I thought that if I brought the Vines down close to the front ventilators, and put something temporary in front of them, and left the ventilators a little open, it would rest them. Would asphalte answer my purpose, or would the smell from it be injurious to other things in the house? *S. W.* [Bringing the Vines down as you propose affords the best way of resting them; but on no account use asphalte; we recommend you to put a double front into your house, so as to give the Vines when at rest a cool compartment to themselves.]

Judging Grapes.—How should Grapes be judged? Some think the size of berry the test of good cultivation, others that of the bunch. At a late show here the first prize was given to large red berries and small bunches, whilst some that were well coloured were passed over unnoticed. Would some one give us the benefit of their experience about judging Grapes? I am, of course, speaking of Hamburghs. *F., Liverpool.*

Vine Leaves.—Oblige me by naming the disease affecting the enclosed leaves. The Vines were planted last spring in a span-roof house, and have had only sun heat. They have grown very well, and their tops are quite healthy and growing still, but a great many of their lower leaves are affected as the enclosed. The roots are planted inside the house on a thoroughly well drained border. *J. M., M.D.* [The most recent explanation of cases of this kind has been given by Mr. Thomson in his Practical Treatise on the Vine, from which the following is an extract:—"This is a sort of conglomerate of little green warts that form on the lower surface of the leaf, as if the result of an extravasation of sap through the epidermis or skin of the leaf. Some able writers say this is not a disease. If it is not such, strictly speaking, it is at least organised, or organisable, matter in the wrong place; and I am confident it seriously impedes the important functions of perspiration, digestion, and respiration; so that if not in itself a disease, it leads to at least functional derangement, which is the same thing. As has been remarked while treating of the effects of sulphur, these green warts are more easily affected by the particles of sulphur floating in the atmosphere of the Vinery than any other portion of the Vine, except the young embryo berries. I can undertake to produce or prevent this disease, shall I call it, at any time betwixt the first expansion of the foliage and the stoning of the fruit. A close warm atmosphere saturated with moisture will produce it; whereas a free circulation of air, moderately charged with moisture, will prevent its appearance. I have seen instances where the leaves were so affected by it that they all cupped themselves up round the edges, the fruit did not swell to much more than half its natural size, and the general progress of the Vine was retarded."]

Orchard Houses.—As orchard house matters have been spoken of so much, I venture to give you the results of my experience. Like many others I am a young beginner in this mode of culture; I have now seen two seasons without failures with the trees that are under my charge. We shall not be able to make all trees in pots carry good crops every season. Last year we had 20 Plum trees in pots, which averaged 3½ dozen fruit each; this, I thought, was sufficient for them to bear. We had also a fine lot of Apricots and four trees with good crops of Pears. These trees were in a lean-to house, 100 feet by 10, with Peach trees trained on the back; the trained trees had no crop on them but made good wood; this spring they were all covered with bloom, but did not set many fruit, a circumstance which I attribute to damp, or to the effect of cold winds blowing through the back wall, which is made of feather-edged boards; consequently there is always draught. Some of the pot trees in this house have good crops on them this year. Peaches, Plums, Pears, Cherries, Gooseberries we also got very early. In January this year I had 20 Peach and Nectarine trees from Mr. Rivers, to fill a span-roof orchard house, 80 feet by 24; these I plunged in the centre bed of the house, with some trees from the lean-to house; they are standards 5 feet high, the heads are not large, but they have made good growth for next season. These have all good crops on them. I have thinned a great many off; the trees we had were equal to Mr. Rivers', and were all in bloom at the same time. But in the span-roofed house I kept the back ventilators closed until the fruit was set; the roof of this house is intended for Vines, which are planted inside. I had four trees, which were started in the Vineries to get them early, from which I have gathered 102 Peaches, and these trees look equal to last year's, so that orchard house culture has not been a failure here, as in many places. In your number for July 19, Dr. Dawson speaks of introducing a beehive into a large orchard house next spring. I have had bee-hives in all the houses here this spring, and have found great assistance from their inmates. *W. Dean, The Hasells, Sandy, Beds.*

Foreign Correspondence.

New Westminster, British Columbia, *May* 24, 1862.—I enclose a pamphlet of some interest to persons who are coming hither with ideas too golden for their real good. For all such it contains some wise advice.

There's welcome and ultimate wealth for all who come to abide and work industriously, and (above all) soberly; but all who do come should come intelligently; should look all their difficulties in the face beforehand, resolved to conquer. Then let them go in for "the long run;" we don't want emigrants who come "to make their pile" one day and perform "Klattawaw" from the country the next. They're of no real use. In miners' phrase that game's "played out," and more calculated to get the country into a regular state of "unfix" than to put it "in circumstances." In reading reports from a gold country, it should always be remembered that the words which are then meeting their eye in some English paper, may be literally true and yet convey the impression of quite a different set of facts to the apprehensions of folks at home ignorant of the difficulties and circumstances of the colony, to that which they convey to us here, who are familiar with surrounding circumstances. I was especially struck with this in perusing Mr. Donald Fraser's well written articles in the *Times*. They are substantially true, and yet do not convey a true impression. The country only requires to be truly known to be properly appreciated, and to attract what we want—a settled population.

The great wants of the country at present are (1) roads, and internal communications of all kinds, and (2) women. Of the latter, anything virtuous from 16 to 60 (pitted with small pox and not too attractive preferred), will do, to lick the present vagabond bachelor population into shape and settled habits, instead of unlimited drinks all round of a diluted poison that would electrify Dr. Letheby's weak nerves, and endless billiards, cards, poker, saloons, and 6*d.* cigars, varied only by the savage solace of vicious squaws—the only joys accessible to compensate them for the enormous, wearing, bodily toil undergone in mining for the four or five months that constitute the season.

It is astonishing to see how many men of education, birth, and character, as well as talent, among the miners, become gradually degraded by revolving in this vicious circle. Many in desperation take to what is called "squawing," rearing a young half savage brood in the bush—hidden as far as possible from the general gaze of men—for ever cut off from their other kindred at home—dragging on a weary existence, with the still small voice ever gnawing at the heart and reminding them of what they have lost,—talents neglected, opportunities wasted, character gone, and themselves utterly lost to society and to themselves, and to call a spade a spade all for want of respectable women as wives.

