John Woodward’s

BRIEF INSTRUCTIONS FOR MAKING OBSERVATIONS IN ALL PARTS OF THE WORLD
1696

With an introduction by
V. A. EYLES, F.R.S.E.

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SOCIETY FOR THE BIBLIOGRAPHY OF NATURAL HISTORY
AN INTRODUCTION TO JOHN WOODWARD’S BRIEF INSTRUCTIONS

By V. A. EYLES

John Woodward’s pamphlet Brief Instructions for making observations in all parts of the world, published in 1696, was symptomatic of the age in which he lived, the age of the Scientific Revolution, as it has sometimes been called. Whether this is an appropriate name for it need not be argued here, but certainly during the seventeenth and eighteenth centuries the quest for scientific knowledge expanded steadily, and the quest was not confined to the mathematical and physical sciences. It extended to natural history, the study of the animal, vegetable, and mineral kingdoms.

In the seventeenth century knowledge of natural history was elementary. To enlarge this knowledge, British naturalists were anxious to obtain new material for study, particularly from overseas, where, according to the reports of travellers, new and strange plants and animals were to be seen. Various methods were employed to meet this need. Occasionally, collectors, or their agents, travelled abroad to acquire new material, but the principal method was that of correspondence. Sometimes, in place of, or in addition to letters, collectors sent out printed broadsheets or pamphlets setting out their requirements. Some of these pamphlets contained, as well as details of the specimens needed, requests for information about the mode of occurrence, habits, habitat, and so forth of the specimens collected; and instructions as to the best method of making observations, preserving specimens, and forwarding them. Woodward’s pamphlet reproduced here, is a good example of this type of publication.

The activity of the early collectors is of more than passing interest. Although some of the early collections may have been formed originally to satisfy personal vanity or curiosity, their formation led ultimately to the establishment of institutional and public museums. The following notes illustrate how this came about in Great Britain.

Museums have a long history in Europe, but in Great Britain they date only from about the beginning of the seventeenth century. The first of any importance is believed to have been that formed by John Tradescant (1587–1638) and his son John (1608–1662). About 1629, they established a museum known as Tradescant’s Ark in South Lambeth Road, London. Among the miscellaneous material in the museum, according to its catalogue Museum Tradescantianum; or a collection of rarities (London, 1656), were specimens illustrating all three branches of natural history. The historical importance of the Tradescants’ museum is that many of its “rarities” passed into the hands of another collector, Elias Ashmole, and thence, by gift, to Oxford University. Eventually they found a home in the newly built Ashmolean Museum (now the Old Ashmolean), which was opened by the Duke of York in 1683, and became a centre for teaching natural history.

By this time the Royal Society had formed its own museum. One of the Society’s original members, Daniel Colwall, contributed £100 towards its establishment, and as
a nucleus the Society purchased with this money the collection of a Mr Hubbard.
Nothing seems to have been recorded about Hubbard, but the similarity between the
names suggests that the collection may have been that of Robert Hubert who published
in 1664 *A catalogue of many natural rarities, with great industry, cost and thirty years
tavel in foreign countries collected by Robert Hubert, alias Forges* (London, 1664).
The Royal Society's museum flourished and it received gifts from donors at home and
when the Society moved to new quarters, this collection was transferred to the British
Museum.

In the second half of the seventeenth century a museum was formed in Scotland.
Sir Andrew Balfour (1630–1694), after spending fifteen years travelling abroad, brought
back to Scotland in 1667 a large collection of fossils, plants and animals. On his death
this collection was acquired by another Scottish collector, Sir Robert Sibbald (1641–
1722). In 1697 Sibbald presented the Balfour collection and part of his own to the
University of Edinburgh, to form a natural history museum which he hoped would be
opened to the public. Unfortunately this collection was neglected and before the end
of the eighteenth century almost all the specimens had been either dispersed or lost.
Sibbald described and illustrated his collection in his *Scotia illustrata sive Prodromus
historia naturalis* (Edinburgh, 1684).

