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GREVILLE

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DIRECTIONS

FOR

COLLECTING AND PRESERVING

BOTANICAL SPECIMENS.

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[*Memorandum.*—The following paper by Dr Greville, on account of the many valuable rules and suggestions contained in it, has been embodied in the Botanical Society's Annual Report for 1838-9; and though a difference of opinion exists amongst the Members respecting some of his views, it will doubtless be regarded with the attention due to any thing which emanates from so high an authority.]

I.—DIRECTIONS FOR COLLECTING BOTANICAL SPECIMENS, AND PRESERVING THEM FOR THE HERBARIUM. By ROBERT KAYE GREVILLE, LL.D., F.R.S.E., F.L.S., &c.

Read to the Botanical Society, 10th May 1839.

Plants are preserved by placing them between sheets of absorbent paper, and then submitting them to pressure until they are quite dry. To *dry* plants is a very simple operation; and there are collectors who seem to think that, if all moisture is expelled, nothing more can reasonably be expected. This, however, is not sufficient for the purposes of science. The botanist must aim not only at retaining as much as possible the *character*, but the original beauty, of the plants he wishes to preserve. Continental botanists, especially the Germans, are celebrated for the beauty and completeness of their specimens; and the black, curtailed, and carelessly arranged *vegetable remains* which in this country are often dignified with the name of botanical specimens, are justly regarded by them as utterly worthless, and would equally be rejected by every one anxious to form a valuable collection. In order to contribute in some degree to improve our taste in this respect, the following rules have been drawn up; and botanists are assured that, by following them, they will preserve their specimens not only beautifully, but with facility and rapidity.

I. *Selection of Specimens.*

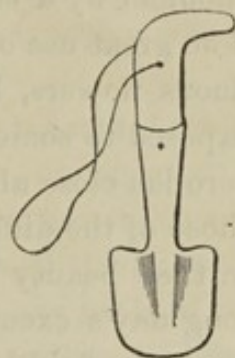
Specimens should be taken (when practicable) in fine weather,

and free from external moisture. They should be in a perfect state of growth, their leaves and other parts uninjured. When, as is the case in some plants, the lower stem-leaves differ in shape from the upper ones, and the plant is too large to preserve entire, portions of the lower parts of the stem with the leaves, should be taken separately: if the root-leaves also differ, they, too, should be preserved. In some cases, it is important to have the young shoot with its fully developed leaves, as in the genus *Salix*, where the stipules are deciduous; and also in the genus *Rubus*, where the leaves, &c. of the barren surculi are most characteristic. In short, it should always be borne in mind, that a *perfect specimen* of any plant includes every characteristic part. *Bad specimens* are always to be rejected, unless the plant is of great rarity. It should, indeed, be adopted as a canon by the botanical collector, that no specimen is to be admitted under the idea that it will *do for a duplicate*, if it would not *do for his own herbarium*; and I can scarcely imagine a botanist content to manufacture and store up in his own collection, such *vegetable remains* as have been already alluded to. Varieties are always interesting, as well as remarkable states and monstrosities, or deviations from the ordinary arrangement of any of the parts. In regard to the *size* of specimens, the best guide is the paper most generally used in good herbaria: this is about 17 by 10½ inches. No specimens should therefore exceed 16 inches in length by 9½ inches in breadth. Plants under this size should invariably have the root attached. It may be laid down as a general rule, that the entire plant should be taken, if, by a little management, it can be brought within the above-mentioned limits. Grasses, Carices, and plants of a slender habit, may be folded once or twice backwards and forwards, if necessary; and long slender Ferns, &c., may in this manner be preserved without mutilation. When it is inconvenient to obtain the root, the stem should be separated below the insertion of the root-leaves. The young collector is reminded, that specimens in fruit are to be selected as well as those in flower.