It would be of the greatest service to emigrants to British Columbia, if influential papers like the *Gardeners' Chronicle* would instil into the minds of the powers that be at home the absolute necessity of helping this colony to help herself in the construction of waggon roads up to the gold fields and agricultural lands, all high up the country, and intended eventually to connect with waggon roads and steamers from Tête Jaune Câche (at the source of Fraser River) over the flat and level pass across the Rocky Mountains to Jasper's House, down the Saskatchewan, *viâ* Edmonton House to Red River settlement, and thence on *viâ* the lakes and Great Western of Canada to the St. Lawrence—a feat which I look upon as certain to be accomplished within the next few years. With a Governor so intimately acquainted with every nook and corner of the country, and so influential with the various Indian tribes along the route, as Governor Douglas, the scheme of this Great Pacific Road *over British territory all the way* to us who know him, is feasible enough. His resolute energy, even with the little aid afforded him by this infant colony, and I may almost say no assistance from home, have already broken the back of the main difficulty in the way of its accomplishment, viz., getting up the Fraser and forcing the passes of the Cascade Range to Alexandria. By Jove! if your editorial eyes could but see the precipices, and (apparently) impassable places round, and sometimes through, which waggons now smoothly roll, carrying up grub to hungry miners (at a saving of many pounds sterling per ton in carriage, often many times the worth of the provisions themselves), you would toss up your cap with a Well done! young Columbia—*ite capellæ!*

And then turning to Arrowsmith's map of British Columbia and British America; find that when the roads this year designed and in course of construction are completed, you can get by boat up the Fraser *viâ* Hope and Yale (or by the competing line *viâ* Douglas and Lilloett), along Lake La Hache to Alexandria, and thence along the Fraser (which at and above Alexandria, is a still deep stream and in no place less than 500 yards wide), by steamer (now being constructed), to Tête Jaune Câche, in 15 days from Victoria (soon to be done in 10 days), you will be still more inclined to applaud the skill and energy that have accomplished so much in so short a time, with such inadequate means. And you will be all the less surprised to hear that by a comparatively small outlay, in opening the route, the distance from Tête Jaune Câche to Red River by waggon road to the Saskatchewan, thence by steamer and waggon road *viâ* Edmonton House to Fort Garry; thence *viâ* Pigeon River to Lake Superior and the other lakes, in 20 more days the traveller can be brought into contact with the Atlantic, and you will probably think that the dream of an inter-oceanic road in British America is much nearer practical realization than you at first imagined. Why, 40,000*l.* to 80,000*l.* would do it: sufficiently, that is (I would have it to be well understood), to open the route for private enterprise to complete, as we do here, by charter for 5 years, and a small toll (hardly felt) levied on each piece of road as it is made, after having been well graded, built, and metalled. For the new roads of the present year the liabilities of the government in loans to road makers alone (irrespective of the cost of government), will be somewhere about 80,000*l.* Revenue last year about 50,000*l.* This year it will probably be nearer 90,000*l.* To meet this a local act has been published, enabling the Governor to borrow 100,000*l.* on the general revenues of the colony at 6 per cent. per annum—a first-rate security.

Had not this expenditure been incurred in opening roads the country would only have fed 4000 or 5000 men, and the miners who are rushing in thousands to Cariboo, the same as in 1858, would inevitably have starved; the amount of suffering and privation that would have been endured would be something awful, and the country would never have recovered the collapse. It speaks volumes for the British gold fields that a second rush should have now occurred here. To no other gold colony that I have heard of have there ever been two general gold rushes. If the act for the loan be confirmed from home, as it undoubtedly should be, next year will see such a progress in the country from its comparative accessibility created by this wise expenditure, as will tell sensibly even upon the existing amount of imports of English goods direct from home instead of Yankee notions, give Mother England not only a strong eye but a strong hand and heart on the Pacific, and directly lead to the consolidation of our influence and power with China and our Eastern trade.

This is the critical year for British Columbia: a false step now—famine however partial up in the mines—ruin was certain. Fortunately for her she had a man of nerve and judgment rarely found at fault to act promptly in her hour of need, who by a wise and thrifty expenditure in reducing the enormous cost of carriage to the mines, stepped in in time, and barely in time, to save the country from the most disastrous results.

I must apologise for the length of my communication, but the theme is inspiring, and thoughts of the escape we have just had, and of the great results now before us, flowing from this single cause, and touching imperial as well as colonial interests, insensibly drew me on.

Reviews.

On the various Contrivances by which British and Foreign Orchids are fertilised by Insects, and on the good Effects of Inter-crossing. By Charles Darwin, M.A., F.R.S., &c. With illustrations. London. John Murray. 8vo.

It is not unadvisedly that we have so long delayed reviewing the work that heads this article. When a naturalist like Mr. Darwin, of "Warrior" power, tonnage, and metal, steers away from coasts on which he has won renown in Zoology and Geology, and aims his prow and points his guns at a science whose defences he is not usually supposed to have examined, it behoves the public to stand back, and the reviewer to scan closely the results, before he commits himself to their approval or the contrary. Such is our position in the present case. We confess that in attacking a purely botanical problem, and especially one so obscure and complicated as the physiology of fecundation in Orchids, Mr. Darwin has taken us completely by surprise; none can more deeply feel the special claim such a work has to an ample share of our columns; none can more heartily grant the prescriptive right which Mr. Darwin has long since established to a most attentive hearing, on whatever subject he speaks; and we frankly admit a proclivity to favour the writings of one who is amongst the oldest and most valued of our correspondents. These are given as excuses for our delay; that they are good reasons also, the following observations will amply prove.

Ever since the publication of the "Origin of Species," the public have waited impatiently for the promised "pièces justificatives," by which its author himself announced that the theory propounded in that work must stand or fall. Meanwhile a moiety of naturalists have accepted his conclusions (it matters not whether wholly or partially, for there is no logical middle course), some from having independently made similar experiments and observations to those which Mr. Darwin cites, and being therefore prepared to accept the conclusions he draws from them; some from a previous leaning to the views of Lamarck; and some from an impression or conviction that as what are called "secondary laws" are now the admitted regulators of all natural phenomena in which life is not concerned, so must they also be of biological phenomena. But the other moiety still waits the appearance of the detailed observations; some convinced of their impotence, but too honourable to condemn unheard; some more cautious or less prejudiced, regarding the question as an open one; and still others, already more than half persuaded, only waiting to strike their colours to a more dignified presence than the little green octavo of 1860. Such being the case, the appearance of the present work, which is not professedly put forth as a prop to Mr. Darwin's hypothesis, will be regarded by many as a disappointment; but on the other hand, by those interested in the study to which it relates, and by a still larger number who condemn the "Origin" while they admire its author, his return with undiminished powers of observation to cautious induction from positive facts, will be welcomed with acclamation.

The object of the work, as stated in the introduction, is "to show that the contrivances by which Orchids are fertilised are as varied and almost as perfect as any of the most beautiful adaptations in the animal kingdom; and secondly, to show that those contrivances have for their main object the fertilisation of each flower by the pollen of another flower." The author goes on to say that the investigation is an episode in his great work; that it was commenced with the view of establishing the doctrine (one of his own original and startling generalisations) "that no hermaphrodite fertilizes itself for a perpetuity of generations;" and that, carried away by the interest and beauty of the subject, he gave himself up to its pursuit; and having outrun the limits it was to have occupied in his work, he has treated it apart.

