

XXVIII. *Extraëts of three Letters of Sir F. H. Eyles Stiles, F. R. S. to Daniel Wray, Esq; F. R. S. concerning some new Microscopes made at Naples, and their Use in viewing the smallest Objects.*

Naples, 11th August, 1761.

Dear Sir,

Read Nov. 7, 1765. **C**aptain Hood, of the Vestal man of war, having failed from hence for Leghorn the 3d instant, I took the opportunity of sending you by him a small box, put into my hands by Father di Torre, containing four of his spherical Glasses for the Microscope, which he had desired me to transmit to England, as a present from him to the Royal Society, which he hopes will prove as acceptable as he wishes. The diameters of the glasses, and their magnifying powers, are as follows.

Glass.	Diameter.	Magnifying powers.
1st,	Near two Paris points,	640 times, and upwards, in diameter.
2d,	One Paris point,	1280
3d,	One Paris point,	1280
4th,	Half a Paris point,	2560.

The paper, which encloses the last of these, has the following superscription.

“ Igne purissimo generatum incredibili patientia
 “ cucullis orichalceis inclusum globum primum &
 “ unicum diametri puncti dimidii Parisiensis, qui
 “ objectorum

“ *objectorum diametrum auget 2560, inclytæ Soci-*
 “ *etati Regiæ Anglicanæ Jo. Maria de Torre*
 “ *D. D. D.*”

I was to have accompanied this advice with some instructions for the management of the glasses, and also with some minutes I took lately of a few observations, which, at Padre di Torre's request, I made with him of the globules of human blood, for the confirming of the discoveries in his book lately transmitted to you by Sir James Gray: but the Captain's departure being sudden, and the above-mention'd papers not yet prepar'd, I thought it best not to lose the opportunity I had of sending you the glasses, and advising you immediately thereof; direct shipping from hence to England being scarce. The other papers I shall transmit you by the post, as soon as Father di Torre has furnished me with his directions for the management, &c.

In anticipation of the minutes I propose sending you concerning the human blood, I can't help taking the opportunity of observing to you, that this most worthy Father is so esteemed here for his excellent and amiable private character, that there can be no room for the least suspicion of the veracity of the remarks in his book; and in respect to his care and exactness in making his observations, I have had such experience of it in several meetings he has favoured me with for the purpose, that I should in any case as readily rely on his eyes as my own, and indeed with better dependence; as, by the habit of observing, he is enabled to pronounce immediately with certainty upon appearances, that cost me much time and inspection to examine and comprehend.

I entreat

I entreat you will present my respects to the Royal Society; and that you will believe me to be, with great truth and esteem,

Dear Sir,

Your most obedient

humble servant,

F. H. Eyles Stiles.

THESE glasses are so small, that the diameter of the highest magnifier among them is but half a Paris point, which is, if I mistake not, no more than $\frac{1}{144}$ of an inch, the point being $\frac{1}{6}$ of a line, and the line $\frac{1}{4}$ of an inch.

The great difficulty, with respect to these glasses, consists, as Padre di Torre tells me, in the handling them, and the getting them into the little brass sockets, prepared for their reception. The making them in his method is soon done; but they must be socketed before he can examine to see whether the flame of his lamp, which produces them, has succeeded to the perfection he wished; that is, whether they be perfectly spherical, and without flaw, speck, or other accident, which they are so liable to, that he makes many, before he produces one to his mind: and indeed he sets so little value upon them, till he has proved them by the vision of some object, that if one of them, when he has made it, slips out of his little pincers before it has been proved, if he cannot re-

cover

cover it at once, he often makes a new one, rather than give himself the trouble to search for it.

The high magnifier I have been speaking of increases the object 2560 times in diameter; it is the first and only one he has ever succeeded to make of that high power; so that this present is a curious one.