II. *Apparatus requisite for Collecting and Preserving Plants.*

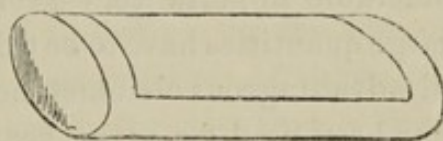
1. The *Digger*. This is a sort of trowel, which will be bet

ter understood by the annexed cut than by description. The whole instrument is 7 or 8 inches long; the spud $2\frac{1}{2}$ inches long, $2\frac{1}{2}$ inches wide at the top, narrowing gradually to 2 inches at the bottom, the lower angles slightly rounded. It should be made sufficiently strong, to resist considerable force in digging out plants from the crevices of rocks, &c.



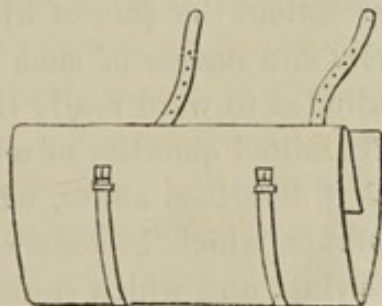
2. The *Vasculum* or *Botanical Box*. The diligent collector will find it convenient to have his boxes of two or three sizes. One of them should be small enough for the pocket, and is very useful for the reception of small and delicate plants, and such objects as demand peculiar care. The principal vasculum, for distinction's sake, we call the *Magnum*. It should not be less than 20 inches long, 8 or 9 inches wide, and 5 inches deep, having a strong handle at one end. The form most strongly recommended is that exhibited

in the annexed figure; in which it will be perceived, that the upper surface, with the lid, is convex,



the curve being similar to that of the under surface. The *Magnum* is, of course, only required on excursions when a considerable number of specimens are desired. On such occasions, it is indispensable, if the collector wishes to bring home his plants in a satisfactory state. In boxes intended for the pocket, and in them only, the common concave form of the lid may be retained with advantage.

3. The *Field-Book*. This may be carried or not, according to circumstances. It may be made of any size, from that of a large pocket-book to a folio, and is in fact nothing more than a portfolio, containing a quantity of absorbent paper, temporary pressure being given by a couple of straps. To the inner edge of one side is attached a piece of oiled silk, as well as to each end, which serves to keep the paper dry in case of rain. If the field-book is of a quarto or folio size, it may be slung over the



shoulder by a strap, on the side unoccupied by the vasculum. The great use of such a book is, that plants having very deciduous flowers, *Veronica saxatilis* for example, may be at once exposed to some degree of pressure. Some plants also, whose corollas close almost immediately after being gathered, such as those of the different species of *Erythræa*, can only be preserved in their beauty by being placed in paper on the spot. In a long day's excursion, where the harvest is likely to be abundant, the field-book will be found extremely useful.

4. *Paper.* The best paper for the process of drying plants is a kind known by the name of *Demy grey*, with a tolerably smooth surface, 18 inches long by 11 inches broad, which is the size found by experience to be most convenient, not only for the resident but the travelling botanist. It may be purchased for seven or eight shillings per ream, and is preferable to common blotting paper, in being very much cheaper, far more durable, and in drying more rapidly after having been used,—a point of considerable importance, especially on botanical excursions, when large quantities have to be dried daily, and sometimes under very disadvantageous circumstances. This is the kind of paper which has been used for many years by Dr Graham, and his friends and students, in their excursions among the Highlands of Scotland; and it may be mentioned in this place, that some of the private friends of the Professor, who are certainly the most active collectors in Scotland, have accompanied him on most of his annual excursions; and that, as it was highly desirable to reduce the labour of collecting and preserving to the *minimum*, every experiment has been tried, both as regards the quality and size of paper, and all the little details of the process of desiccation, the sum of which affects in no small degree the *comfort* and *success* of such expeditions. Some of the excursions alluded to were really the pursuit of plants under difficulties. A limited quantity of *very thin* white paper, of the same size as that described above, will be found useful in preserving some plants, which become soft and flaccid during the process of drying, and which cannot be transferred from one sheet of paper to another without injury. The corolla of *Viola lutea*, for example, collapses, if removed in the ordinary way, after a day's pressure. By placing such plants at first *within* the sheet

of thin paper, the whole sheet, plants and all, can be moved when the drying paper requires to be changed, without their being disturbed.