So far, then the "Fertilization of Orchids" is regarded by its author as part and parcel of his great inquiry into the origin of species; and by way of rendering his subject more acceptable to the timid inquirer, and less obnoxious to the unreasoning or prejudiced (especially, we suppose, to the reviewers of the "Origin"), he adds, "This treatise affords me an opportunity of attempting to show that the study of organic beings may be as interesting to an observer who is fully convinced that the structure of each is due to secondary laws, as to one who views every trifling detail of structure as the result of the direct interposition of the Creator."

The present work is one of a class of which Botany possesses singularly few examples, although in many respects it affords greater facilities for the prosecution of such inquiries than any other branch of Natural History. This is partly owing to the minuteness of the organs of reproduction, to the apparent uniformity of the process throughout large classes of plants, and to the slight, rapid, and often transient nature of the disturbances which accompany the operations of insects, the most active agents in the processes of impregnation; and still more, perhaps, judging from Mr. Darwin's methods, to the extraordinary patience required to master the details of comparative structure, to the necessity of pursuing the inquiry system-

atically upon many living specimens of closely allied species and varieties, and to the possession of considerable previous acquirements in entomology and chemistry; to which must be added almost limitless leisure to watch the growing flower up to the full development of its organs, and to master their forms, relations and positions, their every possible movement, spontaneous and induced, and everything of importance to the operation of fecundation.

Hence it is, no doubt, that while our library shelves teem with works devoted to artificial hybridization, and to the process of impregnation after the contact of the pollen, we have scarcely any devoted to the method by which the pollen reaches the stigma. In modern works little is to be found on this subject; much is attributed to the wind, and much to the indirect agency of insects; but the operations of the latter are supposed to be casual. As a general rule the insect alone was believed to benefit by the plant, to whose peculiarities of structure its own were consequently specially adapted, whilst that the plant should be so structurally modified as to avail itself of the insect's office, was only guessed at, and that the mutual adaptation was so complete that the extinction of a species of plant must follow from the withdrawal of the insect visiting it was never before satisfactorily established.

Again it has generally been assumed, and indeed has held the position of an axiom, that the end subserved by the coincidence of stamens and pistils in one flower, is the insured impregnation of the ovary by the pollen of its own flower, and conversely the pollen of each flower was assumed to be best suited for the pistil of the same; that Diclinism was hence an obstacle placed by Nature in the way of her own operations, and that the nearer the pollen and stigma were, the more certainly was the propagation of a numerous and healthy offspring secured. Mr. Darwin sets himself not merely to refute these ideas, but to establish what is pretty much their converse, to show by experiment that they cannot be true, and by reason that they ought not to be so.

To establish his point he selected primarily the British Orchideæ; a bold step, for in these plants the stamens and stigma are all but in actual contact in each flower, whilst a small but complicated intermediate apparatus has been generally supposed to be provided to secure self-fertilisation, and the form, colour, and odour of the flowers to lure insects to aid in the same. If to these facts are added the minuteness of the parts, the rarity of many of the species, and the acknowledged failure of Robert Brown to explain the physiological significance of their structural peculiarities, it is not surprising that they should long have been regarded as the forlorn hope of physiological botany.

How Mr. Darwin has met every difficulty, from the first—and no slight one—of procuring abundance of specimens of the rarest species, to the instituting of experiments with a fertility of resource that few possess, and the interpreting of phenomena with an equally rare sagacity, the volume itself must be consulted to show; for, from the nature of the enquiry, the work is ill-suited for extracts. Still, without examples, it is impossible to appreciate Mr. Darwin's methods, mental and manual, and we shall therefore select one from each part of his work (that devoted to British, and that to exotic Orchids) before giving our views of the value of his results.

With the exception of Cypripedium Calceolus, almost every British species has been examined, and is fully, nay laboriously described; of these we shall take the common Ladies' Tresses, (Spiranthes autumnalis), for illustration; premising that it is neither the most striking nor interesting example, but a fair and good one. First, the rostellum, which Mr. Darwin finds to be the most important agent, mechanically and functionally is carefully described, and every peculiarity, whether of form or minute anatomy that bears upon its function is detailed; it presents the general appearance of a boat, standing vertically on its stern, and filled with a milky viscous fluid, whose properties and power of adhesion he carefully makes out. This boat-shaped rostellum is decked by a peculiar membrane, and on its anterior face is a furrow, endowed with a remarkable vital property, for a touch with a bristle causes it to split along its whole length, and free some of the liquid, an action shown not to be mechanical nor the effect of violence. This exposes the boat-formed disc. The action is next shown never to take place spontaneously, though it may be induced by chloroform. The stigma is next fully described, and then the pollen, its mode of cohesion, its form, and its friability, this latter being a most important matter. Next is described a curious arrangement of parts in the bud long before expansion, which results in the pollen-masses coming into contact with the disc, becoming gradually denuded through the withering of some parts and the recession of others, and finally lying quite free in the expanded flower. Attention is next directed to the spiral arrangement of the flowers, the adaptation of the grooved and fringed labellum to the visits of bees, the position, &c., of the nectar; and the author proceeds thus, "When the flower first opens, the receptacle contains nectar, and at this period the front of the rostellum, which is slightly furrowed, lies close to the channeled labellum; consequently a passage is left, but so narrow that only a fine bristle can be passed down it. In a day or two the labellum moves a little farther from the rostellum, and a wider passage is left to the stigmatic surface. On this slight movement of the labellum the fertilization of the flower absolutely depends.

"With most Orchids the flowers remain open for some time before they are visited by insects; but with Spiranthes I have generally found the boat-formed disc removed very soon after the expansion of the flower. For example, in the two last spikes which I happened to examine there were in one numerous buds on the summit, with the seven lowest flowers alone expanded, of which six had their discs and pollinia removed; the other spike had eight expanded flowers, with the pollinia of all removed. We have seen that when the flower first opens it would be attractive to insects, for the receptacle already contains nectar; and the rostellum at this period lies so close to the channeled labellum that a bee or moth could not pass down its proboscis without touching the medial furrow of the rostellum. This I know to be the case by repeated trials with a bristle.

"Let it be observed how beautifully everything is contrived that the pollinia should be withdrawn by an insect visiting the flower. The pollinia are already attached to the disc by their threads, and from the early withering of the anther-cells, they hang loosely suspended but protected within the clinandrium. The touch of the proboscis causes the rostellum to split in front and behind, and frees the long, narrow, boat-formed disc, which is loaded with extremely viscid matter, sure to adhere longitudinally to the proboscis; when the bee flies away, so surely will it carry away the pollinia. Hence in Spiranthes, not only the pollen must be carried from one flower to another, as in most Orchids, but a lately expanded flower, which has its pollinia in the best state for removal cannot then be fertilized. Generally old flowers will be fertilized by the pollen of younger flowers, borne, as we shall see, on a separate plant. In conformity with this I observed that the stigmatic surfaces of the older flowers were far more viscid than those of the younger flowers.

