LVI. A new view of vegetable life

Mrs. Agnes Ibbetson

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been so highly impregnated with the earths, that stratum *superstratum* were so rapidly deposited that they proved the grave rather than permanent habitations for their tenants. Hence many of the species perished entirely, and others were vastly diminished. But in the fifth period the water, being sufficiently purified by immense depositions, not only permitted the more perfect orders of aquatic animals to exist, but the Creator replenished the ocean with an increased number of inferior inhabitants suited to the improved state of their element.

I am, sir,

Your very obedient servant,

Wycombe, Oct. 9, 1816.

ANDREW HORN.

LVI. *A new View of Vegetable Life.* By Mrs: AGNES
IBBETSON.

To Mr. Tilloch.

SIR, — **T**HE very curious fact I have now to exhibit throws (I think) a new light on vegetable life, perfectly *confirms* the truth of all I have hitherto shown of the history of their general formation, and renders the commencement conformable to those *universal laws* which appear to be established not only in the vegetable, but in the animal and mineral world; as I shall show at the conclusion of this letter.

In my last I depicted the curious manner in which the flowers are developed in the interior, both in trees and herbaceous plants, the year they are *completed* at the exterior of the vegetable. But I am now authorized to suppose that there is a *prior formation*, both of leaves and flowers, prior to that in which they are collected and enlarged in the middle of the plant. In the first I was able to follow the formation in a *regular series*, till they appeared opening into flower, and making their way out of the vegetable *through the buds* in the usual manner; but the *buds* in this case are really the *vehicles for completing* and sending out the bunches of flowers and leaves, and *not* (as it was supposed) the part in which they are formed:—yet to trace in a series what I am now going to show, *is impossible*, as it will not admit of it. I shall, however, give an exact account of the whole process, and the consequences that must (I think) result from such a formation.

Having cut an extremely thin specimen of the wood of the *cupressus* longitudinally, and placed it in my slider, *under* my best microscope (though using very low powers) I was surprised to see a sort of running pattern of *leaves* and *flowers* adorning every two or three stripes of the wood, and now and then col-

lecting

lecting in thicker patterns, when the lancet, in passing over the raised part, pushed them up together, aggregating their numbers. See fig. 1, Pl. No. 3. [Plate IV.]

After examining many different cuttings, I got a fresh branch of the elm, the beech, the oak, the plane, and rose, and cut specimens from each :—still the same object was visible, though arranged not exactly in the same manner, yet in stripes of flowers. Convinced I was not mistaken, I made a bold effort at proving the fact to others, assured that if Sir William Herschel (who happened to be here) saw it, no one would hazard the contradicting a *sight* whose perfection was so *well acknowledged*, or a *judgement* so well *matured*, though they constantly disputed mine. I requested him, therefore, to prove the fact : and with the generosity and good-nature for which he is so much loved, he came and *examined it* directly ; and said, *he saw it most plainly*. I then showed him an horizontal piece, in which he also saw the same appearance of leaves and flowers (see fig. 6). Assured therefore it was a truth ; the first specimen was allowed to rest for several days, while I was examining *herbaceous plants* : but great was my astonishment when I next viewed it, to find that it had *thrown off* many white and *double lines*, between which flowers and leaves did appear to be formed, and that in many places complete bouquets had also aggregated of a glutinous jelly-like matter ;—in short, that vegetation seemed to have continued and prolonged itself even on the glass ; for as the wood had been cut with a pair of scissars, making its edge exactly even, each addition would be most visible. This was indeed a fact worth ascertaining ; and after trying it repeatedly, I again requested the favour of Sir William Herschel's assistance. He gave it me with the same simplicity and kindness as before—directed me to divide the talc into squares, thus regularly magnified, that I might be sure of the increase of the part ; and then taking an exact drawing of *the specimen* by that measurement, there could be no fear of my not knowing the real quantity *added, even to a hair's breadth*. This was completed on Friday ; but on Sunday morning just *looking at it*, I was not a little vexed to see that (great damps having prevailed in the atmosphere) much moisture had insinuated itself between the two talcs ; and would, I was fearful (before Sir William Herschel came on Monday), destroy that *clearness* and *distinctness* of form for which both leaves and flowers are *remarkable*. I therefore prepared two other specimens ruled in the *same manner*. In three days, though the wet had, from a renewal of moist weather, still in some measure injured it, yet the lines and flowers were perfectly delineated :—indeed, the only harm mois-

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

M^r Ibbetson's Anatomy of Vegetables. N^o 3.

