III. Botany and Zoology.

1. Karl Koch, *Vorlesungen über Dendrologie. Lectures on Dendrology*, delivered in Berlin in the winter semester of 1874–75. Stuttgart, F. Enke, 1875, pp. 408, 8vo.—These are the notes of a course of popular lectures by Prof. Koch, on a subject in which he is thoroughly at home. They must have been delightful to hear, as they are pleasant to read, and are full of interesting matter. It is only the first course of a series which is to be continued this winter. The first division, of seven lectures, is a history of landscape gardens and gardening. The second division, of as many more, treats of the structure, growth, and life of trees, of the influence of woods upon mankind, and as regulators of temperature and atmospherical changes. The third division, in four lectures, treats of Coniferous trees,—all in a popular way. Prof. Koch insists that the two willows confounded as forms of the Weeping Willow, are neither of them Persian or Assyrian, except by immigration, but natives of a farther east, i. e., of China and Japan. One of them may have reached Western Asia, however, early enough to have been collected by Tournefort, and so to excuse the error fixed by Linnæus by his name of *S. Babylonica.* But even the last volume of DeCandolle's Prodromus does not rectify it. Notwithstanding Prof. Koch's correction and elucidation, it is likely that popular books and the popular belief will continue to associate the Weeping Willow with the River of Babylon and the hanging harps of the weeping Israelites, although the tree of the Psalm most likely was a Poplar. We believe it was Ker Porter who remarked that willows were to be found along the river, but only as low shrubs: upon these nothing larger than a comparatively modern musical instrument associated with the name and nation could well be hung. When the course is completed we shall look for an English edition of these lectures upon tree-lore. A. G.

2. *Insectivorous Plants;* by Charles Darwin. With illustrations. London: Murray. New York: D. Appleton & Co.—This long expected work appeared last autumn, was immediately reprinted by the American publishers, and before this time has been so widely read that no detailed account of it is at all necessary. Its main topic is *Drosera* or Sundew, upon which the vast number and diversity of the observations and experiments—at once simple, sagacious, and telling—which it records, are about as wonderful as the results. As to the latter, it is established beyond question that the common Sundews are efficient fly-catchers; that the stalked glands, or tentacles, as Mr. Darwin terms them, are sensitive and turn inward or even in other required directions in response to irritation; that they equally respond and move in obedience to a stimulus propagated from a distance through other tentacles and across the whole width of the leaf; that the sensitiveness belongs only to the glands and tips of the tentacles, but

is propagated thence down their stalks and across the blade of the leaf through the cellular tissues; that they accurately and delicately discriminate animal or other nitrogenous matter from anything else; that the glands absorb such matter; that when excited by contact, or by the absorption of nitrogenous matter by the viscid enveloping liquid, an acid secretion is poured out and a ferment analogous to pepsin, the two together dissolving animal matter; so that the office and action of these glands are truly analogous to those of the glands of the stomach of animals. Finally that animal or nitrogenous matter, thus absorbed and digested in the glands, is taken in, and conveyed from cell to cell through the tentacles into the body of the leaf, was made evident by ocular inspection of the singular changes in the protoplasm they contain. So particularly have the investigations been made and so conscientiously recorded, that the account of those relating to one species of Sundew, *Drosera rotundifolia*, fills 277 pages of the English edition, or more than half of the book. After all it ends with the remark: "and we see how little has been made out in comparison with what remains unexplained and unknown." The briefer examination of six other Sundews follows, some of them equally and others less efficient fly-catchers and feeders.