5. *Boards.* Two kinds of boards must be procured, both of which should be exactly the size of the paper, or, at most, a quarter of an inch larger each way. Two of the boards should be double ones, half or three-quarters of an inch thick; each double board being composed of two thin ones, the grain of the one crossing that of the other, firmly glued together, and further secured by small screws along the edge, at intervals of three inches: the rest of the boards, say eight in number, should be three-eighths of an inch thick. These ten boards form a *set*, and will serve for a couple of reams of paper. If the collector is active, he will require several sets of boards, and paper in proportion. In order to shew what *may* be done, and *well* done, by judicious arrangement, it may be mentioned, that, in an excursion made in the autumn of 1837, by Dr Balfour, Mr Brand, and myself, to the mountains of Forfarshire and Aberdeenshire, chiefly for the purpose of collecting for the Botanical Society, we took with us about twenty reams of paper, the whole of which was brought into use before the time allotted to the excursion (three weeks) had expired; and during this period, about 15,000 specimens rewarded our exertions. A few sheets of stout pasteboard will be found very convenient for separating the specimens and for packing them as they become dry; particularly in preventing woody plants, &c., from injuring those placed above and below them.

6. *Press.* Some botanists employ screw or other presses. A preferable and simpler plan is to use common iron weights, or a squared stone having an iron ring fixed in the centre. By this means, the pressure is never relaxed, as is the case with the screw-press. In preserving *bulky* plants, it is sometimes difficult to equalize the pressure. Paper folded to the required thickness, and placed on each side of the stem, is frequently sufficient for the purpose. In more difficult cases, a sand-bag or two, of the size of the paper, may be used with advantage. In travelling, each parcel of paper containing plants must be secured by three strong straps, a double board being placed above and below, and in this way a considerable degree

of pressure may be obtained. When the botanist is stationary for, several days on an excursion, or even resting for a single night no better resource can be desired than a few heavy stones. A weight of 100 lb. will not be too much to place upon each parcel.

A pair of common surgeon's forceps are very useful in removing small plants from one sheet of paper to another. A second pair, as well as an extra knife, will be provided by the experienced traveller, in case of accidents. If an excursion of some days is contemplated, a good supply of strong cord, and several spare straps, should not be omitted; and every parcel of paper should be completely enveloped in oil-cloth (before the boards are strapped on), to prevent the paper or its contents from being injured by wet.

The botanist being now provided with his *materièl*, I shall suppose him to have commenced a ramble of a few days. He has already been tempted to deposit some fine specimens of very common plants in his vasculum; but let not this provoke a smile, for it is not a bad rule to take even a very common plant, when a *remarkably* fine or beautiful specimen presents itself. But as our botanist has commenced operations, I shall now address myself to him, and offer a few hints for his guidance. Be very particular in the first place, in the choice of specimens: put nothing into your box that is not good of its kind. Let the specimens be the proper size for preserving, and dispose them carefully so as not to injure each other. Clean the roots before you place them in the box, and wash those which have been gathered in muddy places. If you have been very successful, and your box begins to shew symptoms of repletion, sit down and revise its contents; throw away the inferior things, and retain nothing but what is really worth preserving. You will thus bring home your collection in a good state, although you may have, perchance, (no uncommon thing in the Scottish Highlands), to walk a dozen miles to your quarters. If the sun is very powerful, cover your specimens with a few large leaves, or even a little grass, and sprinkle a few drops of water over them. Nothing is more injurious to the beauty of plants, than the cramming system of voracious and indiscriminate collectors. I have seen a heavy vasculum