Fig. 5.

Fig. 7.

Fig. 6.

Fig. 8.

Fig. 9.

ture does, is to render each individual part *less distinct*: still, however, they were sufficiently so, to be perfectly perceptible to Sir William Herschel, who said he thought there could be *no doubt* that it was the *continuation of vegetation on the glass*. This was indeed a great matter gained, especially when so *witnessed*. Sir William Herschel also did me the honour to see the first specimen.

Fig. 2 was the spoiled piece, which had however increased to fig. 3. Fig. 4 was one of the specimens Sir William examined, which was increased in three days to fig. 5; and another which I have not added, fearful of augmenting *too much* the number of specimens. Indeed the collection of flowers on the glass was evidence sufficient of the fact; for no power but their own could place them *there*. The white specimen might be, and *was laid on the glass*; but the rest could not be either *taken off* or put on, unhurt, without Nature's help.

On further examination I found that, if I *watched with great exactness*, drops of moisture were to be seen ejected from the many cut ends of the line of life; and that when the more diminutive lines of that part increased in length, wherever the liquid had *fallen*, and the double line also *passed through it*, bunches of flowers had protruded, till they became either wreaths or bouquets, running and growing in a fanciful manner as long as the moisture would sustain or *assist in forming them*; sometimes even more than a week. It could no longer be a doubtful fact; for on examining the *tals* and glasses I found them covered with different beautiful patterns, which had proceeded from all the specimens accidentally thrown on the surface; and so opposite is the jelly-like appearance of the new propagation, to the white one presented to examination, that it is not possible to mistake them, or to take one for the other: the lines, indeed, are always white, but the *flowers* and *leaves*, I find, require more than a fortnight to become so: and such is the glutinous power with which they stick to the glass, that nothing but soap and sand can eradicate them; nay, even a knife is sometimes required to scrape the wreaths off, as they absolutely almost indent the talc: yet so high do they lie above the surface, from the quantity of leaves and flowers in the bouquets, that they are easily injured. But great care should be taken that a confusion is not made between the white lines of the increasing vegetation and those that are formed by cracking the talc, for I have now discovered that they are very much alike: however it is the lines only. It is better therefore to take it on glass. My glasses are absolutely *covered with beautiful patterns*, and the specimens will not only increase from the ends, but some will
augment

augment their bouquets, both above and under (if not fixed too close to the glass), wherever moisture has prevailed; but I have never seen any part of the wood *grow*; it is merely the leaves and flowers, with the double line, which is certainly a diminutive thread of the line of life. That this matter on the glass is a *continuation of the vegetable life*, and fig. 1. a prior formation of the preceding year, *I cannot doubt*. I believe also it is merely the corolla, *pericarp*, and pistil, that carry the appearance of a flower in the stripes. I have generally found

them *round, oval,*

or some form like this: but

so extremely diminutive that it is impossible the flower should (I think) contain any thing more than the parts I have named, and perhaps the *stamen cases*; and if it is a prior formation protruded the preceding year, it is reason enough to account for the different ingredients of the flower being all made in a separate place;—for, being composed of such various and dissimilar parts, might not the juices intended to form the pistil be highly detrimental to the pollen? and thus with the rest. Hence probably the extreme pains Nature takes to divide the various liquids necessary to vegetable life, and the uncommon arts *resorted to* to prevent the possibility of their meeting, by confining them within layers of cylinders without any means of communication. This law is so evident and universal, that it is generally the first idea with which a dissector is struck, as it is most plain and positive in every plant. Du Hamel observed it, and has given a *print of it*; as well as Du Petit Thouars.