Dionæa is next treated, but with less detail. Indeed, except as to the particular nature of the secreted digesting fluid, there is little in this chapter that had not been made out or already become familiar here. That the secretion has digestive powers, and that it is re-absorbed, along with whatever has been digested, is now proved beyond reasonable doubt. That the motor impulse is conveyed through the cellular parenchyma, and not through the vascular bundles, or spiral vessels, and that the latter do not originate the secretion, as Rees and Wills in a recent paper seem to suppose they must, appears to be shown by the facts, and was antecedently probable. "The wonderful discovery made by Dr. Burdon Sanderson is now universally known: namely, that there exists a normal electrical current in the blade and footstalk, and that when the leaves are irritated the current is disturbed in the same manner as takes place during the contraction of the muscle of an animal." The conclusion here needs to be checked by parallel experiments, to see whether the same reversion of current does not take place whenever a part of any leaf or green shoot is forcibly bent upon itself.

Aldrovanda vesiculosa, of the *Drosera* family, "may be called a miniature aquatic *Dionæa*;" for, as discovered by Stein in 1873, "the bilobed leaves open under a sufficiently high temperature, and when touched suddenly close." Being submerged, their prey is confined to minute aquatic animals. For want of proper material and opportunity, Mr. Darwin was able to follow up only for a little way the observations of Stein and Cohn,—enough, however, to show that it also captures and consumes animals, but perhaps avails itself of the nitrogenous matter only when passing into decay.

Drosophyllum, a rare representative of the order, confined to Portugal and Morocco, grows on the sides of dry hills near Oporto; so that, as to station, it is the very counterpart of *Aldrovanda*. Its leaves are long and slender, in the manner of our *Drosera filiformis*, and are covered with much larger glands. To these flies adhere in vast numbers. "The latter fact is well known to the villagers, who call the plant the 'fly catcher,' and hang it up in their cottages for this purpose." Mr. Darwin found the glands incapable of movement, and their behavior in some other respects differs from that of *Drosera*; but they equally secrete a digestive juice. Insects usually drag off this secretion instead of being fixed on the glands by it; but their fate is no better; for as the poor animal crawls on and these viscid drops bedaub it on all sides, it sinks down at length exhausted or dead, and rests on a still more numerous set of small sessile glands which thickly cover the whole surface of the leaf. These were till then dry and inert, but as soon as animal matter thus comes in contact with them, they also secrete a digestive juice, which, as Mr. Darwin demonstrated, has the power of dissolving bits of coagulated albumen, cartilage, or meat, with even greater readiness than that of *Drosera*.

Mr. Darwin next records various observations and experiments upon more ordinary glandular hairs of several plants. To certain Saxifrages his attention was naturally called, on account of the presumed relationship of *Droseraceæ* to this genus. He declares that "their glands absorb matter from an infusion of raw meat, from solutions of nitrate and carbonate of ammonia, and apparently from decayed insects. To such plants the vast number of little insects caught may not be useless, as they may be to many other plants (tobacco, for instance) with sticky glands, in which Mr. Darwin could detect no power of absorption. The prevalent idea, that glandular hairs in general serve merely as secreting or excreting organs, and are of small or no account to the plant, must now be reconsidered. Those of the common Chinese Primrose (*Primula Sinensis*) although indifferent to animal infusions, were found to absorb quickly both the solution and vapor of carbonate of ammonia. Now, as rain-water contains a small percentage of ammonia, and the atmosphere a minute quantity of the carbonate or nitrate, and as a moderate-sized plant of this primrose was ascertained, (by estimate from a count on small measured surfaces by Mr. Francis Darwin) to bear between $2\frac{1}{2}$ to 3 millions of these glands, it begins to dawn upon us that these multitudinous organs are neither mere excrescences nor outlets, nor in any just sense insignificant.