brought under a burning sun from a distant mountain, and after every tolerable specimen was removed, contain a mass of *rejectamenta* that would have reflected discredit on a whole party. Having returned with your treasures, you will be anxious to commit them to paper, and I hasten to give you the necessary directions. Provide yourself with a number of slips of paper, 2 inches long by 1 inch broad, with a slit half an inch in length cut in the centre, and have your knife and forceps at hand. Place now half a dozen sheets of paper upon one of the double boards, and proceed to lay out your specimens; one or more on the same sheet, according to their size. It is not desirable that the branches, leaves, &c., should be *artificially* displayed: separate them slightly, if they require it, and take care that the parts are not unnaturally bent or folded. Long slender plants, however, that require to be folded, must have the folded extremity passed through the slit of one of the paper slips, which will keep the parts in their proper position. Lay down your specimens (as a general rule) with their roots towards you, and as you place five or six sheets of paper upon them, arrange the leaves, &c., with your hand or the forceps, and then proceed with other specimens, until you have a dozen or more sheets of them arranged. Cover them, then, with one of the thin boards, and begin another series, and so on until all your plants are secured. Place the other double board upon the top, and submit the whole to pressure. The above directions are sufficient for the preservation of most plants: there are some, however, which demand particular treatment. If the specimens are woody, or very thick in the stem, a slice can often be taken from the back without affecting the character of the plant: a portion of the plant may be removed if it is densely tufted; and some of the branches of the back in such plants as *Hippophäe rhamnoides*, *Prunus spinosa*, &c. Robust plants that yield but slightly to pressure, *Statice Armeria* for example, and others which do not yield *at first* to pressure, require a thin board to be placed between every sheet of specimens. The stone-crop tribe must be plunged for some minutes into boiling-hot water, and then pressed between coarse napkins until the external moisture be removed, before they are committed to paper: unless this be done, the plants will live for a month under pressure, and the leaves die and fall off by degrees.

Aquatic plants should also be freed from external moisture by means of napkins, and the same plan may be advantageously resorted to when specimens are collected in wet weather, which is sometimes inevitable. Orchideous plants must be subjected to great pressure, and ought to be dried very rapidly: scarify the back of the stem and the midrib on the back of each leaf with a knife, in order that the juice of the plant may have an outlet by which to escape: separate the flowers also, by inserting small pieces of paper between them. When plants have large and delicate corollas, place a piece of thin paper, somewhat larger than the corolla, above and below it, to remain until the specimens are dry. The quantity of paper to be placed between each sheet of specimens will vary according to circumstances. For plants of a thin texture, and containing little moisture, five or six sheets are sufficient; but more is necessary for succulent kinds, for aquatic plants, and for plants in general, when gathered in wet weather; likewise for woody and robust specimens.

In regard to the frequency with which the paper ought to be changed, this, for ordinary plants, is a *daily* operation, and ought on no account to be omitted, until they are very nearly dry. Aquatic and very succulent plants should be transferred to dry paper twice a-day; and the species of *Sedum*, &c., which have been plunged into hot water, several times during the first and second days, as the moisture is given out very rapidly. Change the paper in which orchideous plants are drying twice a-day, and let it also be well heated. If you are stationary, and have plenty of paper, slender plants, like many of the Grasses, &c., and others containing very little moisture, like *Myosotis collina* and *versicolor*, &c., may be allowed to remain in the paper after having received a single change, until they are dry, two or three extra sheets being placed between the specimens. In giving your specimens their first change of paper, you will not omit to rectify any mistake in their disposition, and place those leaves right that have been accidentally folded, &c.

On the second day of your excursion, you will have a quantity of damp paper on your hands. In some places it is easy enough to get it dried, but in the little inns of mountainous districts, the difficulty of getting several reams of damp paper dried *daily*, at first sight appears insurmountable. Nothing,

however, is more readily effected, provided you wait upon yourself. Having brought a roll of thick cord (and a score of strong nails in case they should be wanted), fix one end of the cord to the roof of the *kitchen*, and carry it backwards and forwards along the roof as many turns as you require. Hang your paper on these ropes in parcels of a few sheets before you leave your quarters in the morning, and by the time you want them in the evening they will be thoroughly dry. Another set may be dried during the night.