S I R,

Read Nov. 14, 1765. **A** Greeable to the promise in mine of the 11th past, I enclose you Father di Torre's instructions for the using of his glasses; and I subjoin an account of three several observations I made with him, at his request, of the human blood. The account may be thought longer than was necessary; but I was willing to be as full and particular as possible, as I consider'd it as a kind of appeal to my testimony, and as the object of it respected the improvement of those branches of science so interesting to mankind, the medical and anatomical. I have put down only what I saw, without any regard to what he has printed. As Father di Torre's more particular view in proposing to me to go through these observations with him, was the satisfying of the Royal Society of the fidelity and exactness of the account he has given of this subject in the book he lately presented to them, I must desire the favor of you to lay my account likewise before them; and you will also please to deliver to them his paper of instructions for the use of the glasses he has sent them. I am, with great truth,

S I R,

Your most obedient servant,

F. H. Eyles Stiles.

To Daniel Wray, Esq;

*Descriptio Novi Microscopii, a R. P. Di Torre
construēti.*

Microscopium quo utor idem est ac illud Wilsoni, simplex, aptatum speculo cavo ab artificibus Londinensibus, quod describitur ab Henrico Baker in *Microscopio ad captum vulgi* cap. iv; quoniam tamen plura conducere possunt ad microscopii perfectionem, illius quo utor tradam dimensiones.

Capsulas rotundas, quibus, ope binorum cuculionum ex orichalco, claudio minimos globos, jam ad vos misi. In his observandum sedulo est foramen respiciens oculum spectatoris, quod & valde exiguum, & perpolitum esse debet, & foramen quod respicit objectum, quod fere ejusdem diametri esse debet ac globulus; ita ut hic fere a foramine elabatur. Capsulas accuratius conficient artifices Londinenses, ut globuli constituentur in centro capsulæ, & cuculiones, non ope ceræ, sed cochleæ, firmentur.

Est intra corpus microscopii alia capsula rotunda, diversa ab ea qua utitur Wilsonus, cui imponuntur laminulæ orichalceæ cum quatuor, vel quinque foraminibus munitis duobus talcis pro objectis. Capsula hæc integra est, & intra ipsam filum orichalceum, quod instar elastarii firmas detinet laminulas cum objectis. Supra hanc capsulam, est intra corpus microscopii alium filum orichalceum ut, cum hæc capsula, ope tubi inferioris, cum cochlea sursum impellitur ut objectum globo appropinquetur, non excurrat lateraliter, sed in eadem maneat directione.

Huic tubo cum cochlea, qui est intra corpus microscopii, & quo objecta appropinquantur, globo adhæret

ret in parte inferiori tubus alius, qui ope cochleæ aptatur, cujus longitudo est pollicis Parisiensis cum tertia parte. Hoc utor ad excludendum lumen laterale superfluum, & dirigendum lumen a speculo concavo inferiori reflexum pro objectis illuminandis. Quandoque, si lumen a speculo reflexum satis vividum fuerit, intra hunc tubum apto successive diversa diaphragmata lignea cum foraminibus $\frac{1}{3}$ vel $\frac{1}{4}$ pollicis Parisiensis ad arcendum lumen superfluum, & ut ea tantum portio luminis introducatur, quæ necessaria est ad illustrandum objectum, ut clare & distincte videatur. Ad eundem effectum parata etiam habeo plura diaphragmata ex charta crassa, quæ speculo concavo superimpono.

Sub microscopio adest duplex speculum concavum, cujus centrum distat a plano subjecto per pollicem Parisiensem cum dimidio, & ab objecto illuminando per pollices quatuor. Focus speculi ex una parte est pollicum 2 cum dimidio, ex alia vero parte pollicum 2. Hoc ultimo speculo utor cum lumen est nimis vividum. Ut lumen probe a speculo reflectatur, curandum est ut lumen sumatur ab aliquo pariete extra cubiculum, qui a Sole illuminatus sit, & lumen intra speculum ab alto cadere debet; si cadat sub angulo fere 60 graduum, tunc lumen est optimum. Quandoque, si nullus sit paries ante cubiculum, utor lumine reflexo cœli; sed tunc diaphragmata adhibenda sunt, donec objectum clare, distincte, & vivide oculis affulgeat. Quandoque, si globuli præcipue minimi sunt aut Sol non luceat, nec diaphragmata adhibeo, nec tubum inferiorem microscopii.