If, therefore, we suppose this part of the flower presented in fig. 1. to be a prior formation, it is most probable that it should be *protruded* in a *separate state*, from the pollen and seeds. I have accordingly laid it down in this manner.

The corolla, pericarp, and pistil, formed the first year, and followed the next by the insertion of the heart of the seeds and the pollen; which when so far ready rise up from the root in a different part of the stem, and after various preparations, regularly to be traced from point to point, enter the pericarp, where the formation of the flower is complete, and where the whole process terminates, by the displaying their scents and beauties in the open air.

The *flower-bud* and *leaf-bud* therefore must be only intended for the receptacle of the unfinished flowers and leaves, the place in which those parts are completed, and acquire the last finish to their respective forms. The *flower-bud*, when at last fixed in its proper place, is followed by the flowers which were formed

the

the preceding year, now entering the flower-bud for the first time to complete their forms; by the *heart* of the *seeds* when ready, drawing themselves into the *pericarp* by means of the line of life, with which they are tied; and the pollen powder into the stamen. The whole then closing, till near the time of fructification; when the enlarged flowers acquiring new stalks (again leaving the flower-bud which falls off, being scales only) the flowers shoot up into perfection;—then the seeds fill up their heart, acquire their outward part; and when the flower dies, they soon complete their cover, and drop into the earth. The *leaf-bud* also, by taking in the leaves, and completing their edges and upper cuticle (being evidently an after process), and thus gave the idea of their being formed *there*: nay, I have reason to think their pabulum is also a late formation, the bark-juice being then undoubtedly propelled into the leaf-bud.

Thus this new discovery only more completely establishes all the facts I have hitherto made known of the formation of plants, and confirms some of the propositions I wished to prove; viz. that the seeds, pollen, and *flower-bud*, are formed in the root: it shows that also the *flower-bud* and *leaf-bud* are a totally different substance from the *flower* and *leaf*; and that the account I have before given of the passage of the flower-bud through the wood is a *real fact*, and which this new discovery by no means invalidates. Indeed, it accounts for some trifling contradictions that did not quite *assimilate* with the general plan, and for some difficulties I could not *before understand*. The first was the earliest separation of the *flower-bud* and flower, when *in the root*, as every author and every prejudice had taught me to seek the flower in the *flower-bud*. Now this prior formation completely clears the whole, and shows that the flower-bud was merely intended as a case to perfect the flower, not to commence it. How beautiful are they now made to meet, and the flower to enter there for the reception of its various ingredients! In the second place, it showed that what *I took* for the first *commencement* of the leaf was the *weaving* of the scales, and the finishing the leaf: indeed, I never before could account for the little branches of *extremely diminutive leaves* I found also in the leaf-bud, with the loose fibres weaving other parts: the latter were for the *scales*, the former the real *unfinished leaves*: while the leaf-bud is certainly formed in the *bark*, as I have before shown. Thus, though the whole has been discovered by *detached pieces*, it all arranges itself in a perfect regular manner, and, like a *cut map*, each part fits into the place appropriated for it. If this does not prove it true, I know not what will, since perfect consistency belongs to God alone: and I feel thoroughly conscious of my inability to produce or invent such a plan. In short, every
additional

additional discovery, and every new view we take, *prove*, that of the form and proceedings of vegetable life we before knew *nothing*; all our *facts* have *proved false*; all our conjectures *mistakes*; and that we must begin by banishing every former idea that *respects the real nature* of a *vegetable*; except the inimitable and well observed *sexual system*, and the observations of many authors *on seeds*, which have been *really dissected*. As to the nomenclature and general arrangement of plants, and all that part of botany, I touch not on them.—I respect them as I ought, and only admire. All this will, I fear, appear bold language, especially in a woman: but it is necessary sometimes to be bold in the cause of truth; and I am assured I am defending it. That no person had ever torn down a plant for examination, or followed a plant in the interior from day to day, and from year to year, I am *perfectly persuaded*; and these progressive steps are the *only means* of coming at the *secrets of nature*, and viewing the rising of its seeds from the first moment of their protrusion in their mother's womb, and the formation of flowers from their beginning. But let me not be misunderstood:—I do not mean to say that *innumerable mistakes* will not be found in this general plan of the foundation of plants. As I enter into the details, I have no doubt there will. But I have watched with such carefulness, that I hope they will *be few*. Hitherto I have been most fortunate in not discovering *one gross error*; since I am so particular not to declare a truth till I have investigated it in so many ways, and placed it in so many different lights, that I hope the mistakes will not be *serious at least*. The present truth would not (but for so kind and perfect a voucher) have made its way to the public notice till next year.

