XIII. *Account of the Germination and Raising of Ferns from the Seed.*
By Mr. John Lindsay, Surgeon in Jamaica. Communicated by Sir
Joseph Banks, Bart. P. R. S. and H. M. L. S.

Read Jan. 3, 1792.

IT was not generally known many years ago that ferns bore any seed, hence the notion of its power of rendering whomsoever possessed it invisible*; and it does not appear that the writers on Natural History are yet very well acquainted with the real seeds of ferns, or from what particular part the young plants are produced. In the *Encyclopedia Britannica*, 3d edition, where good information might be expected, we have this account of the fructification of ferns: “The flowers, whatever be their nature, are, in the greater number of genera, fastened, and as it were glued to the back of the leaves; in others, they are supported upon a stem which rises above the leaves, but in some are supported on a flower-stalk as already mentioned: the stamina are placed apart from the seed-bud in a genus termed by Mr. Adanson *Palma filix*: in the other ferns, where we have been able to discover the stamina, they are found within the same cover with the seed-bud†.” While studying medicine at Edinburgh, I had good opportunities of getting acquainted with the fructification of ferns, under the direction of my worthy

* “We steal as in a castle, cock sure; we have the receipt of fern-seed, we walk invisible.” SHAKESPEARE.

† Vide Filix in the article Botany.

friend

friend and patron Dr. Hope, late professor of botany there. But I did not then learn that any of those parts which I had seen were the real seeds, or capable of producing new ferns. I understood that this point was still uncertain.

When I came to Jamaica, I observed great numbers of small young ferns rising after the rains in marle and gravel pits, and on the shaded banks of rivers which had been broken down by the floods; and indeed in every place where the earth had been dug into, and left shaded and untouched for a few months, numbers of young ferns of different kinds generally began to appear. This I considered as a fair opportunity of ascertaining from what part the young fern arose. I had some spare time, which with propriety I could dedicate to that purpose, being assistant to my good friend Dr. Clarke, botanist for the island, and I had the opportunity of a good microscope. The minuteness of the seeds rendered every attempt to discover them, by searching at the roots of even the smallest visible plants, entirely fruitless. I then thought of sowing the powder or dust, which falls from the fern leaves when drying, in a flower-pot, of keeping them in my room, and of observing their progress. To enable me to do this with ease and certainty, I mixed some of the powder with some of the mould it was to be sown in, and by the help of the microscope was soon able to distinguish readily the different parts of the powder, or fructification, from the particles of the mould in which it was sown. Having collected the dust of some of those ferns which, from the number of their young ones rising every where, promised to grow readily and sown it in a pot filled with the same kind of mould in which the young ones grew, I placed the pot in a window of my room, watered it daily, and every day or two examined a small portion of the mould by the microscope. I could always readily distinguish the dust or seeds from the mould, but observed no alteration till
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about the 12th day after sowing, when many of the small seeds, represented at 6 in the annexed plate, had put on a greenish colour, and some were pushing out their little germ, like a small protuberance, the rudiment of the new fern, as at 8. This little protuberance gradually enlarged, and successively put on the appearances at 9, 10, and 11. They had acquired small roots, and the remains of the little seeds were still discernible where the roots of the infant plant commenced. Although the young ferns were now very conspicuous by the microscope, the naked eye could see nothing but a green appearance on the surface of the mould, as if it were covered with some very small moss: this was the numberless young plants from the quantity of the seed sown. In some weeks this moss began to appear to the naked eye like small scales, as at 13; which gradually enlarged, as at 14: they were generally of a roundish figure, somewhat bilobate, but sometimes more irregular; they were of a membranous substance, like some of the small *lichens* or liverworts, for which they might readily be mistaken, and of a dark green colour. At last there arises from this membrane a small leaf, different from it in colour and appearance, as at 15, and shortly after another still more different, as at 16. Now each succeeding leaf grows larger than the last, till they attain the full size, and are complete in all the parts and discriminating characters of their respective species. Some of the above observations appearing to me new, I communicated them to Dr. Hope. He judiciously offered a few queries, founded on the deceptions to which observations made by high magnifiers are often liable: these I endeavoured to answer; he was satisfied, and promised to lay the observations before the Royal Society of Edinburgh.—But that city soon after lost an amiable member of society, and I a friend, whose memory will be dear to me while I live. Engaging in the practice of medicine soon after, I thought no more of the subject, till I had the honour of a
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very polite letter from Sir Joseph Banks, Bart. P. R. S. dated March 29, 1789, where, after mentioning some other plants, he observed that ferns would be particularly acceptable. In answer I observed, that the risk of carrying many of the ferns alive such a distance was great, and proposed to send some of their seeds, which, being properly sown, I had reason to believe would grow. He very soon informed me that, if I could furnish the means of making the ferns of this island grow in England from the seeds, I should have the credit of making a very valuable discovery, and requested I would send him some seeds, with my notes on this subject, by the first opportunity. Being now more convinced that the seeds, and progress of the germination of ferns, were still but little known, I collected the seeds of 16 or 18 different sorts, and sowed them in a flower-pot in my room, of about 10 inches diameter, each in a separate space, and marked. I kept the pot in my room, and watered them duly. They all appeared between the 10th and 20th day, in the form of a small green moss on the surface, and at length were putting on the membranaceous form, when they were all destroyed by being exposed to the sun in a dry hot day. I repeated the sowing of the seeds in the flower-pot; and also sowed others in the mouth of a marble pit, shaded from the sun's rays, where no ferns of the same kind had grown before. They are all now growing; and those in the flower-pot have made some progress in the membranous form; and in the marble pit they are beginning to put out the leaves peculiar to their species.—Having now pointed out the seeds, or that part of the fructification, from which the young plants of this beautiful and curious tribe of vegetables, the ferns, arise, and shown the beginning of their germination and progress of their growth; it remains to say a few words concerning the gathering and sowing of their seeds.

