumes is unique; but, unfortunately, wants the whole of sheet II. This will be supplied from the second edition of 1850; failing it, from the third edition of 1859 in the last title. The Council is indebted to Dr. George Knapp for the loan of Lodge's 'Outline Sketches in the Hibernian,' 1811, and 'The Mountains of Great Wey,' 1856, the contents of which are so rapidly altered. It was supposed that the second part of the *Stenobothrus* MS. would have been ready for issue at this time, but the relative has proceeded so slowly that the requisite number of pages is not yet printed. It will probably be given with next issue.

Two papers concerned the death last week of Mr. John Hodgkin. He was a member of the bar, a brother of the late Dr. Hodgkin, and a leading writer on topics connected with the Society of Friends.

REVIEWS

Insectivorous Plants. By Charles Darwin, M.A. F.R.S. With Illustrations. (Morsey.)

It is not intended to be a review as should take exception to the title of this work. Mr. Darwin, as we shall presently show, presents a vast body of evidence to substantiate his opinion that insects, and animal matters generally, are not only captured by, but digested and absorbed by, certain plants. Further he, not only says this, but even proclaims that any plant actually devours any insect. In the case of the higher animals, the first process in the act of dining is that of prehension—the prey must first be caught. The animal dies, and is then, and by an effort of will, in the various insect-catching plants, prehension is a much more complicated process. Certain hares and certain plants make a sticky secretion, which, as we may presently see, is attracted to some prey in the vicinity. As a bait is caught with this secretion, so the prey is caught in a pitfall by the attraction from the plant, except being rendered the more impracticable by the fact that the latter, sometimes the white lead, or considerable portions of it, exhibits a kind of retro action, by virtue of which, when attracted by the bait, the prey is repelled, they move on the surface of the sticky plant &c. The sticky nature is then finally withdrawn, so that we are returned to the nature of the sticky and well-known kind of animal prehension. But, to proceed, while prehension of food in the first may lead to the higher animals and in those insect-catching plants, the necessary stages are different. There is not prehension in the case of the plant, there is an swallowing process, and, therefore, an instantaneous light is appearing to the term "insectivorous" as applied to this volume. It may be thought that this

is mere splitting, and so, in a sense, it is; but in another sense we hold it to be justified by the necessity of pointing some check on the old-fashioned style of writing which is fast giving its period scientific literature, a style which will describe rather than advance the real progress of science. It adds the temptation is great. The general public have in the many cases, been so led in scientific works, from the fact that there is little chance of any expounding with, much more appreciating the severely simple style in which scientific writers should express themselves.

Let us at once hasten to say that the author of this book is guilty of no such fault of expression. If objections may be raised to the title, there can be made to the style. On the contrary, Mr. Darwin's book may be held up as a model of what a treatise should be that is addressed to intelligent readers, a majority of whom, if to be pronounced, have no special acquaintance with the matter under consideration. In style it is strongly marked with Darwinian characteristics. The opening passage, indeed, showing the difference of subject, is drawn up almost precisely in the same way as that which occurs in simpler one of the 'Origin of Species.' We have had before us the same evidence that led the author to present his remarks in the first instance, at the least as 1859; then, step by step, we are treated to the history of those researches; that is added in that, inference to inference, till at length the body of evidence, direct and indirect, becomes so overwhelming, that there is no little chance of overlooking Mr. Darwin's conclusions on them in a day or so, except when one has too long sought in the usual course of a reviewer. The ordinary, as perhaps needless, the suggestions are to the knowledge the lessons of others, even in this as in the rest of Mr. Darwin's books. These theories and observations, as we venture to call them, are only expounded by the apparently unobtainable positions with which he has prepared the observations and experiments throughout many years. All this must be acknowledged even by those who refuse to accept the validity of Mr. Darwin's reasoning and conclusions. The statement of facts is himself put forward may always be confidently relied on. The statements of others which he cites may not in all cases be so trustworthy; and yet Mr. Darwin himself seems to attach no such importance to them as to the very researches. The ordinary reader will probably do so too, but the scientific reader must be more elastic in this regard, and, indeed, it would be to us, for he will soon find that the degree of perfection of Mr. Darwin's observations is, in many cases, considerably above the average of that of other papers.