As the plants become dry, they may be arranged close together, but so as not to touch each other, on single sheets of perfectly dry paper, and kept in parcels by themselves. When a considerable number of plants are in process of drying, those in the different stages of the process should be kept apart from each other, in order that the desiccation of the more advanced specimens may not be retarded by the juxtaposition of those more recently collected.

Invariably attach labels to your specimens, mentioning the particular station, the date of collection, elevation above the sea (as nearly as it can be estimated), the geological formation of the locality, and any additional information that may be interesting.

I have one other point to notice, and if your excursion is to last a week or more, it is of great importance, and equally applicable whether you are alone or form one of a party. It is very easy to visit a number of localities, and to collect a vast number of plants; but if you wish to exhibit the fruits of your labour, and not to be ashamed of them, you must from time to time suspend the labour of collecting. Unless there be some fixed rule of this kind, you will find little comfort or satisfaction in your exertions. You may sit up (as has been often done) night after night, and deprive yourself of that rest which is absolutely necessary, and after all be unable to preserve your plants with proper care. You will soon find, if you are a diligent collector, that your labour increases for some days in a sort of geometrical ratio. Half a day, therefore, *at least*, in the middle of the week, say the morning of every Wednesday till two o'clock, should be appropriated to the preservation and arrangement of your plants; and a part, or the whole (according to circumstances), of every Saturday should *invariably* be set

apart for the same purpose, in order that they may not be injured by remaining untouched on the Lord's Day.

Many Cryptogamous plants do not necessarily require the same care when first collected as those about which I have been speaking, as they can be relaxed by moisture and prepared at any subsequent period. They will, perhaps, lose somewhat of their original bright colour; but this is of trifling importance, if the great saving of time to the collector, especially in foreign countries, be considered.

Mosses and *Hepaticæ* may be gathered in tufts, or masses of considerable size, always selecting such as are in fructification. If the stems or roots are loaded with mud or soil, they should be well washed. The tufts are then to be placed between sheets of coarse paper, and dried under a moderate pressure, after which they may be packed like other plants. In subsequently preparing specimens for the herbarium, a greater pressure will be required.

Lichens may be treated like mosses, at least such kinds as admit of pressure. Those species which form a close crust on rocks, trunks of trees, &c., and which can only be obtained along with a portion of the substance on which they grow, should be wrapped separately in paper, like minerals, and packed into a box.

Algæ or *Sea-weeds* are preserved in a rough state with much facility, and, on account of the increasing interest which attaches to them, should be assiduously collected in foreign countries, especially in the southern hemisphere. They should be taken, if possible, with the root, and will often be found in the highest state of perfection thrown on shore by the tide. All kinds should be taken, from the smallest, to the largest manageable size; avoiding those specimens which are battered, or in a state of decomposition. Spread them on the ground, or in an outhouse, to dry, without washing them in fresh water, in fact just as they are gathered; and when they are quite dry, pack them without pressure into a box, mixing a few small branches with them, to prevent them from being pressed too much together, in case of damp on the voyage.*

* Some useful directions for preserving sea-plants for the *herbarium*, will be found in the *Magazine of Zoology and Botany*, vol. ii. p. 144, by Dr Drummond. It may be added in this place, that the larger olivaceous species should be put into boiling-hot water until the mucus be all given out, and then wiped with coarse napkins before they are committed to paper.

II.—OBSERVATIONS ON THE PRESERVATION OF FRUITS
AND OTHER BOTANICAL SPECIMENS IN THE MOIST
STATE. By ROBERT CHRISTISON, M.D., F.R.S.E., Pres. R.C.P.E.,
Professor of Materia Medica in the University of Edinburgh.

Read to the Botanical Society, 12th April 1838.