Totum artificium pro usu recto hujus microscopii cum globulis in eo constituitur, ut lumen aptum ad-

hibeatur pro illuminandis objectis, quod nec nimium, nec debile esse debet : si in alterutro pecces, omnia confundentur ; agitur enim hic de globulis qui vix oculis nudis distinguuntur, & adeo exiguæ superficiei ut radii luminis, licet exilissimi, sensibilem habeant ad ipsam superficiem rationem, quod in lentibus, aut globis majoribus non evenit. Ideoque has omnes cautiones quæ adhibendæ sunt plusquam par erat forsan exposui ; usus enim quæ necessariæ tantum sunt facile edocebit.

An Account of some microscopic Observations on the human Blood.

THE first observation was made July 2^d, 1761, with Wilson's single microscope, constructed for a perpendicular inspection, with a mirror beneath it for reflecting the light. The instrument was placed on a table near to a South window, but the sun's rays were not reflected on the object ; it being Father di Torre's opinion, that the ordinary day-light would shew the globules in a more natural state. A small drop of blood was included between two talks, and was changed during the observation, in order to give the appearance all the advantage that might arise from the accidental situation of the globules between the talks, and also to renew their motion ; for although the blood viewed in this manner is not in a state of circulation, yet, either from the vacuum formed between the talks, the attraction of their surfaces, or some other cause, the serum is seldom in a quiet state on its being first included between them, and the globules that float in it move for some time

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in various directions as the current of the serum inclines them, or as they themselves are more or less attracted by each other or by the talks, till the whole has found a state of rest.

The magnifier applied was a spherical glass, which he computed to magnify the object 512 times in diameter.

In these views, the globules, though they varied a little from each other in their outlines and dimensions, appeared in general to be circular or elliptic, and of the size of swan-shot. Their figure as solids was not easily to be determined in such an exposition of them, but they had the appearance of oblate sphaeroids much compressed, although, from their free motion with the serum, it was manifest they suffered no pressure from the talks; where the focus was perfect, or nearly so, the middle part of each globule was darker than the margin; and this difference in shade gave them an appearance, as if a dent or concave impression had been made on their surfaces, which resembled those of young peas that have dimpled in the boiling. What this darkness next the center was owing to, will appear from the second observation; but in this I could not judge it to arise from any thing but a sinking in of the surface in that part, or some accident of the light that furnished such an appearance.

July 9th, a second observation was made with the same instrument, to which was applied a sphere which magnified the object 1280 times in diameter. In this view, the variation of shade on the middle part of each globule from that of the margin, was such as carried with it strongly the appearance of a perforation.

perforation. I had indeed my doubts of this on first examining them, because, on a very slight alteration of the delicate focus of so high a magnifier, the light and dark parts would interchange, so that the refraction or reflection of the light might still be suspected to occasion the appearance in question : but continuing my view steadfastly, and taking notice of all the diversities which a numerous collection of globules presented, I remained at last thoroughly convinced that they were perforated ; for, when any of the globules happened to move with the serum in the most perfect focus, which could not happen to all, in a medium of some little depth, I could with great clearness distinguish the exterior and interior circumference of the ring, of which each globule consisted ; the interior one being bounded by a black line or shade next the perforation, exactly resembling that which bounded the exterior one, and distinguished it from the serum without. In such globules I could also easily observe the ring to be articulated, the transverse lines at the joints being very distinguishable. The figures of the articulations were various ; in some they were roundish, so that the ring appeared like a bead necklace ; in others, cylindrical, and of some length. The number of which the whole was composed, seemed uncertain, varying from two or three to six or seven ; many of the rings were broke, either by some confinement of the talks, or by beating against each other, which I saw them continually doing ; and by these accidents the joints of the rings were detached, and wandered about separately in great numbers ; and indeed they appeared separable with as much ease as if they had been united
by