The lower having been sought, say to the fact of a number of flowers, the latter clearly but surely useful and doing the intended. The sticky secretion of the glands gives place to one of an acid nature, and of more solvent power. The other names of the contents are derived by the aid of the acid and not of a ferment like the points found in animal stomachs. The evidence of this latter is as yet seen a matter of inference than of actual demonstration. In any case, solution and subsequently absorption of sensitive matter takes place. The fact is that these cases thus perform the functions of the stomach,

and intestinal canal of animals. One difference, then, which need to be laid down between plants and animals, to the effect that the one had, and the other had not, a stomach, is shown to be only partially true. But the reader may perhaps impatiently with the remark:—The nature of insects may be after all a merely mechanical or rather chemical process, and so on. No doubt in a sense it is, but it is something more, and for the reason that certain substances are more freely dissolved than others, and some are not at all acted on. It is a matter of fact, we find that while almost any substance may, by the irritation caused by its impact, cause the movements of the sensitive hairs to which we have alluded, it is substances into the composition of which nitrogen enters, such as meat, albumen, fibrin, cartilage, the pulps of livers, &c., that cause this motion more particularly, and it is almost exclusively such substances which are dissolved and absorbed by the plant. In this statement, altogether, the great solvent nature of albumen, constitutes one of the few exceptions.

We must leave the reader to consider for himself the evidence adduced by Mr. Darwin. All that we say of it is that it is direct and positive, that it is convincing, that it is based on actual eyes and ears again for a series of years in rigorous investigation, and, therefore, it comes before us with every claim for acceptance. A vast number of substances were experimented with, and always with similar results. Among them we may especially allude to the results of the experiments with salts of ammonia. These make great activity in the middle hairs, even in much less readily small quantities than the various solutions of the ammoniacal salts to be less effective than hares, for it must be remembered we have here seen merely an indication of the existence of a particular substance, such as it given by the spectroscopy, but direct evidence of a certain effect produced by a certain substance. We have here a parallel case to the practically infinite availability of matter down in the case of such, parties of which, we need to be contented of yet comprehend the whole a distinct impression on the ordinary person. This power of absorbing nitrogenous matters by means of the glandular hairs, as illustrated by Mr. Darwin, is a certain point gained for vegetable life. With such a vast quantity of nitrogen in the atmosphere, it has always been a matter for surprise that it should not be absorbed by the lower life. Mr. Darwin's researches show that at least under certain conditions it may be done. Indeed, we would gladly repeat that these experiments and conclusions will prove the starting point of new lines of thought and investigation, and opening an entirely new chapter in physiology. The various opposite effects produced by some substances as contrasted with others will, we think not, also lead to important practical results in plant-cultivation as also in medicine.

The function of the glandular hairs in plants, as may be guessed long, what we have often stated, were considerable doubtless, though Mr. Darwin is careful not to commit himself, as to the statement that they are necessary, as in all cases, abundant as well as covering organs. The abundance of these glands, in many cases on the flowers, stems, or in the leaves themselves, as, for instance, in

and Diamonds,' n.d., 'The Knave of Harts : Haille Fellow well met,' 1612, and 'The Melancholie Knight,' 1615; Lodge's 'Phyllis : Honoured with Pastorall Sonnets,' 1593, and 'The Divil Coniured,' 1596. The volume of Patrick Hannay's Poetical Works, 1622, is ready; but as Mr. David Laing has promised to write an Introduction, it will be kept back till that is printed. The Council has in hand Rowlands's 'Betraying of Christ,' 1598, 'Tis Merrie when Gossips Meete,' 1602, and 'A Sacred Memorie,' 1618. The second of these volumes is unique; but, unfortunately, wants the whole of sheet E. This will be supplied from the second edition of 1605; failing it, from the third edition of 1609 in the Bodleian. The Council is indebted to Dr. George Kingsley for the loan of Lodge's 'Catharos : Diogenes in his Singularity,' 1591, and 'The Wounds of Ciuill War,' 1594, the reprints of which are to appear shortly. It was expected that the second part of the Bannatyne MS. would have been ready for issue at this time, but the collation has proceeded so slowly that the requisite number of pages is not yet printed. It will probably be given with next issue.