One of the most interesting and active collectors of that period was the naturalist
and apothecary James Petiver (ca 1663–1718). Petiver left some account of his collections
in his few publications which are now rare. Fortunately a great deal is known
about him as a result of the exhaustive researches in British and American archives by
the late Professor R. B. Stearns who published “James Petiver Promoter of Natural
From Stearns we learn that Petiver opened an apothecary's shop in Aldersgate Street,
London, in 1685, and that “From this shop were dispatched thousands of letters and
queries, . . . news sheets, scientific pamphlets and books, frequent consignments of
brown paper, wide-mouthed bottles, and detailed instructions for amateur naturalists
and collectors who had set forth, or were on the point of setting forth to nearby
English counties or to far-off foreign lands”.

“To this shop were addressed other thousands of queries—most of them pertaining to
the scientific identification, description, classification and preservation of botanical
specimens and other items of natural history—and hundreds of consignments of seeds,
dried plants, insects, serpents, birds, fishes and small animals, for the collections of
Mr Petiver and his friends, whose appetites for such things were insatiable”. As an
example of Petiver's activity Stearns mentions that between 1685 and 1718 he corre-
sponded with eighty different persons in the English colonies in North America.
Petiver was clearly *persona grata* in scientific circles in London. He was a member of the Temple Coffee House Botany Club (so far as I am aware, Woodward was not); and he was elected to Fellowship of the Royal Society in 1695. There seems no reason to doubt Stearn's conclusion that Petiver's achievements "were of considerable importance in the promotion, patronage, development and popularization of . . . natural history". Petiver presented many specimens to the Royal Society, and after his death his collection and his manuscript remains were acquired by Sir Hans Sloane.

In the meantime, John Woodward (1665-1728) had started to build up his specialized collection of fossils and minerals, which passed to Cambridge University after his death.

Finally, mention must be made of the great collection amassed by the wealthy physician Sir Hans Sloane (1660-1753), a detailed account of which has been published by Sir Gavin de Beer in *Sir Hans Sloane and the British Museum*, (London, 1953). In 1753 it was purchased by the British Government with funds raised by a lottery and formed the foundation of the Natural History Collections of the British Museum.

The story of the old collectors and their museums is an interesting one that has been told in much more detail elsewhere, see especially Vol. I of D. Murray, *Museums their history and their use* (3 vols. Glasgow, 1904); also E. Edwards, *Lives of the founders of the British Museum with notices of its chief augmentors and other benefactors* (London, 1870). It remains to say something about the printed questionnaires circulated by some of the collectors.

The earliest known to me was compiled by Robert Boyle, and published in the *Transactions of the Royal Society* in 1666 (Vol. I, Nos. 11, 18, 19: 186-89, 315-16 330-43). It was entitled "General heads for the natural history of a country, great or small; drawn out for the use of travellers and navigators". Though composed in the form of a questionnaire, it seems to have been designed as a general guide to the sort of information that should be looked for and recorded by persons interested in natural history, rather than as an invitation to supply specimens. Boyle's opening sentence is that "the things to be observed in such a history, may be variously (and almost at pleasure) divided: as into superterrestrial, terrestrial and subterrestrial; but we will at present distinguish them into these things, that respect the heavens, or concern the air, the water or the earth". There follows an exhaustive series of questions under these headings. Boyle asks for information on several branches of natural history, but he was evidently especially interested in every aspect of mining activity, about which he asks no less than eighty-eight questions, under six sub-headings; and adds eleven additional "*Promiscuous Enquiries about Mines*". Many of the questions seem designed not so much to obtain new information as to confirm or refute existing beliefs. In one such, among the *Promiscuous Enquiries*, Boyle asks "Whether the diggers do ever really meet with any subterrestrial demons; and if they do, in what shape and manner they appear; what they portend, and what they do &c.". This question is not so
naive as might appear, for belief in such creatures, gnomes or Kobolds, not necessarily harmful, was widely held in the sixteenth century, for example by Georgius Agricola, author of the mining classic De re metallica (Basileae, 1556). In fact, Agricola wrote a tract on the subject, De animantibus subterraneis (Basle, 1549). The belief continued into the seventeenth century.