It is most curious, that in examining sea weeds I have also discovered the flowers and leaves either filling up the midrib or concealed between the cuticles: but they do not run from the root upwards, they are divided into little *separate plants* with a sort of *root to each*. See fig. 9. the *fucus bulbosus*, where they are to be taken from the midrib by numbers, as when that is torn up a number fall out, and will grow on the glass as long as you please to supply them with drops of salt water administered with the fingers. They grow also in the interior of the *dulse*, or *fucus pinnatifidus*; and if the coralline is first taken off by scraping it with a knife on each side, the flowers will be plainly seen; for, thin as the *dulse* is, it is covered by a double coralline and many layers of net, besides having the young plants in the interior. These evidently take their nutriment from the lumps of jelly which forms their apparent root, within which grows also a small piece of sea weed—the whole appearing like *Mocha stone* or Egyptian pebble. (See fig. 8.)

At

At the beginning of this letter, I said that the curious formation just discovered, agreed with the general *laws of nature* in the *mineral*, as well as *animal* world. But I should rather, perhaps, have said “they *appear to agree**.”

I shall now explain what I mean by the assertion.—All metals when first shooting carry the appearance of *leaves* and *flowers*. But when examined they are always to be divided into the regular forms belonging to each separate *metal*, as *octagonals*, *pentagonals*, &c. &c. though they carry the appearance of *leaves* and *flowers*: as is seen in the arborescent *silver ore from the mines of Potosi*;—in the common iron ore, when combined with salt, at Dawlish;—in the arborescent copper, and zinc tree. But they are all (as I said) to be reduced into their *primitive forms*, and it is merely by their diminutive size, and their attraction for each other, that they carry the appearance of a branch.

But in *animal* life by what principle are they made to receive the same form? I have seen the scale of a beetle when broken, *recover and renew itself*. by the same means, forming branches thicker and thicker, till the whole became one mass; yet never growing beyond the boundary line given it, the creature being confined for a few days, and regularly examined in the microscope, till the whole scale was completed and restored to its perfect state. I found also a shrimp with part of the claw broken, and evidently renewing in the same manner: but it appeared to me to resemble the metallic manner: that is, to be divided into octaëdrons rather than the coral form of lime: but part of it had grown so thick it was difficult to develop the exact shape†. A fly also, while I detained it in confinement had a part of its wing restored in the same apparent way, and one part of it (some moisture oozing from the interior) absolutely grew after the creature was dead. But I had some most curious trials respecting a butterfly that are most wonderful, but too long for this place. But if any naturalist will try these experiments, he will, I believe, find them just and correct.

* Some aqua-fortis I had by me, became, in *dissolving copper*, not of a *blue colour*, but a *fine green*; but adding the mercury, it soon changed to a *beautiful blue*, and made a most admirable mixture; for it might be seen to vegetate in a few *minutes time*, and produced in a few hours vigorous branches of two inches in length: when the branches are formed, it looks exactly like Mocha stone. The experiment is certainly important, as explaining how ramifications are produced in the fissures of slate, flints, agates, Florentine marbles; and, perhaps, even in their very substance at the time of their formation, by the intermixture of saline and metalline particles; and also how metals dissolved by and incorporated with the saline juices of the earth are formed into branches and seem to vegetate.

† Of course these, though belonging to animals, must be classed as of the *earths*, and divisible into the forms that sort of lime adopts.