THE papers announced the death last week of Mr. John Hodgkin. He was a member of the bar, a brother of the late Dr. Hodgkin, and a leading writer on topics connected with the Society of Friends.

SCIENCE

Insectivorous Plants. By Charles Darwin, M.A. F.R.S. With Illustrations. (Murray.)

If we were inclined to be captious we should take exception to the title of this work. Mr. Darwin, as we shall presently show, presents a vast body of evidence to substantiate his opinion that insects, and animal matters generally, are not only captured by, but dissolved and absorbed by, certain plants. Neither he, nor any one else, has ever pretended that any plant actually devours any insect. In the case of the higher animals, the first process in the art of dining is that of prehension,—the hare must first be caught. The animal does this consciously, and by an effort of will. In the various insect-catching plants, prehension is a much more mechanical process. Certain hairs and certain glands exude a sticky secretion, which, we may presume, is attractive in some way to the insect. As a bird is caught with bird-lime, so the unhappy insect is detained a prisoner by the secretion from the plant, escape being rendered the more impracticable by the fact that the hairs, sometimes the whole leaf, or considerable portions of it, exhibit a kind of reflex action, by virtue of which, when stimulated by the impact of the insect, they move as the leaflets of the sensitive plant do. The unhappy insect is thus literally vivisected: a fact we commend to the notice of the amiable and well-meaning band of anti-vivisectionists. But, to proceed, while prehension of food is the first step both in the higher animals and in these fly-catching plants, the succeeding stages are different. There is no mastication in the case of the plant, there is no swallowing process, and, therefore, we are technically right in objecting to the term "insectivorous" as used in this volume. It may be thought that this

is mere quibbling, and so, in a sense, it is; but in another sense we hold it to be justified by the necessity of putting some check on the *ad captandum* style of writing which is beginning to pervade scientific literature, a style which will impede rather than advance the real progress of science. We admit the temptation is great. The general public have, in too many cases, been so fed on unwholesome, frothy literary diet, that there is little chance of their sympathizing with, much more appreciating, the severely simple style in which scientific writers should express themselves.

Let us at once hasten to say that the author of this book is guilty of no such faults of expression. If objections may be raised to his title, none can be made to his style. On the contrary, Mr. Darwin's book may be held up as a model of what a treatise should be that is addressed to intelligent readers, a majority of whom, it is to be presumed, have no special acquaintance with the matters under consideration. In style it is strongly marked with Darwinian characteristics. The opening passage, indeed, allowing for difference of subject, is drawn up almost precisely in the same way as that which ushers in chapter one of the 'Origin of Species.' We have laid before us the circumstances that led the author to pursue his researches in the first instance, so far back as 1860; then, step by step, we are treated to the history of those researches; fact is added to fact, inference to inference, till at length the body of evidence, direct and indirect, becomes so overwhelming, that there is as little chance of controverting Mr. Darwin's conclusions as there is for a fly to escape when once it has been caught in the cruel embrace of a sun-dew. The modesty, the perfect candour, the scrupulous care to acknowledge the labours of others, even in the most trifling particulars, are as apparent in this as in the rest of Mr. Darwin's books. These Darwinian characteristics, as we venture to call them, are only equalled by the apparently inexhaustible patience with which he has pursued his observations and experiments throughout many years. All this must be acknowledged even by those who refuse to accept the validity of Mr. Darwin's reasonings and conclusions. The statement of facts he himself puts forward may always be confidently relied on. The statements of others which he cites may not in all cases be so trustworthy; and yet Mr. Darwin himself seems to attach as much importance to them as to his own researches. The ordinary reader will probably do so too, but the scientific reader must be more eclectic in this respect, and, indeed, is certain to be so, for he will soon find that the degree of perfection of Mr. Darwin's observations is, to say the least, considerably above the average of that of other people.