Professor Christison remarked, that, after numerous experiments made for a series of years with various fluids, he had found none which served so well to preserve both the consistence and colour of fruits, leaves, and flowers, as a concentrated solution of common salt. The solution should be made with the aid of a boiling heat, otherwise it can with difficulty be obtained sufficiently concentrated. When articles are to be sent to a distance, as when specimens are transmitted from hot climates to this country, the best mode of putting them up is to preserve those which are of small size in green glass bottles, such as are used for pickles, to fill the bottles with the solution, and to secure the corks, previously well dried, with a thick covering of some resinous substance, and cloth tied over all. But the cheapest and most effectual mode for larger articles, and indeed for botanical specimens generally, is to sew up each in cloth of any kind, with a wooden label attached to it, and numbered by branding, and to put the whole in a barrel, containing the solution of salt, and of such size that the specimens are loosely packed, and yet cannot easily change their position. He has frequently received specimens sent in this way, in a state of complete preservation, from Ceylon, the Isle of France, and the West Indies, although four or six months elapsed before they reached their destination.

Specimens which are to be preserved for demonstration should be immersed for a month or upwards in the saline solution before they are finally put up. The solution should then be changed, partly because it is usually somewhat coloured, but partly also because it is rendered too diluted in consequence of the juices of the vegetable passing out by *exosmosis*. The last solution should be filtered. It is often found difficult to confine the salt in the preparation-jar. The most effectual method,

where the mouth of the jar does not exceed two inches or two inches and a half in diameter, is to leave a space of half an inch or more at the top without fluid, to clean and dry the lip of the jar thoroughly, to drop melted sealing-wax on the upper surface of the lip, so as to form a uniform ring over it, to place over the mouth a watch-glass of such size as to cover the whole lip, or even to overhang it a little, to press this gently down with one finger, and to fuse the wax between the lip of the jar and the watch-glass, by moving a large spirit-lamp flame around the edge. After the whole ring of wax is thoroughly melted, the pressure must be kept up till the glass cools and the wax concretes. The glass never cracks in this operation, if carefully performed; but occasionally the watch-glass cracks on cooling. Sometimes the watch-glass becomes displaced after a time; but this inconvenience is of little moment, as an adroit person may easily restore it in two minutes. Where the mouth of the jar is larger, the most effectual plan, and at the same time the easiest, is to tie one layer of sheet caoutchouc over it in the usual way for anatomical preparations. The caoutchouc should be stretched over the jar, but not strongly, by one, or still better by two persons, while another secures round the neck two or three folds of stout twine as a temporary ligature. A thinner twine is then drawn steadily and tightly round three or four times above the former, care being taken not to cut the caoutchouc.

Numerous specimens were exhibited which had been preserved in these ways for one, two, three, and five years, among which were sprigs with leaves, and ripe and unripe fruit, of *Myristica moschata*, *Xanthochymus pictorius*, *Garcinia Gambogia*, *Garcinia Mangostana*, *Hebradendron gambogioides*, *Alpinia Cardamomum*, *Mangifera indica*, *Tabernæmontana dichotoma*, *Ricinus communis*, *Theobroma Cacao*, *Tamarindus indica*, *Calophyllum Inophyllum*, *Flacourtia inermis*, *Strychnos Nux-vomica*. In the greater part of these the green tint of the leaves, and the peculiar colour of the fruit, seemed to have undergone little alteration.

Solution of salt is comparatively inapplicable, however, where the fruit is very pulpy,—in such fruits, for example, as *Solanum lycopersicum*, or lemons and oranges; because the fruit shrivels

by exosmosis of its fluids. Diluted pyroligneous acetic acid, diluted to the density of 1008, sometimes answers well in such circumstances; but after a few years the texture of the specimens becomes so pulpy and brittle, as not to admit of their being handled, and most colours are in no long time more or less altered. Spirit, which is most generally used, speedily renders all colours alike brown; but is probably better for delicate specimens which may be subjected to minute dissection.