by mere contact only. Some of the rings were broke into semi-circles, others into greater or less portions, and others again divided into their constituent articulations, which in some places floated about single, and in others formed by their mutual attraction a lateral union, like the pipes of an organ. I must observe also, that these separated parts seemed to be hollow and transparent, and, like inflated bladders, would easily yield, and change their figure, stretching or contracting themselves from round to oval and cylindrical, and *vice versa*, as any lateral pressure in crowding along with the serum brought a constraint upon them. As they floated at different levels, I observed many of them pass over or under each other without interruption, and the same would happen also to the whole rings and larger portions. I remained, therefore, after repeated examinations of the globules in this state, without the least doubt either of their perforation or articulation; for although the articulation was not distinguishable in every globule, I think it was so in the greater part of them; and it is natural to imagine that the rest were articulated likewise, though they might not pass at the proper distance for its being distinguished. I omitted to speak of the size of the globules in this observation, nor indeed can I, from so various an appearance, form any judgment thereof, farther than to say that they appeared in general much augmented beyond their appearance on the 2d of July.

August 27th, a third observation was made with the same instrument of some blood dropped upon a single talk, and view'd as it lay without any cover, so that there could be no compression. I view'd it, whilst

whilst the globules were still in motion, with a sphærule that magnified the diameter 1920 times; and in this view the globules appear'd so clearly to be hollow rings, that there was not room for the least suspicion of the reality of the fact from any circumstance. The diameter of the perforation appeared much larger in proportion to the thickness of the circumference than it had done in the former views. The figure of the rings, where they were free, and in their natural state, was circular; but where they were so crowded together as to compress one another in their passage, they assumed a variety of different figures, although they generally restored themselves to a circular figure again, unless broken by the compression which frequently happened, and then the broken parts floated separately; or, if they opened at a single joint only, the whole of the ring would float along, varying its figure occasionally from that of a portion of a circle, which it would first assume, to a straight line, an undulated one, or some other accidental incurvature. The articulation was visible in several of the perfect rings, but for the most part it was not to be distinguished, tho' even in these, from their breaking so easily, it was not to be doubted but that they consisted of the same detached members or joints as those in which the transverse divisions were visible.

Upon applying afterwards magnifiers of less power to the same blood, the greater advantage of light made the rings appear still more perfect and distinct; but as these were not applied till the globules had lost their motion, and the whole drop had grown dry upon the talk, the divisions at the joints were

none

none of them visible; almost all the globules or rings, as I must now call them, had, upon drying, formed themselves into perfect circles. The most complete and satisfactory view I had of them in this dried state, was with a magnifier that encreased the diameter 640 times; tho' the perforation was distinguishable even with one which encreased it only 129 times. In many places the globules had, by the drying of the whole drop, united into a closer body, and seem'd as if cemented together by a grumous substance of a blackish or deep red colour, which possessed and filled up all the exterior spaces form'd by the union of so many circular bodies; but the interior spaces or perforations of the rings were still free, and for the most part distinctly visible, some few places excepted, where the globules seem'd to have united over one another, and not only lay in too much confusion to give room for any proper observation of them, but formed also a body too dense to transmit the light. The grumous substance above-mention'd, as it extended itself along the exterior spaces, had the appearance of a ramification; and it was perhaps in some such state that the globules were view'd by Dr. Adams, whose glasses induced him to suspect the truth of the common opinion, that the blood consisted of globular particles, and to describe them rather as imitating the branches of a tree. See his Remark on Blood, in Jones's Abridgment of the Philosophical Transactions, vol. IV. p. 204.

A Letter of Sir F. H. E. Styles, F. R. S. to Daniel Wray, Esquire, F. R. S. on the Sexes of Plants.

Naples, December 29, 1761.

S I R,

Read Dec. 12, 1765. **I** Enclose you Professor Cyrillo's drawings of the objects lately viewed with the microscopes of Padre di Torre, which he desires may be presented with his respects to the Royal Society. The explanation I have annexed of the figures, will in some measure shew how they serve to confirm the remarks I sent you on the impregnation of vegetables. However, that our reflections on this subject may receive a more methodical support from them, I enclose you another copy of the remarks, with numeral references to those figures, that serve to verify the account given of the particular appearances, which I was obliged to omit in the first copy, as the figures had not been then ranged and numbered.