"At Torquay I watched a number of these flowers, growing together, for about half an hour, and saw three humble bees of two kinds visit them. I caught one, and examined its proboscis; in the superior lamina, some little way from the tip, two perfect pollinia were attached, and three other boat-formed discs without pollen; so that this bee had removed the pollinia from five flowers, and had probably left the pollen of three of them on the stigmas of other flowers. The next day I watched the same flowers for a quarter of an hour, and caught another humble bee at work; one perfect pollinium and four boat-shaped discs adhered to its proboscis, one on the top of the other, showing how exactly the same part had each time touched the rostellum.

"The bees always alighted at the bottom of the spike, and crawling spirally up it, sucked one flower after the other. I believe humble bees generally act thus when visiting a dense spike of flowers, as it is most convenient for them; in the same manner as a wood-pecker always climbs up a tree in search of insects. This seems a most insignificant observation, but see the result. In the early morning when the bee starts on her rounds, let us suppose that she alighted on the summit of the spike; she would surely extract the pollen from the uppermost and last opened flower; but when visiting the next succeeding flower, of which in all probability the labellum would not have moved from the column (for this is slowly and very gradually effected), the pollen-masses would often be brushed off her proboscis and be wasted. But nature suffers no such waste. The bee first goes to the lowest flower, and crawling spirally up the spike, effects nothing on the first spike she visits till she reaches the upper flowers; there she withdraws the pollinia; she soon flies to another plant, and alighting on the lowest and oldest flower, into which there will be a wide passage from the greater reflexion of the labellum, the pollinia will strike the protuberant stigma; if the stigma of the lowest flower has already been fully fertilized, little or no pollen will be left on its dried surface; but on the next succeeding flower, of which the stigma is viscid, large sheets of pollen will be left. Then as soon as the bee arrives near the summit of the spike, she will again withdraw fresh pollinia, will fly to the lower flowers on another plant, and fertilize them; and thus, as she goes her round and adds to her store of honey, she will continually fertilize fresh flowers and perpetuate the race of our autumnal Spiranthes, which will yield honey to future generations of bees."

It would be difficult to match the above as a specimen of purely physiological investigation, laborious, ingenious, and conclusive as to its results, except by the similar descriptions of the other Orchids in the same work, some of which indeed far surpass it in point of interest. Take for instance the experiments on the pollinia of Orchis mascula and pyramidalis, and of Gymnadenia, which a child can repeat; or those connected with the explosive rostellum of Listera ovata, whose office, which is obvious enough when demonstrated by Mr. Darwin, had been completely misinterpreted by his predecessors.

(To be continued.)

The Science of Home Life. By A. J. Bernays. Allen & Co. 8vo.

Dr. Bernays, like many other modern chemists, has endeavoured to render his science popular by pointing out the manner in which it explains the phenomena that surround us; and he has been one of the most successful. His language is clear and his subjects well selected. The reader is not puzzled by elaborate disquisitions suited only to college lectures, nor bewildered by formulæ that the initiated hardly understand. What he says is short, plain, and to the purpose.

In the volume before us the author treats of heat; the atmosphere with its relations to animal and vegetable life; of fuel, and light; of water, soap and bleaching agents; of glass and porcelain, gold, silver and base metals, fermentation, and food. We content ourselves with what is said of wine:—

"Whether persons in robust health require the constant stimulus of wine, or any other form of alcohol, may, perhaps be questioned; but it would tax the ingenuity of any one to show that such persons are injured by it. But, in truth, the great majority of persons, especially among town populations, are not in robust health. The impurity of the air, the habits of town life, the demands on the nervous system in the struggle for existence, and many other causes in operation in towns, do, it is to be believed, more or less deteriorate the health of the majority of their inhabitants, and render the moderate use of wine or good unadultered beer decidedly beneficial.

"Its benefit in many cases of small or defective appetite can scarcely be questioned, and is, indeed, admitted by the most strenuous opponents of its general employment. But in such cases it may be regarded, not as an article of diet, but as a medicine.

"Dr. Carpenter, the great apostle of teetotalism, is obliged to confess of it, that 'there is another class of cases in which we believe that malt liquors constitute a better medicine than could be administered under any other form; those, namely, in which the stomach labours under a permanent deficiency of digestive power. . . . . There are many cases in which no form of medical or hygienic treatment seems able to develope in the stomach that spontaneous power, which it has either completely lost, or which it never possessed, and in which the artificial excitement of an alcoholic stimulus affords the only means of procuring the digestion of the amount of food which the system really requires.'

"Within the last two or three years Messrs. Lallemand, Perrin, and Deroy, and subsequently Dr. Edward Smith, have shown by experiment that a part, and therefore perhaps all, of the alcohol taken into the system is exhaled, unchanged, by the lungs, skin, and other channels. This fact has been pressed into the service of teetotalism, and has been put forward in support of the sweeping assertion, that alcohol is useless as food and therefore injurious. It may, perhaps, show that it is incorrect to say, as Liebig formerly did, that 'alcohol stands high as a respiratory material. Its use enables us to dispense with the starch and sugar in our food, and is irreconcilable with that of fat.' But to affirm that it is useless is an assertion not only altogether incapable of proof, but contrary to the testimony and reason of every age. The upholders of this doctrine are compelled in its defence to ignore every argument except this one derived from pure science, thereby doing the science itself an injustice, and inflicting violence on the reason of impartial men."

We further recommend Dr. Bernays' opinion of beer to those who think that its only use is to muddle people's brains:—

"Beer is not to be regarded simply as a stimulant, for the beer of most brewers contains more or less of actual nutriment. In addition to sugar and dextrine, they often contain as much as 1 per cent. of gluten and albumen, together with salts of potash, soda, lime and magnesia, as well as the important acid of bones, phosphoric acid, in combination as phosphate."

Be it remembered however that in saying this he means real beer, not the poisonous adulterations which "form the rule in beer sold by retail."

The *Botanical Magazine*, for August, contains figures of some very pretty garden plants, noticed below:—*Nolana lanceolata*, a Chilian annual, exhibited last summer by Messrs. Veitch & Son, by whom it had been introduced. It is a prostrate hoary plant, having lanceolate leaves growing in pairs side by side, and producing handsome blue flowers with a white centre, "much larger and handsomer than in the well-known N. paradoxa." *Grammitis caudiformis*, a simple fronded Pacific Island Fern belonging to the Selligueа group, with copiously anastomosing veins. Sir W. Hooker identifies it with the Polypodium caudiforme of Blume, being, he observes, "so fortunate as to possess specimens exhibiting all the intermediate grades between the perfect sori of Grammitis, and that form of sori which would almost justify its being placed in Polypodium." *Bolbophyllum pavimentatum*, a little tropical West African Orchid with spikes of purplish-red flowers recalling to mind those of a Persicary.

a subject of any magnitude that has not been well treated by men willing and able to state honestly the truth, the *whole truth*, and *nothing but* the truth, concerning the methods by which they have achieved success. This is their great merit. They do not pretend to be learned, nor do they indulge in speculations concerning what may possibly happen; they are contented with what is, and leave horticultural dreams to others.