Mr. Darwin next investigates the densely crowded short glandular hairs, with their secretions, which form the buttery surface of the face of the leaves of *Pinguicula*, the Butterwort. He finds that the leaves of the common Butterwort have great numbers of small insects adhering to them, as also grains of pollen, small seeds, &c.; that most substances so lodged or placed, if yielding

soluble matter to the glands, excite them to increased secretion; but that if non-nitrogenous the viscid fluid poured out is not at all acid, while if nitrogenous it invariably has an acid reaction and is more copious; that in this state it will quickly dissolve the muscles of insects, meat, cartillage, fibrin, curds of milk, &c.; that when the surface of a plane leaf is fed, by placing upon it a row of flies along one margin, this margin, but not the other, folds over within twenty hours to envelope them; and when placed on a medial line, a little below the apex, both margins incurve. He concludes "that *Pinguicula vulgaris*, with its small roots, is not only supported to a large extent by the extraordinary number of insects which it habitually captures, but likewise draws some nourishment from the pollen, leaves, and seeds of other plants, which often adhere to its leaves. It is therefore partly a vegetable as well as an animal feeder." The leaves in one or two other species were found capable of greater and more enduring inflection, and the glands excitable to increased secretion even by bodies not yielding soluble nitrogenous matter.

The aquatic type of this family is *Utricularia;* and the bladder-bearing species of this genus are to *Pinguicula* nearly what *Aldrovanda* is to *Dionæa* and *Drosera*—the bladders imprisoning minute aquatic animals, by a mechanism almost as ingenious as that of *Dionæa* itself. Observations of the same kind were made in this country by Mrs. Treat, of Vineland, New Jersey, before Mr. Darwin's investigations were made known. These submerged aquatic stomachs, ever deluged with water, apparently do not really digest their captures, but merely absorb the products of their decay.

The same must in all probability be said of such Pitcher-plants as *Sarracenia* and *Darlingtonia*, which Mr. Darwin merely alludes to at the close of his volume but does not treat of. *Nepenthes*, however, according to Dr. Hooker's investigations, has attained a higher dignity, and converted its pitcher into a stomach. This parallelism, and this higher and lower mode of appropriating organic products by each of the three well-marked carnivorous families of plants, are highly suggestive.

In concluding this notice of a book for which we have no room to do justice—but which is sure to be in the hands of many interested readers—there is somewhat to be said in regard to the discovery of the lure in some of our Sarracenias. We have by degrees to discover our discoverers. In this Journal, only so far back as the number for August, 1873, is a notice of the discovery of a sweet secretion at the orifice of the pitcher of *Sarracenia flava*, by Mr. B. F. Grady, of Clinton, North Carolina (in the article by an oversight called "Mr. Hill"), which effectively lures flies to their destruction. This statement, made in a letter, had been for several months in our hands, awaiting the opportunity of confirmation, when an allusion to the same thing appeared in the English edition of LeMaout and Decaisne's System of Botany, without reference to any source, and on inquiry we learned that the authority

for the statement was forgotten. But early in the following year, when the monograph of the order appeared in the last volume of DeCandolle's Prodromus, a reference was found to a paper by Dr. Macbride in the Transactions of the Linnæan Society. His observations (made upon *S. variolaris*), it appears, were communicated to Sir J. E. Smith, read before the Linnæan Society in 1815, and published soon after. They are referred to by his surviving friend and associate, Eliott, in his well-known work, and therefore need not have gone to oblivion, or needed rediscovery here in our days by Mr. Grady and Dr. Mellichamp, the latter greatly extending our knowledge of the subject. Probably the main facts were all along popularly known in the regions these species affect, and where their use as fly-traps is almost immemorial. But the *gist* of these remarks is, that a colleague has just called our attention to an earlier publication than that of Dr. Macbride, viz., an article on "Certain Vegetable Muscicapæ," by Benjamin Smith Barton (one of our botanical fathers), published in Tilloch's Philosophical Magazine, for June, 1812. Among other matters not bearing directly upon this point, he says of *Sarracenia*, without reference to any particular species: "A honeyed fluid is secreted or deposited on the inner surface of the hollow leaves, near their *faux* or opening; and this fluid allures great numbers of the insects which they are found to contain into the ascidia."