In my letter of the 16th of November, accompanying these remarks, speaking of the class Diœcia, I said, that there must in this class be some original difference, either between the corpuscles which produce the male plants, and those which produce the female ones, or between the respective ova which receive them : a further reflection since upon the subject has led me to doubt whether there is a necessity for such supposition, there occurring to me another way
of

of accounting for this part of the œconomy of Nature, which I not only think a more probable one, but which, if all the circumstances to be explained are duly attended to, will, perhaps, be thought to amount to more than a conjecture. I would suppose that not only in the Dicœcious plants, but in the Monœcious and Polygamious also, and, to speak more generally, in all cases where the male and female organs are found separate, the defect is not in the flower, which I suppose to be originally instructed with the rudiments of the organs of both sexes, but that it arises from some circumstance in the plant that determines it to blow the one organ and not the other.

That the absence of the rudiments is not to be inferred from the want of their expansion appears plainly from the following circumstances that fall under every one's observation, viz.

That plants do not produce their flowers all the year, but only at particular seasons.

That many plants are some years before they produce their flowers, and hardly any, except annuals, blow the first year after they are sown.

That soil, climate, pruning, and many other circumstances, will bring plants to blow sooner or later than they would otherwise do.

That culture will encrease the quantity of bloom, and thereby occasion the expansion of flowers, which would otherwise have remained within the wood.

Now if these circumstances, which are similar to those of which the explanation is sought, be so common, I ask why we may not in like manner suppose, " that, whenever either the male or female organs

“ are absent, it is owing to some circumstance that
 “ determines the sap into other channels, and thereby
 “ prevents the expansion of the part.”

I said this would, perhaps, be thought to amount to more than a conjecture ; because, besides its probability from the circumstances I have stated above, it will perfectly explain another well attested phænomenon in the class Diœcia, that is scarce to be accounted for on any other supposition. viz. that a male plant has, at a certain age, been found to change to a female one, and *vice versa*, and also to bear flowers of both sexes, to which I may add another which I have myself observed in the Monœcious plants, Zea and Ricinus, where I have often found spikes of fruit breaking out amongst the male flowers, though they commonly come out separate from them in another part of the plant.

If there be any weight in the arguments I have here used in support of this supposition, the general conclusion will be this, that the flowers of all vegetables whatsoever are hermaphrodite in their original construction, though both the organs do not appear in all cases.

I am,

S I R,

Your most obedient Servant,

F. H. Eyles Stiles.

Remarks

Remarks on the Impregnation of Vegetables.

EACH grain of pollen is a vessel filled with pulpy matter, in which are lodged a considerable number of smaller grains, which may be called the impregnating corpuscles (Figure 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13). These are not visible with the naked eye, but may be distinguished with glasses of moderate power, if the grain be transparent, or if the pulp be forced out by compressing the grain between the talks. They are round, transparent, and nearly of the same size in all plants. They are conveyed to the germen through the style, which is furnished with internal ducts for that purpose; and in the class Syngenesia, and in the small plants of other classes, where the style is slender and transparent, they may be distinguished in their passage (Figure 19). The manner of their reception into the style depends on the disposition of its surface: our observation fell chiefly on those plants that have hairy styles or stigmas; and in these the corpuscles enter by means of the hairs, which are often found on the style itself, so that the stigma must not always be looked upon as the only recipient part, though it may, perhaps, be so in most instances. The hairs are so many tubes open at the extremity for the reception of the corpuscles; they are usually shaped like a thorn, or prickle, widening towards the base. They are each of them furnished with a canal, or tube, which divides itself at the broader part of the hair, and enters the pistillum in two branches (Figure 17) which run on till they join the longitudinal