Among men of this class is the writer of the volume before us; when a gentleman's gardener one of the most successful winners of prizes at our great metropolitan shows of Orchids; and now as a nurseryman holding his own with greater distinction than ever. He here presents the public with his latest experience, regulated by many more years of daily intercourse with his favourites—our favourites—everybody's favourites; and it is no fault of Mr. Williams if every body cannot grow them as well as himself. *Liberavit animam suam*; he has made the whole public his confessor, and he has nothing more to reveal.

We observe full 50 pages more than in the first edition of this capital book, and many more heads of instruction, some of which relate to seedling Orchids, to "the spot," and to the best contrivances for constructing and heating Orchid houses. There are notices moreover of about a couple of hundred species not mentioned in the first edition.

Of course all growers will take care to provide themselves with a copy of the work, so that extracts are superfluous. Nevertheless we must give our readers one scrap which has a larger application than to Orchids:—

"*Spot in Orchids.*—A great deal has been said and written respecting this disease, which I have seen in several places, and in other plants as well as in Orchids. I have not experienced much of it myself, but I have given advice respecting its cure, and have found in most cases the plants to outgrow it.

"In 1860, a gentleman bought some Phalænopsis of me, which were the finest grown plants I had seen, and they did beautifully with him for some time, growing very fast, in fact too fast, for they got sappy, and their leaves became spotted, as did also some others he had. I went to see them, and he asked my opinion respecting them. Upon inquiring how they had been treated, he told me that he gave them a great deal of water over the leaves, and kept the roots wet; this was during winter. I went several times to see them the following spring, and advised him to treat them as recommended for Phalænopsis. (See p. 132.) These plants have quite outgrown the spot, and are now among the finest round London.

"When at Hoddesdon, I had two Phalænopsis which went in the same way; they got spotted in the winter. I cut off one of the leaves, and sent it to Dr. Lindley for his opinion as to the cause of the evil. His reply was, that the plants had been kept too moist during the cold dark days of winter,—a fact which I have never lost sight of. He was quite right, for it was a sharp winter, and I had kept these two plants wet, by placing the bottom of the block on which they grew in a pan of water to keep off cockroaches. In that way too much moisture crept to the roots, and, being in the winter time, doubtless caused the leaves to become spotted.

"However, by following the treatment recommended in my remark on Phalænopsis, the plants soon recovered; but if steps of that kind had not been taken in time the disease would have gone too far, and probably killed the plants. Much injury is done by keeping the plants too wet at the roots in dull weather; in fact, too much moisture in that way is injurious at any time, especially to those that grow on branches of trees, when they come to be confined in pots and baskets with a host of wet material about them, which is unnatural. My practice is to give but little water at the roots during winter, and not so much as many people in summer, because I have seen the ill effects of it. The treatment I recommended some years ago I still follow, and with uniform success.

"Some Orchid growers give more heat and moisture than I recommend, and the plants have done well for a time; but under such exciting management they are apt to became spotted, and get into a permanently bad state of health; in short, the least chill, after so high a temperature, is liable to induce disease. The great secret in the cultivation of these, as well as all other plants, is a proper house, sufficient ventilation, heat and moisture and good glass, without drip. Let the temperature throughout the whole year be in accordance with directions laid down in this book, which is the result of long experience and close observation."

On the Various Contrivances by which Orchids are Fertilised by Insects. By C. Darwin, Esq., F.R.S., &c.

[Second Notice. See p. 789.]

Having examined in the utmost detail the method of fecundation in almost every British species of Orchid, Mr. Darwin directs his attention to the exotic forms, choosing prominent members of most of the great tribes as defined by Lindley. In this enquiry we recognise the same industry and care in mastering every point of structure, the same power of seizing upon every character of significance in a physiological point of view, and even greater fertility of resource in experimenting. The results, as might have been anticipated from flowers so grotesque, are often most curious and even startling, and his demonstration of the special objects for which some of the organs are fashioned into forms so misshapen as to be apparently useless, are in many cases marvellously sagacious. We can but direct attention *en passant* to Cattleya, which though fertilised in a very simple manner, differs in this respect from all British Orchids;—to Stelis, which so closes its flowers after fecundation that they cannot be distinguished externally from buds, but which opens them again when immersed in water!—to that Masdevallia whose flowers resemble a closed box with two windows, leading towards the reproductive organs, but which could not be fertilised by any means adopted;—to Bolbophyllum, whose stigmatic cavity is exactly fitted by *one* only of the two pollen masses, and whose stigma shuts up after the flower has been some time opened—facts observed in no other Orchid;—to Dendrobium, whose flowers may be fertilised by their own pollen, and the action of whose opening anther case is to scoop up the pollen and toss it into the air with so nicely graduated a force that it must fall on the stigma;—to the beautiful analysis of the various "movements of depression" exhibited by the pollinia of Vandeæ, and of other spontaneous movements, in every case ingeniously measured, and which vary in amount and direction with the elasticity, rigidity, viscidity, or contractility of the organs they affect;—to the mechanical arrangement in Calanthe, which obliges the fan-shaped pollinia to strike the stigma, and which fans are split up into darts projecting from that organ;—and to the unique case of Maxillaria ornithorhyncha, in which the pedicel of the pollinia is reflected.

The wonderful Angræcum sesquipedale now arrests our pen. What can Mr. Darwin make of this exaggeration of an Orchid?—can it too demand insect aid, and of what conceivable use can its enormous spur, all but a foot long, be to itself or to insects either? The answer is necessarily conjectural in a great degree, but every hypothetical step in his reasoning being shown to be founded on observation of what occurs in analogous forms of Orchids, we are compelled to acknowledge that the explanation is in the highest degree probable. That the plant wants insect aid is easily proved; of that no one who reads the description of its flower and looks at a specimen can doubt; then as moths are the known agents in similar cases, so are they presumably in this; gigantic moths abound in hot countries, and great moths have prodigious probosces. But the difficulty only began here; however long Mr. Darwin made his artificial proboscis, he failed to fertilise the flower, and he goes on to say that he could not for some time understand how the pollinia of this Orchid could be removed, until it occurred to him that the probosces of large moths are thick at the base, and that to drain the last drop of nectar, even the largest moth would have to force its proboscis as far down as possible; then in effecting this the proboscis must infallibly be forced into a certain cleft, which would result in the required depression of the rostellum, and in shortening the distance of the tip of the nectary from its orifice by a quarter of an inch: hence when he took a bristle fashioned at the base like the base of a moth's proboscis, and inserted it as a moth would, on its withdrawal the pollinia were in every case withdrawn firmly adhering. So too in depositing the pollen on the stigma of another flower it is shown that this also cannot follow, except the pollen is attached to the very base of the moth's proboscis.