Still

Still the vegetable draws its source from a totally different power, from the *vitality of that line* on which its life and *existence depend*. When the wing of the fly grew, it was visibly from the juice, and began where the juice fell, and joined itself to the wing afterwards. But the vegetable requires *two things*, the double line and the liquid, without which it cannot increase: for I have watched with care where the juice was when no line came to it, and it evaporated without any increase; it is therefore merely the effect of the moisture on the continued line of life, that creates and excites it to further growth, and the continuation of vegetable life.

I am now going to undertake the *leaf* and *flower-bud*.—Various dissections will be placed before the public, which delineations will, I hope, clear up the whole of this subject, and make it impossible for the most unbelieving really to doubt the facts I have shown. I shall pursue the inquiry in a regular series, by taking the buds from the first of their appearing till they burst out into leaf and flower;—ascertaining every three or four days the contents, and taking drawings of them every week. For this purpose, I shall fix on the ash, the lime, and the oak. I shall also begin this week with the sea-kale and cabbage, to ascertain the *interior flower* of the herbaceous plants,—and the result will all be laid before the public.

I am, sir,

Your obliged servant,

Dawlish, Sept. 29, 1816.

AGNES IBBETSON.

Description of the Plate, No. 3. [Plate IV.]

Fig. 1. A specimen of the wood of the *cupressus* cut *longitudinally*.

Fig. 2. A specimen of the matter which grew on the glass.

Fig. 3. That which increased from fig. 2 in three days.

Fig. 4. The specimen which was drawn and measured for Sir William Herschel's inspection.

Fig. 5. The same specimen of the wood of the Scotch fir, which increased on the glass from fig. 4 to the present size.

Fig. 6. A specimen of the wood of the *cupressus* cut *horizontally*.

Fig. 7. A specimen of an herbaceous plant cut *longitudinally*.

Fig. 9. A specimen of the *fucus bulbosus* growing on the glass.

Fig. 8. A specimen of the *fucus pinnatifidus*.

The herbaceous plant has its flower running up from the root inclosed within a circular vessel; which is not the case in trees

or

or shrubs (see fig. 6, *aaa*), but it is very difficult to make them appear within.

†† Mrs. Ibbetson is much shocked at a double mistake made by her respecting the scale of the thermometer, which was Celsius's. (p. 184, Sept.) of which not being accustomed to the scale, and not having her books with her, she was deceived by the person to whom she applied. It however only makes the assertion respecting the heat the more impossible to be believed.

* * In Mrs. Ibbetson's last communication, p. 181, line 25, for "higher regions" read "lower regions;" and in p. 185, for "approaches" read "apparatus."

LVII. On Sir HUMPHRY DAVY'S Safe-lamp, and on Flame.

By J. MURRAY, M.D.

To Mr. Tilloch.

SIR, — IT has always been my most anxious wish to combat whatever doubts I may have found to exist on the perfect security held out to the miner by the continued use of Sir Humphry Davy's safe-lamp. I have cheerfully descended into the abysses of the mine to exhibit my unshaken confidence in, and entire conviction of, its safety.

That on its introduction prejudice did exist, cannot be denied; but this, the offspring of ignorance, was soon dispelled by the beam of truth. It is difficult to believe that any one nurtured in the paths of science can for a moment honestly doubt of the sufficiency of the security. Let them with me enter the mine, that we may rejoice together.

The extraordinary phenomena presented by this discovery were on their announcement rashly questioned, and I am glad of it.—"*Vires acquirit eundo.*" The most sublime discoveries that have adorned the annals of science have had their ordeal to pass, and they have risen with livelier loveliness from the crucible of trial.

In my experiments in the mine I have ventured to place the lamp in the *jet of a blower*:—this would seem to contradict the experiments of Mr. Holmes. In the Dee Bank Colliery, when the fire-damp was flaming in the cylinder, I projected against it a quantity of that highly inflammable powder called *lycopodium*; but even this had no other effect than to increase the *intensity of light*. Like an enraged and imprisoned tiger, it simply gratified the admiring eye with the form it presented and beauty of its appearance. With this shield I could encounter the fire-damp in its most terrific form: and when my services in the cause of humanity are demanded, I think I shall
not