The insect having been caught, say on the leaf of a sun-dew (*Drosera*), the hairs slowly but surely enfold and clasp the intruder. The sticky secretion of the glands gives place to one of an acid nature, and of more solvent power. The softer tissues of the creature are dissolved by the aid of this solvent and of a ferment like the pepsin formed in animal stomachs. The existence of this latter is as yet more a matter of inference than of actual demonstration. In any case, solution and subsequently absorption of nutritive matter takes place. The leaf in these cases thus performs the functions of the stomach

and intestinal canal of animals. One difference, then, which used to be laid down between plants and animals, to the effect that the one had, and the other had not, a stomach, is shown to be only partially true. But the reader may perhaps interpose with the remark:—this solution of insects may be after all a merely mechanical or rather chemical process, and so on. No doubt in a sense it is, but it is something more, and for the reason that certain substances are more freely dissolved than others, and some are not at all acted on. As a matter of fact, we find that while almost any substance may, by the irritation caused by its impact, cause the movements of the sensitive hairs to which we have alluded, it is substances into the composition of which nitrogen enters, such as meat, albumen, fibrin, cartilage, the pollen of flowers, &c., that excite this motion more particularly, and it is almost exclusively such substances which are dissolved and absorbed by the plant. To this statement chlorophyll, the green colouring matter of leaves, constitutes one of the few exceptions.

We must leave the reader to examine for himself the evidence adduced by Mr. Darwin. All that we can say of it is that it is direct and positive, that it is cumulative, that it has been subjected over and over again for a series of years to rigorous investigation, and, therefore, it comes before us with every claim for acceptance. A vast number of substances were experimented with, and always with similar results. Among them we may specially allude to the results of the experiments with salts of ammonia. These excite great activity in the mobile hairs, even in such inconceivably small quantities that the numerous dilutions of the homeopaths seem to be less ridiculous than heretofore, for it must be remembered we have here not merely an indication of the existence of a particular substance, such as is given by the spectroscope, but direct evidence of a certain effect produced by a certain substance. We have here a parallel case to the practically infinite divisibility of matter shown in the case of musk, particles of which, too small to be conceived of, yet nevertheless produce a distinct impression on the olfactory nerves. This power of absorbing nitrogenous matters by means of the glandular hairs, as illustrated by Mr. Darwin, is a cardinal point gained for vegetable physiology. With such a vast quantity of nitrogen in the atmosphere, it has always been a matter for surprise that it should not be absorbed by the leaves. Mr. Darwin's researches show that at least under certain conditions it may be so. Indeed, we confidently expect that these experiments and conclusions will prove the starting-points of new lines of thought and investigation, and open up an entirely new chapter in plant-history. The curiously opposite effects produced by some substances as contrasted with others will, we doubt not, also lead to important practical results in plant-cultivation as also in medicine.

The functions of the glandular hairs in plants, as may be gleaned from what we have before stated, receive considerable elucidation, though Mr. Darwin is careful not to commit himself to the statement that they are necessarily, and in all cases, absorbent as well as secreting organs. The abundance of these glands, in some cases on the flower-stems, or on the flowers themselves, as, for instance, in

the orange hawkweed (*Hieracium aurantiacum*), in which plant the glands in question are almost exclusively confined to the spots mentioned, suggests the idea that absorption of nitrogenous matters may be necessary for the full development of the seed or of the embryo within it. Indeed, as in the case of Mr. Darwin's other books, the suggestions for further investigation, the new lines of research opened up for would-be naturalists, are numerous and important.

The plants specially alluded to in this volume are the sun-dews (*Drosera*), Venus's fly-trap (*Dionæa*), bladder-wort (*Utricularia*), butter-wort (*Pinguicula*), and some others. The pitcher plants, *Nepenthes*, *Sarracenia*, *Cephalotus*, &c., are only incidentally alluded to, but, no doubt, they have similar properties, as we have frequently extracted half-digested insects, including cockroaches, from the pitchers of *Nepenthes*, while Dr. Hooker has observed the gradual digestion of morsels of cartilage by the same plants.

Throughout the volume but little reference is made to Mr. Darwin's theories of evolution and natural selection, though it is easy to see how the facts would fit these theories as well as they do the ideas of adaptation and design. In conclusion, we lay this book down with increased admiration for Mr. Darwin as a discoverer and expositor of facts, and with great satisfaction at the increase to our knowledge of plant-physiology given us, as well as the ample promise of further additions as the direct consequence of the present publication.
