

Body. The Pain has not been always equally sharp, but he says, that the first time he lost the Use of his Breath for some Moments; and he then felt so intense a Pain all along his right Arm, that he at first apprehended ill Consequences from it; tho' it soon after went off without Inconvenience.

It is to be remarked, that in this Experiment he stood simply upon the Floor, and not upon the Cakes of Resin. It does not succeed with all Glasses; and tho' he has tried several, he has had perfect Success with none but those of *Bohemia*. He has tried *English* Glasses without any Effect. That Glass with which it best succeeded was a Beer-Glass.

Mr. *Muschenbroeck* the Professor has repeated his Experiment, holding in his Hand a hollow Bowl exceeding thin, full of Water; and he says he experienced a most terrible Pain. He says, the Glass must not be at all wet on the Outside.

XII. *A Letter from Mr. John Hill, Apothecary, to the President, concerning the Manner of the Seeding of Mosses; and in particular of the HYPNUM terrestre, trichoides, luteovirens, vulgare, majus, capitulis erectis. RAII Synops. Ed. 3. pag. 84.*

S I R,

Read Feb. 13. 1745-6. with Alterations.

THE many late Discoveries of the Seeds of Vegetables (formerly supposed to produce none) have opened a Way

Way to an extensive Scene of Knowledge; and led to a Series of Observations, in which there will be found an almost inexhaustible Store of Delight and Admiration. The Mosses, in particular, one of the most beautiful Parts of the vegetable Creation, will afford the curious Observer more Matter of Entertainment than perhaps any other Class of it. A Specimen of which I do myself the Honour of communicating to you in this Letter.

The particular Observations it contains, though new and surprising, you will allow unquestionable in Fact and Certainty, when I add, that they are what I have not *only* often repeated myself, but have also shewn to Mr. *Baker*, Dr. *Parsons*, and Mr. *Needham*, Gentlemen of too nice Eyes, and too conversant in Observations of this kind, not to have discovered Mistakes, if there had been any; and who all agree, that no Discovery by the Microscope was ever clearer.

The Manner of seeding of the Mosses in general is a Thing perhaps as little understood, as any Part of the vegetable System: What I have to offer here is the explaining and describing it clearly, in one Species at least, from a Number of Observations made on it in its different States, and at different Seasons of the Year.

The thorough Knowledge of the Operations of Nature in the Seeding of one of these little Plants, may, I hope, be a fair Step to the discovering it in them all. And the almost infinite Variety of not only *Species*, but *Genus's*, in this Class of Vegetables, seems to promise the Inquirer a vast Variety of new Discoveries.

I shall

I shall not trouble you, to whom I very well know there is no need of repeating any Part of the Labours of the antient or later Naturalists, with an Account of the erroneous Opinions of others on this Subject; you will find, by this Account, that those who have been used to judge well in other Parts of Botany, have been altogether mistaken here: And even the accurate Mr. *Hook*, who of all others has come nearest a Discovery of the Truth, and who actually saw some Part of the Organization of these little Bodies, was so far from making the least Guess at the Nature and Uses of what he saw, that he even mistook the Structure of it.

The particular Species of Moss, whose Head I here send you a Description of, is the *Hypnum terrestre, trichoides, luteovirens, vulgare, majus, capitulis erectis*. Raii Synops. ed. 3. p. 84. *Hypnum vulgare, sericeum, recurvum, capsulis erectis cuspidatis*, Dill. Hist. Musc. 323. It is frequent on old Walls, and there is a Specimen of it in the third Volume of the *Hortus siccus* of *English* Plants of my collecting, which you honour with a Place in your Library.

The Head of this Moss appears to the naked Eye (as at *Fig. 3. TAB. I.*) of a pale-brown Colour, and smooth Surface, and is in Part cover'd with a membranaceous *Calyptra*, resembling in Shape an Extinguisher, or a Funnel inverted. When this *Calyptra* is taken off, and the Head placed before the Microscope, the Surface of it is seen to be ridg'd with longitudinal *Striae*, the Basis of the Head is of a dark Orange-colour, and more opaque than the rest; and the Top is bounded by an orange-colour'd Ring, swelling out something
beyond

beyond the Surface of the contiguous Parts of the Head.