Acropera presents a labellum so extraordinary in form as to baffle description, and it remained inexplicable till it occurred to Mr. Darwin that the plant was bisexual; this he proves to demonstration by a series of beautiful and curious observations. Catasetum is however the most extraordinary and complicated case in the whole order of Orchids, and whether as regards oddity of form, complexity of structure, diversity of sexes, or its exquisitely sensitive antennæ, this genus and its allies must rank amongst the greatest wonders of the vegetable kingdom. It would be impossible without occupying many columns to offer even an outline of the strange structures these plants present, and of the multiplicity of observations and experiments instituted to explain them. Fifty-eight pages are devoted to Catasetum, Myanthus, Mormodes, Monachanthus, and Cycnoches, literally teeming with curious and interesting matter, which alone would establish the reputation of its author as a master of scientific research. We shall endeavour to make two of his great points clear in as few words as possible, viz., the method of impregnation in Catasetum saccatum, and his explanation of Schomburgk's famous specimen presenting three genera on one spike, premising that to do this we have had great difficulty, so interwoven are the descriptions of their parts with comparisons of those of other species, and so difficult is the whole subject.

Of Catasetum saccatum, he says, "The flower stands more or less inclined, but with the lip downwards. The dull coppery and orange-coloured tints—the yawning chasm in the great fringed labellum—the one antenna stuck out, with the other hanging down, give to these flowers a strange, lurid, and reptilian appearance. * * * The cavity in the middle of the labellum does not secrete nectar, but its walls are thick and fleshy, and have a slightly sweet nutritious taste. I believe, as we shall hereafter see, that insects visit the flowers to gnaw these fleshy walls and crests The extremity of the left-hand antenna stands immediately over the cavity, and would almost certainly be touched by an insect visiting this part of the labellum for any purpose. These antennæ are the most singular organs of the flower, and occur in no other genus. They form rigid curved horns tapering to a point. In all the flowers I have examined they occupy the same position; but though otherwise alike they do not stand symmetrically. The extreme part of the left-hand antenna (which is excessively sensitive) bends upwards and a little inwards, so that its tip guards the entrance into the pit of the labellum. The right-hand antenna hangs downwards, with its tip turned a little outwards. It is almost paralysed and apparently functionless.

"Now for the action of the parts. When the left-hand antenna is touched, the edges of the upper membrane of the disc instantaneously rupture, and the disc is set free. The highly elastic pedicel then instantly flirts the heavy disc out of the stigmatic chamber with such force, that the whole anther and its pollinium are ejected with the viscid disc foremost. I imitated this action with a minute strip of whalebone, slightly weighted at one end, to represent the disc; and by bending it round a cylindrical object, gently holding at the same time the upper end under the smooth head of a pin, to represent the retarding action of the anther, I then let the lower end suddenly free, and the whalebone was pitched forward, like the pollinium of the Catasetum, with the weighted end foremost. Besides the spring from the straightening of the pedicel, elasticity in a transverse direction comes into play. If a quill be split lengthwise, and the half be forced longitudinally on a too thick pencil, immediately the pressure is removed the quill jumps off; and an analogous action takes place with the pedicel of the pollinium, owing to the sudden inward curling of its edges. These combined forces suffice to eject the pollinium to the distance of 2 or 3 feet.

"After trials made on 15 flowers of 3 species, I find that no moderate degree of violence on any part of the flower excepting the antennæ produces any effect, but when the right-hand antenna is touched the pollinium is instantly ejected. In C. tridentatum a touch from a bristle sufficed; in five specimens of C. saccatum the touch of a fine needle was necessary; in four others a slight blow was required, I measured the length of several cells in the tissue of the antennæ of C. tridentatum, and found that the stimulus must travel through 70 to 80 closed cells. I have stated that in C. saccatum the right-hand antenna does not hang down and is almost paralysed, and as this does not guard the labellum, which seems in all Orchids to be the part attractive to insects, its sensitiveness would be useless. * * * The viscid matter sets so firmly and the pedicel is so strong though only 1-20th inch broad at the hinge, that it supported for a few seconds a weight of 1262 grains. The utility of so forcible an ejection may be to drive the soft and viscid cushion against the hairy thorax of a large hymenopterous insect, or the sculptured thorax of a flower-feeding beetle. When attached assuredly no force that the insect could exert would remove the disc and pedicel, but the caudicles are ruptured without much difficulty, and the pollen would thus be left on the viscid stigma of a female flower."

After summing up his observations on the uses and positions of these wonderful sensitive antennæ of the Cataseta, Mr. Darwin says: "In every case notice will be given by them in an admirable manner when an insect visits the labellum, and the time has arrived at last for the ejection of the pollinium and for its transportal to the female plant."

(*To be continued.*)

The *Floral Magazine* for September has good figures of Azalea Brilliant, Two-coloured Bee Larkspur, some pallid varieties of Gloxinia, and a new Japanese Lily called Lilium (nova species). The Larkspur has nothing to do with what is called "The Bee," but is a very fine state of D. chinense, itself a variety of D. grandiflorum. As to the Lily, it is some species in a very ugly monstrous state—most likely L. Thunbergianum.

Routledge's Illustrated Natural History, Part 43, is now among Insects, and the Lepidoptera or Butterflies have supplied some gorgeous figures. But we must observe that the woodcuts in this Entomological Department are very inferior to those which preceded them; it would seem as if they could not proceed from any artist.

Garden Memoranda.

ROYAL HORTICULTURAL SOCIETY'S GARDEN, SOUTH KENSINGTON.—As promised last week we now furnish a coloured plan of one of the handsomest of the many beautiful examples of Mr. Nesfield's embroidery represented in this garden, the appearance of which, notwithstanding that the sear and yellow leaf begins to fall from the trees, is as gay as could well be expected at this season of the year. The plan in question represents a circular sunk panel in front of the central piece of water, at the head of which preparations are being made for the erection of the great commemorative monument of the Exhibition of 1851. In the middle is a stone vase 12 feet in diameter filled with flowering plants, and surrounded

readers a few observations as to the merits or demerits of greenhouses, hothouses, and Pineries constructed of iron, and to learn from those best acquainted with the result of this metal's test, since its application to this purpose by architects, whether it answers or not. Many of your readers may have made critical observations, and formed a preference either for iron or wood; their ideas therefore would doubtless be interesting to many. *A Constant Reader.*

Pampas Grass.—Some of your Correspondents may have this Grass now in bloom; I should therefore like to hear of any that could beat one specimen I have. It is about four years old, and has 70 spikes now in full beauty; some of the spikes I should say are 9 feet high. It is situated in rather a damp place. Some younger plants I have near are at present also in flower; they have from 12 to 18 spikes on them. *John Hollingworth, Turkey Mills, Maidstone.*

Societies.