dinal ducts that lead to the germen (Figure 21). These canals, after they enter the pistillum, are less regular, branching out frequently into smaller ones, which, instead of running directly to the longitudinal ducts, vary their direction, and fall into the canals that run from the hairs next adjoining, furnishing the appearance of an irregular reticulation (Figure 22), though nevertheless there are commonly principal canals observable that run more directly towards the longitudinal ducts, and fall into them (Figure 22). The corpuscles are admitted into the hairs in the following manner; the grains of the pollen having dispersed themselves about the style and stigma, great numbers of them find a lodgement amongst the hairs; those which fall between the hairs, or cling to the sides of them, may be supposed to lose their effect, which will not be thought improbable, if it be considered what an abundant provision there is of the pollen, and how large a part of it must necessarily be wasted by being carried away by the flower, or at least not falling on the female organs, but there are many of the grains that fall on the points of the hairs (Figure 23), and these furnish the impregnation. The grains being arrived at a state of maturity before they issued from the antheræ, are prepared to burst and discharge their contents when they fall on the hairs, and the female organ assists likewise in producing this effect; for soon after a grain has lodged itself, the point of the hair begins to open, and the mouth extends itself by degrees over the surface of the grain, till almost the whole body of the grain is drawn within the tube (Figure 23); in this situation, the

the grain soon yields to the compression of the tube, and discharges its corpuscles, which, with the assistance of the fluid parts of the pulp that enter with them, or of the juices with which the tube itself is furnished, float on till they enter the longitudinal ducts, which convey them to the germen. The grains, after thus emptying themselves of their contents, wither and contract, and, falling off from the mouth of the tube, remain in a perished state about the sides of the pistillum (Figure 19). The figure of the hair, whilst the grain is lodged in the mouth of the tube, is remarkable; for the tube is then widest at the extremity, and lessens gradually as far as the bifurcation, where it forms a narrow neck, which gives a bell-shaped figure to the superior parts, whilst the lower part widens again towards the base (Figure 23). In transparent styles, the ducts that lead to the germen may be seen filled with corpuscles, which, being supplied in great quantities from the hairs, pass on through these ducts in regular lines so close as to touch one another (Figure 19). In some inspections, the corpuscles were seen to move both in the hairs and in the principal ducts of the style, which shewed them to be detached substances, that could pass freely with the current of the juices in which they floated; but their regular progress towards the germen was doubtless interrupted by the gathering of the flower, so that the motion observed could only be ascribed to accidental attractions, which put the juices in motion between the talks; and this was evident also from the direction of their motion, which was casual, and not always leading towards the germen. The number of the principal ducts that

that lead to the germen cannot be ascertained; they probably vary according to the number of loculaments to be supplied; more than one was commonly observable with the corpuscles passing in close files through them, as has already been described. In the pistilla of flowers in bud, no corpuscles could be discovered; which is a strong proof that they are received from the pollen, and destined for the impregnation.

Upon examining the pappus or down that crowns the seeds in the class Syngenesia, the hairs of the pappus were found to be hollow, and filled with the same corpuscles (Figure 24). How the corpuscles are admitted into them, or for what purpose they are lodged there, must be left to further enquiry; in the mean time, it may be observed, that the situation of the pappus makes it improbable that the corpuscles should be received therein for the purpose of conveying them to the germen; and that therefore it is more natural to suppose, that the corpuscles arrive there after their passage thro' the germen, and that the hairs of the pappus serve as excretory vessels for taking off those that were useless to the impregnation. This is the more probable, as the great quantity of them brought by the ducts must doubtless occasion such a superfluity.

Upon examining various plants of the order Filices, of the class Cryptogamia, no male organs could be discovered. If the flowers of these plants be hermaphroditic, the staminiferous part doubtless falls off as soon as the impregnation is over, as it does in other cases; so that if the male organs are not sought for at the precise time when the plant is in bloom, the
search

search must be a vain one. The fructification in these plants is for the most part covered with a thin membrane, which Mr. Miles calls a sort of fungus or tubercle (Phil. Transf. N°. 461.) and which, at its first appearance, and for some time afterwards, seems to have its margin closely adhering to the leaf. If the antheræ lie under this cover, it is probable that the flowers do not blow till the margin has detached itself from the leaf, and admits the air to come under it, for the maturation and dispersion of the pollen. This may, perhaps, point out the critical time for searching for the antheræ. However this may be, the antheræ and pollen are probably very minute; and as it is no easy task to make the examination of what is concealed under these membranes with a single microscope, to which the glasses we have used are commonly applied, we have not yet found the means of discovering them. The feed vessels and seeds have been already well described and figured by Mr. Miles; however, as some delineations were made of them as they appeared to us, they will accompany the other drawings (Figures 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36,) and may serve to confirm Mr. Miles's account of them.