A close Observation and good Glasses have inform'd me, that in this little Head there are not wanting the Parts essential to the Fructification of what are commonly called the more perfect Plants.

This Ring is truly a monophyllous undulated *Calyx*; and within it arise sixteen pyramidal fimbriated *Stamina*: These are of a pale-greenish Colour, and are loaded with a white oval *Farina*: The *Stamina* all bend toward each other from their Bases, and almost meet in a Point at their Tops. This is their Appearance when the Head is nearly ripe, and is what is express'd at *Fig. 4.* TAB. I. And immediately under the Arch formed by these *Stamina* is plac'd a slender, cylindric, hollow *Pistillum*, thro' which the *Farina* makes its Way, and is dispersed among the Seeds in the Head.

The external Membrane of the Head is a Continuation of the outer Covering of the Stalk, and is strengthen'd at its Basis by four or five Ribs, which soon lose themselves in the *Striæ*.

A longitudinal Section of the Head shews, that the Membrane before-mentioned incloses a Seed-vessel so large as to fill it every Way: In most Places they touch; but where-ever they do not, a Number of very slender, white, and transparent Fibres shew themselves, which join them together. This Seed-vessel is fill'd with perfect and very beautiful Seeds; they are round, transparent while unripe, but afterwards opaque, and of a very beautiful Green; which Colour they retain even when dried.

The Number of Seeds in one of these Heads is astonishingly great: I have many times attempted to
count

count them, in such as were full, and out of which few or none had been dislodg'd by the Cutting ; and as the Accounts, at different Times, and various in Heads, have not much differ'd, I shall venture to insert a Guess from them. It will easily be conceived, that in Seeds so minute as well as numerous, this must be a very difficult Task ; and indeed to count every separate Seed, I believe would be not much less than impossible : The Method therefore by which I make the Calculation is this.

I count in an eighth Part of the Circumference of one Half of the Head nine Seeds, $9 \times 8 = 72$. there are therefore 72 Seeds in a Line, which reaches round the Circumference of one Half of the Head. I judge the Length of this Half to be to its Circumference as 3 to 2, or thereabout : Therefore, in one longitudinal Line in it, there must be 96 Seeds ; the whole Quantity in the Half of the Head therefore is $72 \times 96 = 6912$; and, doubling that for the equal Number of Seeds of the other Half, there appear to be in one Head $2 \times 6912 = 13824$ Seeds.

Fig. 5. TAB. I. shews a longitudinal Section of the Head with the Seeds, the *Stamina*, and the joining of the Capsule with the external Membrane of the Head.

The *Stamina*, examined alone, afford a most pleasing Sight ; they are composed of a white transparent Substance, of a pyramidal Figure, everywhere cover'd with a pale-greenish Crust ; which is the Receptacle of a vast Quantity of an oval *Farina*, so extremely minute, as to be visible only with the most powerful Magnifiers in the double Microscope.

The outer Membrane of the Head becomes separable from the Capsule when perfectly ripe and dry ;
and

and then, view'd in the double Microscope, shews a reticular Texture, not visible in it before.

When this Head is first produced from the Plant, the *Stamina* are very slender, and stand erect; the Head is scarce any thicker than the Stalk, and the *Calyptra* covers the Whole, to shield the tender Substance of the *Farina* from external Injuries. As the *Farina* afterwards swells in the *Stamina*, the Seeds also in the Head increase in Bulk, and become visible, and are then transparent; but when it is perfectly ripe, the *Calyptra* falls off, and the Wind dislodging the *Farina* at times, as it ripens some sooner, some later, it makes its Way through the *Pistillum* into the Head, and the Seeds then become much larger and opaque; to favour the Falling of the *Farina* into the *Pistillum*, the *Stamina*, as they ripen, are, by the Increase of Thickness in the Head, thrown farther and farther from each other at their Bases, but bend inward at the Points, so as to form a kind of Arch over the Opening of it.