ROYAL HORTICULTURAL: *Sept.* 5.—S. H. Godson, Esq., in the chair. The following new members were elected, viz.:—

Alderman Challis, E. Disney, Esq.; Major General Dunn, Mrs. Henry A. Hunt, Hon. Spencer Lyttelton, Henry Vaughan, Esq.; William Wiffin, Esq.; Mrs. Edward Foxe White, and Mrs. Peers Williams.

Sept. 23 (*Floral Committee*).—Messrs. Low contributed on this occasion a plant of Caladium Lowii, a fine kind with large shining deep green leaves, prominently veined with white. The same firm also furnished Cypripedium Stonii, a creamy white and reddish purple flowered kind, with narrow pendulous tails about 4 inches long, drooping something like those of C. caudatum. From Messrs. Lee came examples of Gold and Silver Spruce Firs, the former of a beautiful golden yellow hue; the latter not so ornamental. Mr. Barker, of Godalming, sent a Weeping Cypress, called Cupressus Barkeri, a variety apparently related to C. Goveniana. The same exhibitor also contributed cut flowers of upwards of a dozen charming varieties of 'perpetual-flowered' Tropæolum, varying from rich golden yellow to brilliant scarlet. Messrs. E. G. Henderson furnished a pretty variegated variety of Solanum capsicastrum, the beauty of which when covered with round bright orange scarlet fruit has often been the subject of remark in our columns. From Mr. Bull came various white and purple flowered Petunias, and Doryopteris nobilis, a handsome new Fern, each of whose leaves is ornamented with a stripe of white up the centre. Mr. Knight, of Battle, showed cut flowers, among which were some very pretty kinds of Tropæolum and Verbena. A promising crimson Rose called Turenne, and a white called Louise Darzans, were shown by Mr. Wm. Paul, and a pink-flowered Rose in bad condition came from Mr. Torbron. Mr. Wm. Paul also furnished a fine deeply glaucous form of Abies nobilis. Various Seedling Dahlias were exhibited by Mr. Turner and others; but none of them received any award. In a collection of older kinds of Dahlias from Mr. Turner were remarkably fine blooms of the following: viz., Lord Derby, Princess of Prussia, Lord Dundreary, Madge Wildfire, Charlotte Dorling, Preeminent, Chieftain, Bob Ridley, Model, Cygnet, Chairman, Mrs. Bush, Norfolk Hero, Earl of Shaftesbury, Criterion, Mr. Stocken, Pioneer, Lord Palmerston, Pauline, Umpire, Beauty of Hilperton, and Delicata.

Sept. 23 (*Fruit Committee*).—Fruit was somewhat plentiful, especially Apples, among which were several seedlings, apparently kitchen sorts, the examination of which was deferred till another occasion. Among named varieties the best came from Mr. Cunningham, gr. to the Bishop of London, whose kinds were Yellow Ingestre, Early Nonpareil, and a seedling from the Ribston Pippin, which promises to be an acquisition. The best Pears came from Mr. Spivey, gr. to J. A. Houblon, who sent Flemish Beauty, Gansel's Bergamot, and Jersey Gratioli. Mr. Swinerd, Minster Abbey, showed Gratioli, Williams's Bon Chrétien, and Royal Somerset. Marie Louise, and others, though good fruit, were unripe. Of Plums the best came from Mr. Bousie, of Stoke Park, near Slough, who sent beautiful fruit of Coe's Golden Drop, and Reine Claude de Bavay. From Mr. Bailey, gr., Shardeloes, came Prince of Wales, a variety like Goliath, Magnum Bonum, and Coe's Golden Drop. Mr. Kaile, gr. to Lord Lovelace, contributed Coe's Golden Drop, and the yellow and red varieties of Magnum Bonum. A good dish of Morello Cherries was shown by Mr. Tillery, of Welbeck, and a late sort of Bigarreau came from Mr. Rivers, who also exhibited several seedling Peaches, the best of which was said to have been obtained from the Pitmaston Orange Nectarine! This was a medium-sized Peach, not unlike a Royal George in appearance. Salway and one or two other yellow-fleshed Peaches were shown; but they were not at all good. Among Melons the best was Golden Perfection from Mr. Bousie; and Mr. Whiting, gr. at the Deepdene, and Mr. Bailey, also furnished good fruit of the same variety. Mr. Turner had a good Orion. Among Figs the best was White Ischia from Mr. Pottle; there were also fine examples of Brunswick and Lee's Perpetual from other exhibitors. From Mr. Graham, of Cranford, came a small but good seedling Pear, and specimens of a white Grape which resembled the Chasselas Musqué. Melville's seedling Grape was also shown, but not in good condition. When in perfection it is, however, reported to be a valuable variety.

Notices of Books.

On the Various Contrivances by which Orchids are Fertilised by Insects. By C. Darwin, Esq., F.R.S., &c.

[Third Notice. See p. 863.]

After fully detailing the structure and mode of fecundation in Catasetum, Mr. Darwin proceeds to read the riddle first propounded by Sir R. Schomburgk, who found three distinct genera, Catasetum tridentatum, Monachanthus viridis, and Myanthus barbatus, all growing on the same plant. All these he proves are sexual forms of one species, arguing from the following considerations. In no Catasetum is the stigmatic surface ever viscid (as in all other Orchids except Cypripedium), which viscidity is indispensable for securing the attachment of the pollen by rupturing their caudicles; the ovary is short, smooth, and narrow; the funicles are very short, the ovules quite imperfect, and the utricular tissue of the stigmatic surface different from that of other Orchids; further, Sir R. Schomburgk never saw Catasetum tridentatum producing seed; on the other hand the sensitive antennæ, staminal organs, and pollinia are perfect. It may hence be concluded that Catasetum tridentatum is a male flower exclusively.

In Monachanthus viridis again the antennæ are entirely absent, the pollen-masses rudimentary, there are no traces of pedicel or viscid disc; the utriculi of the stigmatic surface are different from the male form; the ovarium is longer, thicker at the base, more furrowed, the funicles long, and ovules as in other Orchids; furthermore Sir R. Schomburgk found it seeding abundantly; hence it is almost certain that this is a female plant.