In the male flowers of *Marchantia Polymorpha* Linn. the grains of pollen were observed in a thick tuft of hairs, where they seemed rather to have lodged themselves accidentally after their dispersion, than to be affixed to them as they are described by Linnæus (*Farina crinulo affixa*. Gen. Plant.) These hairs, viewed with the microscope, had a remarkable appearance, each hair consisting of a double chain, and each chain being composed of round bodies,

placed at regular distances from each other, and connected by a thread. The two chains are so close to each other, that the bodies touch one another in pairs, the whole making a regular figure. After compressing one of these hairs between the talks, the two chains seemed to have twisted round each other, and to exhibit an appearance somewhat resembling the cable of a ship. Of the use of these hairs in the male flowers, we could form no conjectures. The figures of them will be found amongst the drawing (Figures 37, 38.)

Explanation of the Figures in TAB. VIII. and
TAB. IX.

N. B. The generic and specific names here used are the Linnæan. The numbers in the column on the right hand shew how many times the object was magnified in diameter.

- FIG. 1. A grain of the pollen of *Hibiscus Syriacus*, 512
2. The same, with the impregnating corpuscles forced out by compressing the talks, 512
3. Some of the same corpuscles separate from the grain, and more extended in length, which was supposed to arise from their adhesion to one another, tho' the division was not perceptible, 512
- 3 4. Grains

Fig. 1.



2.



3.



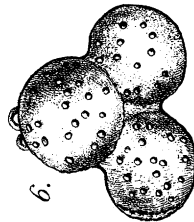
4.



5.



6.



7.



8.



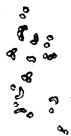
9.



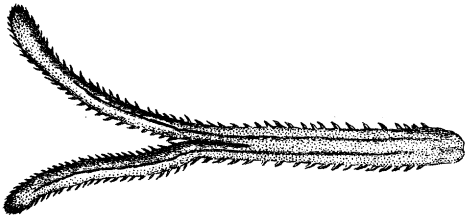
10.



11.



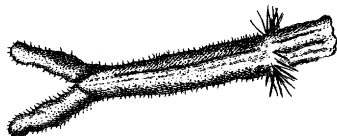
14.



15.



16.



19.



17.



20.



18.

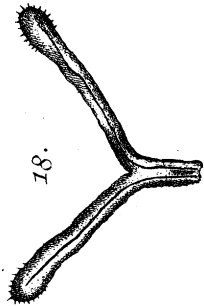
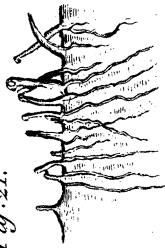
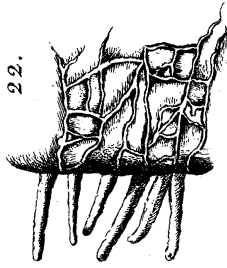


Fig. 21.



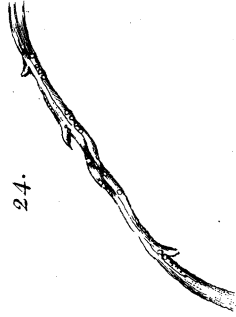
22.



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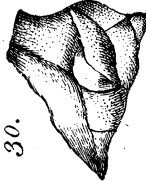
28.



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31.



32.



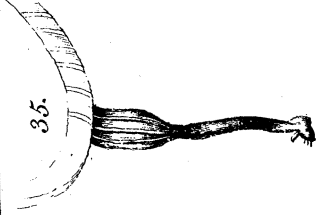
33.