Here is earlier publication by three years. Yet we suspect that Dr. Barton knew little about it at first hand, and we find clear evidence that he had not anticipated Dr. Macbride. All his references have an indefiniteness quite in contrast with Dr. Macbride's narrative; he says that "some if not all the species of the genus appear to possess a kind of glandular function," without mentioning those that have it, or the absence of it in the only species growing around him at the north; and he adds that he "was entirely unacquainted with this curious economy . . . when I published the first edition of my Elements of Botany, and even when I printed the appendix (in vol. i) to the second edition of this work." Now his paper is dated September 11, 1811; and the volume referred to, as just printed, is dated 1812. But Macbride states that his observations were chiefly made 1810 and 1811; he corresponded intimately with Eliott, through whom, if not directly, his observations would probably find their way at once to the Philadelphia naturalists. A. G.

3. *The Movements and Habits of Climbing Plants;* by Charles Darwin. Second edition, revised, with illustrations. London: Murray. 1875. pp. 208.—This most interesting treatise was read to the Linnæan Society over ten years ago and published in the ninth volume of its Journal, in 1865. There was a separate issue, which has long been exhausted. It is now carefully re-edited, considerably added to, and reproduced as an independent volume. It will no doubt be much sought after, as the topic and treatment of it are peculiarly fascinating and instructive, and the

book is throughout readable. Mr. Darwin's gift for making things clear without technicalities, is as great as that of many writers for enveloping them in technical obscurity. Having given an account of this essay upon its original appearance, we need only mention the republication, which will be within the reach of all, as an edition is about to be issued by Appleton & Co. A. G

4. *Hœckel's Ziele und Wege der heutigen Entwickelungsgeschichte.*—The controversy carried on by Hæckel in defence of some of his pet theories has gradually assumed a more and more personal character. The criticisms in his *Generale Morphologie* were sharp, but justifiable from his standpoint. In the *Schöpfungsgeschichte*, they had already become sensational. In the *Anthropogenie* his sketches of contemporaries and his analysis of their work assumed a still more unpleasant emphasis; and this has now culminated in a pamphlet entitled "Ziele und Wege der heutigen Entwickelungsgeschichte."

It is difficult to characterize this production without indulging in the same style of epithets which Hæckel uses so freely. From the title we expected one of those brilliant chapters, which, however untrustworthy, are full of suggestions; we were sadly disappointed to find it filled simply with abuse of His, Gœtte, Ludwig, Reichert, Michelis, Agassiz and others.

We shall not fill the pages of this Journal with countercharges or explanation; a man so skilled in coarse invective, who has risen to such a height of intolerance, is proof against anything so tame as fact or argument. This is not the place to refute his absurd claims to omniscience, and his assumptions of immunity for the very offences he so mercilessly condemns. According to Hæckel it is an unpardonable sin for His or Gœtte to give a false interpretation of what they have seen, or for Ludwig and Reichert to differ from him in his explanation of protoplasm; but when he himself, to suit a purpose, deliberately falsifies facts, when he manufactures with names and figures an archetype which never existed, we are called upon to be grateful that a corner of the veil shrouding creation is lifted, and that we are fortunate enough to live at a time when so infallible an interpreter of its mysteries, has taken up his abode at Jena.

In the concluding pages, devoted to Agassiz and Michelis, all the bitterness of his bigotry and dogmatism are poured forth against the latter, while he stoops so low in his attacks on the former as to pick up all the baseless slanders ever circulated by his enemies during his life. With scientific productions like these we have no concern. A few more such criticisms, and Hæckel's claim to be recognized as a true and devoted student of nature will be forgotten. In its place, he will gain, what he seems to seek, the front rank among scientific demagogues. A. AG.

5. *Memoirs of the American Association for the Advancement of Science.* I. *Fossil Butterflies*; by S. H. SCUDDER. 99 pp. 4to, with three plates. Salem, 1875.—The sum of one thousand dollars was given in Aug., 1873, by Mrs. Elizabeth Thompson, of