For the most part, however, Boyle’s questions were far-seeing, and sensible. For example, he asks whether or not certain plants will grow in the region of mines, and whether the inhabitants of mining regions live longer or less long than others, or are subject to diseases that may be imputed to mining operations.

The questions must have been widely circulated and may well have had some influence on the development of new ideas about natural history. They were republished in a book entitled General heads for the natural history of a country (London, 1692). Although the title page of this work attributes it to Boyle (who had died in the previous year) readers are informed that additional matter has been added by another hand. In fact, Boyle’s original questions are reprinted, with some rearrangement, and there are twenty additional questions of a botanical nature, several relating to the movement of sap in trees. The latter part of the book contains eleven sections, each with questions about specific countries or regions which seem to be phrased to confirm or refute existing information about the countries named.

Robert Plot was another naturalist who made use of printed questionnaires but with the definite intention of acquiring specimens. Two of his questionnaires have been preserved in the Bodleian Library. They were issued to further the grand design Plot conceived in 1673 or 1674 to travel through England and Wales collecting information for the purpose of writing a comprehensive account of these countries, which he hoped would supersede the accounts of Leland and Camden. Information was sought, not only about natural history, but also about archaeology, industry and the arts (see R. T. Gunther, Early science in Oxford, 12: 335–345 (Oxford, 1939). At an early stage Plot must have decided to proceed county by county. The project did not progress far, but it resulted in the publication of his Natural history of Oxfordshire (Oxford, 1677) and his Natural history of Staffordshire (Oxford, 1686), in which he figures many natural history specimens from these counties.

The earlier questionnaire is entitled “Quae’s to be propounded to the most ingenious of each county in my travels through England”, to which is added in manuscript, “in order to its History of Nature & Arts”. This is the shorter of the two pamphlets, and in it the questions are not arranged systematically.

The title of the later questionnaire differs only in minor particulars, but the words “and Wales” have been added after England. Both pamphlets have the initials R. P. printed at the end, but the later one has, in addition, the date 1678 “Oxon 14 Febr.” added in manuscript. This pamphlet occupies a little over three folio pages, printed
in double columns. The questions are arranged under several heads such as “the Heavens and Air; Waters; Earths and Minerals; Stones; Metals &c.; Plants; Animals”.

The specimens Plot accumulated as a result of sending out this questionnaire and others he collected himself, found their way into the Ashmolean Museum; and he also presented duplicates to the Royal Society’s Museum at Gresham College.

James Petiver also made use of questionnaires, and probably distributed a variety of broadsheets or pamphlets after 1785. One single sheet, preserved in the British Museum (Natural History), is entitled “Directions for Gathering Plants”. It lists six questions, instructing collectors what they should collect, and asking that, when collecting plants, they should also gather their seeds, flowers, fruits and leaves. Collectors were also requested to carry a collecting book into which plants should be put as soon as possible, and in which the place and date of collection should be recorded.

A more detailed questionnaire is printed in one of Petiver’s publications, his *Musei Petiveriani rariora nature continens: animalia, fossilia, plantas...* (London, 1695–1703). This was issued irregularly in a series of ten sections (*Centuria*), each listing 100 specimens (sometimes two appearing in the same year). Thus, the pamphlet lists by name 1000 specimens, usually with the locality and donor’s name as well. At the end of *Centuria* III, which is dated 10 May 1698, there is an ADVERTISEMENT, extending to three and a half pages. In this, Petiver mentions having received several collections “from my kind Friends in different parts of the World”, and he goes on to say, “I presume it may not here be amiss to give these Gentlemen, and such as for the future design me Collections of any of the aforesaid natural history specimens, some short Instructions or an easie Method, how to preserve these things and send them with very little Charge or Trouble”.