The annual Product of these most minute Seeds is astonishing: An ingenious Gentleman has given, in N^o. 468 of these *Transactions*, p. 320. an Account of the wonderful Increase of the Mallow; one of which he found to yield in one Year 200,000. But this is much inferior to those of the little Plant before us; for, allowing to a Root of this 8 Branches, and to each Branch six Heads (which any one, who will observe it in a thriving Situation, will find a very moderate Computation), the Produce of this is $6 \times 13824 = 82944$. and $8 \times 82944 = 663552$ Seeds, the annual Produce of one Seed; 13824 of which are contain'd in a Head, whose Length is

but $\frac{1}{9}$ of an Inch, and its Diameter but $\frac{1}{23}$ of an Inch,
and whose Weight is but the thirteenth Part of a
Grain. I am,

S I R,

With the greatest Respect,

Broadway, Westminster,
Feb. 6. 1745-6.

Your very obedient,

Humble Servant,

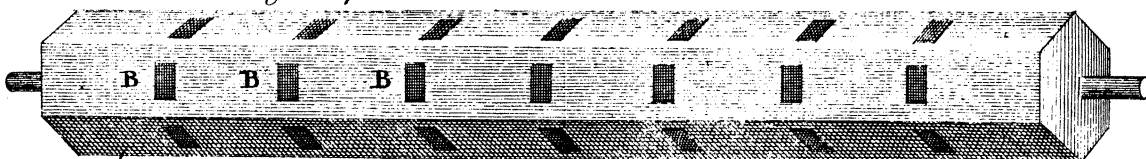
John Hill.

Explanation of the Figures, TAB. I.

- Fig. 3.* shews the Head of this Mof in its natural
Dimensions, with and without the *Calyptra*.
Fig. 4. The same view'd thro' a powerful Magnifier,
without its *Calyptra*.
Fig. 5. A longitudinal Section of the same.
Fig. 6. *Stamina* taken off from the Head, and view'd
by a more powerful Magnifier.
Fig. 7. A Piece of the outer Membrane of the Head,
shewing its reticular Texture.

Fig. 1. p. 1.

A



D

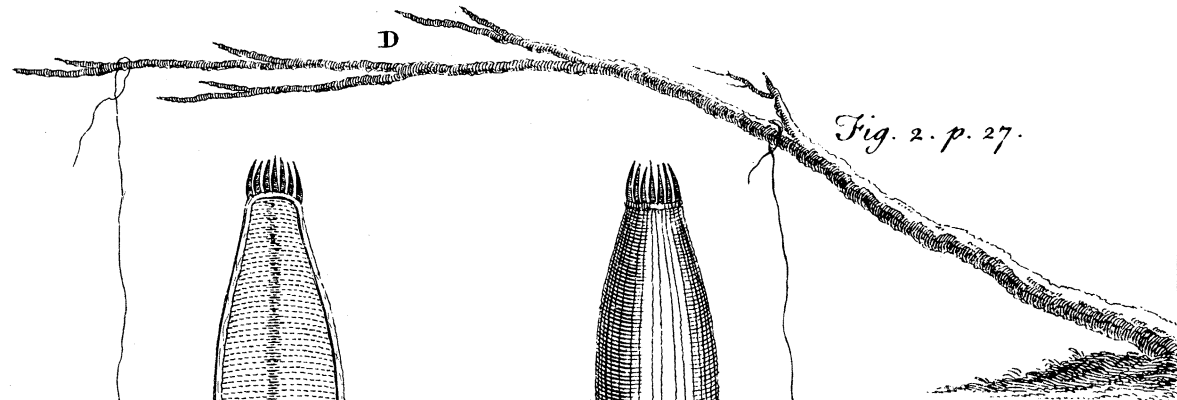


Fig. 2. p. 27.

Fig. 3. p. 62.



Fig. 5. p. 64.

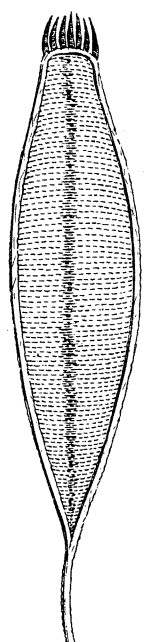
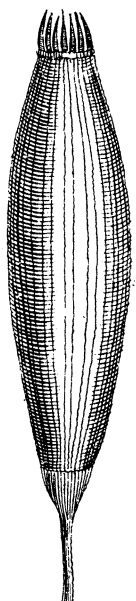


Fig. 4. p. 63.



A



Fig. 6. p. 66.

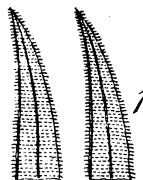


Fig. 7. p. 66.