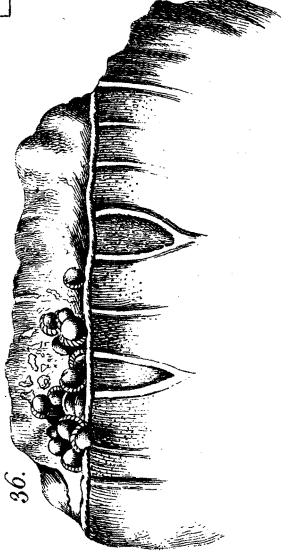
34.



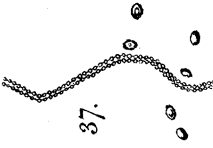
35.



36.



37.



38.



- FIG. 4. Grains of the pollen of *Mirabilis jalapa* with the impregnating corpuscles seen within them, 72
5. A grain of the same, 512
6. Three grains of the same sticking together, 1280
7. Corpuscles of the same, viewed separate, 1280
8. A grain of the pollen of *Cucumis fativus*, with the corpuscles within it, and some on the outside, that had been forced out, 192
9. Grains of the pollen of *Bignonia radicans*, with the corpuscles within them,
10. A grain of the same, 1280
11. Corpuscles of the same, view'd separate, 1280
12. A grain of the pollen of *Gomphrena globosa*, compressed, 1280
13. Grains of the pollen of *Bryum*, with the corpuscles within them, 1280

N. B. The same corpuscles were seen in the pollen of *Atropa*, *Hyoscyamus*, *Scilla*, *Scabiosa*, *Valeriana*, *Verbascum*, and a great number of other genera ; but the delineations were omitted, as the appearances were nearly alike in all.

- FIG. 14. The style and stigma of *Leontodon taraxacum*, 72
15. Two hairs of the same, in which the perforation was distinguishable, 1280
- M m 2
- FIG. 16.

- FIG. 16. The stigma and part of the style of *Carduus crispus*, 72
17. Two of the longer hairs of the same, in which the canals or tubes, with their bifurcation, are shewn, and the corpuscles passing thro' them, 1280
18. The stigma and part of the style of *Conyza squamosa*, 72
19. A portion of the style of the same, with the corpuscles passing thro' its longitudinal ducts, and the emptied grains of the pollen adhering to its sides, after having dropped from the hairs of the stigma. 859
20. A perfect grain of the pollen of the same, 859
21. Part of the side of a style of *Solanum officinarum*, with its hairs, and the continuation of their canals thro' the body of the style, 128
22. Part of the same, in which the transverse communication between the canals is shewn, 384
23. A hair of the same, with a grain of pollen lodged within the extremity of the tube, 1280
24. Part of a hair of the pappus that adheres to the rudiments of the seeds in *Sonchus oleraceus*, with the corpuscles within them, 1280

FIG. 25. A leaf of *Asplenium ruta muraria*, with its seed vessels, which in this plant have no membrane that covers them.

26. The seed vessels of the same, with their elastic rings, 42

27. A seed vessel of the same, broke by compression, with the seeds falling out, 128

28. Seeds of the same, 859

29. A seed vessel of the same, in which the parallel streaks on its exterior surface are shewn, 128

30. A small portion of the capsular part of the seed vessels of the same, on the surface of which there appeared smaller streaks, which subdivided the parallel ones shewn in FIG. 31. 859

31. A portion of the ring of a seed vessel of the same, 512

32. A smaller portion of the same ring, in which was observed a plane side at the under part, where it adhered to the capsule; upon examining the broken part at the end, the ring appeared to be solid.

- FIG. 33. A membrane that covered the fructification of *Polypodium filix* was separated from the leaf, and shewn as it appeared upon viewing its under side with some of the seed vessels adhering to it. (a) The broken part where it had been joined to the leaf.
34. Some of the seed vessels of the same viewed separate, 48
35. The peduncle of a seed vessel of the same supporting the ring, 1280
36. Part of a leaf of *Adiantum capillus veneris*, shewing the membrane which grows from its margin, and which folds over it to cover the fructification, but had been unfolded for observing the under side and seed vessels, which are here shewn.
37. Part of one of the hairs of the male flowers of *Marchantia polymorpha*, with some of the pollen, 1280
38. The same compressed, 1280