The seeds of ferns may be procured with readiness and ease by
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taking those frondes or leaves on which the fructification is copious, fair and conspicuous; which are of full growth, have a healthy appearance, and are more exposed to the free air than confined in shade. These leaves, laid on clean paper in a dry place, soon shed their seed in the form of dust or fine powder, of colour varying from black or brown to yellow: the grosser part of this powder is the empty capsules, and that very fine part which adheres closely to the paper is the seed. The seeds thus procured may be sown immediately, or kept in paper in a dry place. How long they will retain the principle of vegetation I cannot say. I have kept some above three months, which grew well enough when sown; but they seemed to be rather longer in vegetating than those freshly gathered. There are doubtless many species of ferns, which, like other vegetables, require a soil and situation peculiar to themselves, yet we often find the same species growing in different soils: hence the propriety of attending to the soil and situation of each species is pointed out, and at the same time there is room left for trying a general medium.—I took equal parts of brick mould and good pit marle, at some depth below the surface, to avoid the seeds of other plants, mixed them well together, and with this filled the flower-pot, moistened it properly, and made the surface very smooth: I then divided it into small spaces, according to the number of the different kinds intended to be sown in it; and lastly strewed the seeds lightly on the surface, which may be moistened with a little water just before they are sown: they require no covering. They should now be placed in a heat corresponding to that of their native climate, in a place rather moist than too dry, freely open to the light and fresh air, but so shaded that the direct rays of the sun shall not reach them. All ferns seem to grow best in moist and shaded places; and although many of them will bear the sun's rays very well when grown up, few of them, I believe, will do so

when very young. They should be daily moistened with water in the most gentle manner possible, and the pot may be kept in a basin with a little water in it. Great care is requisite to keep them from all sorts of vermin: covering the mouth of the pot with a network of fine brass wire answered this purpose with me.—In about 10 or 15 days, or perhaps later, the surface will begin to look green, as if some fine moss were beginning to grow on it: this will gradually increase, and the progress will be nearly as I have described.—What relates to the transplanting of them, after they have acquired a little strength, will easily be judged of by every one accustomed to the raising and transplanting of other plants; and the rearing of them afterwards will be best understood by attending to the soil, situation, and climate from which they have come. What space of time may be required between the sowing of their seeds and their acquiring the leaves proper to each species, I cannot readily point out; in different sorts it may be different: the shortest I have observed has been almost three months, sometimes more; but this may be varied no doubt by various circumstances. Having thus given an account of the germination and progressive growth of young ferns, it only remains to give some description of the fructification, which I shall do in a few words, assisted by the annexed drawing.

EXPLANATION of TAB. 18.

Figure 1. represents a leaf of the *Polypodium lycopodioides*, and the dots the little clusters of fructifications. Each cluster is generally* covered with a thin membrane or scale, commonly called the

* Many, if not most species of the genus *Acrostichum*, and this, with several other species of *Polypodium*, want this membrane or calyx. This difference therefore, *Flores caliculati*, et non caliculati, vel nudi, might be useful in distinguishing the numerous species of this extensive genus.

calyx,

calyx, and consists of a number of small globules or capsules: each capsule is girt with an elastic and apparently articulated ring, which when dry, breaks suddenly, rends the capsule, and scatters the seeds in the form of a fine dust*.—2. One of the capsules and its elastic ring magnified.—3, 4, and 5. Different views of the capsule bursting and discharging the seeds.—6. The seeds highly magnified appearing full of dots, as if they contained another series of bodies within them: this has been alleged as a proof of their not being the real seeds.—7. The seed burst by being bruised when moist, its contents giving the appearance of small grains mixed in a transparent mucilage.—8, 9, 10, and 11. Different degrees of progress in the germination, to be seen only by being highly magnified.—12. A whole capsule prevented from bursting by moisture, with the seeds vegetating, and making their way through it.—13. The first appearance of the young fern in the form of a small thin scale; these may be seen by the naked eye.—14. The scales gradually becoming larger, and appearing like small *lichens* or liverworts.—15. The first appearance of the first true leaf of the fern.—16, 17. Ferns with the second and third leaves beginning to take the form of their proper species.

HAVING now given some useful additions to the history of this beautiful tribe of plants, the Ferns, I shall conclude with expressing my hopes that some additional light will soon be thrown on the fructification and germination of those curious vegetables the *Musci* or Mosses, and others of the class *Cryptogamia*, by men of abilities, and shall give an instance in proof that the hope is

* With the anthera, or what is analogous to it, I am yet unacquainted; it has been supposed to be the elastic ring, but I do not know if with good reason.

not ill founded.—I have very lately sown that fine farina or dust contained in the anthera of a species of the genus *Bryum*, viz. *Bryum cespitium*, or one very like it, and also the farina of the *Lycopodium cernuum*. There is a vegetable growth taking place where they were sown, which I hope will prove their young plants.—If this should be the case, that which has generally been called the anthera, must be considered as the true capsule or seed-vessel, and the antheræ must be sought for anew.