In Myanthus barbatus the antennæ are present, but not so long as in the Catasetum; the stigmatic chamber is intermediate in size between those of Monachanthus and Catasetum; the utriculi are as in other Orchids; the ovary is straight, well furrowed, twice as long as in Monachanthus, but not so thick at the end; the ovules not so numerous, but perfect; the pollinia are small but perfectly developed, and have a well developed disc and pedicel; from all which circumstances Myanthus barbatus may be pronounced a hermaphrodite plant, of which Catasetum is the male and Monachanthus the female.

Still more beautiful and interesting, though not so complex sexually, is the Mormodes ignea, the crowning case of all cited in this remarkable book: this we have read and re-read, fascinated by the marvellous example it affords of the infinity of the resources at the disposal of an all-wise Creator, when he sees fit to adapt the most useless-looking organs to the highest purposes of the plant; we know of nothing in the whole range of botanical literature that can compare with this as an episode in a plant's life: no point seems to be overlooked; the most trifling deviation which Mormodes ignea presents from the ordinary structure of its allies, even to the exact amount of the twist of the pedicel, and direction of each flower on each side of the spike, has a special purpose, and proves to be a most exquisite adaptation of structure to function, failing which all the rest is useless. It takes, however, fully 16 pages to render it clear, and as we have already far exceeded our limits, the work itself must be consulted.

Cypripedium is the last genus described by Mr. Darwin. Its general structure is too well known to be repeated here, and, as might be anticipated, its method of fertilization differs widely from that in all other Orchids. The grains of pollen are coated by and immersed in a viscid fluid, so glutinous that it can be drawn into threads (a unique case), and it is impossible that the pollen can reach the stigma without mechanical aid. The stigma again is not viscid, as it is in all other Orchids, and is convex instead of concave. There is no nectar proper, but the inside of the lip of all the species examined is studded with glandular hairs, which secrete a viscid fluid. The explanation of the operation of fecundation is hypothetical, but otherwise in all respects satisfactory, and is as follows. Two narrow passages, one on each side of the column, lead to the cavity of the labellum; an insect inserting its proboscis into the cavity to reach the glandular secretion within the labellum, would infallibly get the proboscis smeared with the glutinous pollen, and pushing it still further, especially if through a little notch outside the anther, would deposit some of it on the convex stigma of its own flower, or that of another flower, as the case may be.

The remainder of Mr. Darwin's volume is occupied with general considerations, viz., the secretion of nectar, a curious and complicated subject; the homologies of Orchid flowers, worked out with great ability and lucidly explained—especially interesting are the parts relating to the rostellum and development of the pollen; genealogical affinities of Orchids, a very speculative and seductive discussion; the mechanism of the movements of the pollen; uses of the petals; production of seed. Here (apropos, we suppose, of his favourite Malthusian doctrine) he informs us that supposing every seed of Orchis maculata germinated and seeded during four generations, "*the great grandchildren of a single plant would nearly clothe with one uniform green carpet the entire surface of the land throughout the globe.*" The infinite resources of Nature, the hopelessness of any attempt to entertain any adequate conception of their multiplicity, and the illimitable diversification of forms that slight changes effect *in cumulo*, are then eloquently discussed; the importance of the most trifling details of structure is strongly insisted upon, and the perfection of the contrivances for fecundation is shown to be unintelligible if the closest attention be not paid to these details; and the work concludes with a statement (by way of application and warning), of the author's views as to the eligibility of crossing, and injurious effects of marriage between near relations.

It remains to say a very few words as to the general impressions left on the mind by Mr. Darwin's book; his main point, that kept most prominently in view throughout—that Orchids are fertilised almost exclusively by insects, and that their flowers, though hermaphrodite, are fertilised by the pollen of others, is abundantly proved, and the whole subject, under every one of its multitudinous phases, admirably worked out. His secondary object, "to show that the study of organic beings may be as interesting to an observer who is fully convinced that the structure of each is due to secondary laws, as to one who views every trifling detail of structure as the result of the direct interposition of the Creator," he has also more than established; for no author hitherto, let his views be what they may, has written a book relating to vegetable physiology to compare with Mr. Darwin's in point of engrossing, fascinating interest. Whether, however, his third object, that of supporting his hypothesis of the origin of species by natural selection, is attained, will no doubt lead to much diversity of opinion. Upon this point we have earnestly and assiduously laboured to arrive at an unprejudiced opinion, feeling pretty well assured that this great subject must be treated in Mr. Darwin's forthcoming volumes very much as it is here, and that in the present state of our knowledge it admits of no very different method of treatment, nor more powerful advocacy. We find, then, that Mr. Darwin has, in the case of the natural order of Orchideæ, shown that there is an astonishing range of variation in each organ; that a trifling difference in structure between two organs homologically the same, may lead to inconceivable differences in the offices each performs, differences too that materially change the relations of other organs to one another and to their prior purposes, and change too the relations of the species to the organic (especially the insect) and inorganic worlds around; differences, hence, which natural selection cannot fail to take advantage of and intensify, leading rapidly, as it would appear, and infallibly, to that loss of resemblance between the offspring of a common ancestor, which is often the equivalent of generic as well as of specific differences. Of this Catasetum and its sexual forms is the most obvious example, but though more obvious it is not a whit more suggestive than very many others. In so far then, that is in all that relates to structure, the hypothesis gains in every way by a study of Orchideæ. It has, however, been argued that though there is no limit to the ratio in which structural differences may accumulate in an organising progeny, and that hence the origination of species and genera thereafter by natural selection is so philosophical a conception as to demand assent in the absence of any other equally good, there is a physiological rule which is never transgressed, according to which different species are infertile inter se. This argument the study of Orchideæ does not solve, nor indeed could it be expected to do so, but it certainly alters its aspect; it shows, as in the case of Habenaria bifolia and chlorantha, how trifling a structural difference (one far within that ordinarily assigned to variation) will present an insuperable obstacle to fecundation. And this physiological element confounds our ideas of species rather than the contrary, for if Catasetum and Monachanthus are shown to be structurally different genera but physiologically the same species, and Habenaria chlorantha and bifolia are to be considered structurally the same species, but physiologically distinct ones, we may naturally suppose that the infertility of two forms *inter se* is simply the effect of the differences induced between their reproductive organs by variation and natural selection. If these differences are accompanied by others in other organs, the forms are acknowledged to be species by all; if not the question is still a moot one, for one party insists on the positive argument that they are never known to breed together, and are therefore species; and the other must be content to demand proof of the negative, that they never did breed together and never will.

The last Number of the *Botanical Magazine* (September) contains figures of the undermentioned subjects:—*Agave glaucescens*, a remarkable species received at Kew, from Galeotti, as a native of Mexico. It is a large growing plant, with a stem 3 to 4 feet high, and thick fleshy leaves 2 to 3 feet long, and producing from the centre a cylindical scape 8 feet long, terminating in a caudate deflexed spike of densely packed green flowers having much protruded stamens. It flowered in the autumn of 1861 for the first time, and was a very attractive object during the whole winter, for the