Petiver states first that “All small Beasts, Fishes, Serpents, Lizards and other Fleshy Bodies capable of Corruption, are easily preserved in Rack, Rum, Brandy or any other Spirits, or in a strong Pickle or Brine of Sea-Water: to every Gallon of which put Three or Four Handfuls of Common or Bay Salt, with a Spoonful or two of Allom pounded, and so send them in any Pot, Bottle, Jar, Cask or other Vessel”, and similarly “all pulpous moist Fruit... apt to decay or rot, to each of which and all other Fruits, its desired you will tye a Sprig of its Leaves”.

“As to Fowls”, he continues, “those that are large, if we cannot have their Cases whole; their Head, Legs and Wings will be acceptable, but smaller Birds are easily preserved Entire... take out their Entrails, and then stuff them with Ockam or Tow mixt with Pitch, or Tar, and being thoroughly dried in the Sun, wrap them up close and keep them from Moisture”.

Petiver’s directions about plants are similar to those already mentioned; but “In relation to Insects, as Beetles, Spiders, Grasshoppers, Bees, Wasps, Fire-Flies, &c., these
may be Drowned altogether as soon as caught, in a little wide mouth’d Glass or Vial of the aforesaid Spirits or Pickel”, except for “Butterflies and Moths or Night Butterflies” which “must be put into your Pocket-Book, or any other small Printed Book as soon as caught, after the same manner as you do the dry Plants”. 

“There needs no Art in sending Shells, but in choosing such as have their Snails or Fish in them, which may be easily taken out, by boyling them as soon as you come home: The Sea-shells will be very acceptable, yet the Land and Fresh water ones are the most rare and desirable”.

“All coloured Earths, Clays, Minerals, Metals and Ores to be taken up as you find them, as also such Form’d Stones [fossils] as have any resemblance to Shells or Bones, as Vertebrae, &c., these must be got as entire as you can, the like to be observed in Slates that have the impression of Plants, Fishes, Insects or other bodies on them: These are to be found in Quarries, Mines, Pitts, Caves or where-ever the Earth is laid open”.

Petiver concludes these instructions with the following statement: “These Directions being very short . . . I therefore recommend you for more particular Enquiries to the Honourable Mr Boyle’s General Heads for Natural History, proposed to Travellers and Navigators. Printed at London 1692.12”. To which he added: “N. B. As amongst Plants the most common Grass, Rush, Moss, Fern, Thistles, Thorns or vilest Weeds you can find, will meet with the same acceptance as a Scarcer Plant, so in all other things the most common as well as rare, i.e. whatsoever you meet with, will be Welcome to

Sir,
Yours most Obliged and
Humble Servant
James Petiver”.

John Woodward (1665–1728) was thus following the tradition of the seventeenth century naturalists by publishing an instruction sheet for the guidance of other naturalists and collectors. His Brief Instructions was published anonymously, but contemporary booksellers’ advertisements name him as the author. The pamphlet, reprinted here, need not be discussed in detail, but a few words on his collection and how he amassed it may be of interest.

His very extensive collection consisted mainly of rocks, minerals, and fossils, though it included also a herbarium. As a naturalist, Woodward’s first interest had been in botany, an interest no doubt stimulated while he was studying to become a physician. In his Attempt towards a natural history of the fossils of England (1729), Part II, Preface: 1, he described how he acquired the interest in geology which persisted for the rest of his life. It arose during a visit to the home of Sir Ralph Dutton at Sherborne
in Gloucestershire. Here he continued his studies in anatomy and records that Sir Ralph had "very generously allow'd me all Conveniences and Assurances . . . and had all the several sorts of Brutes, of Birds, of Fishes, that this noble and plentiful Country afforded, readily brought to me for Dissection. I had here likewise, opportunity of carrying on my Botanic Studies". It was while botanizing in the neighbourhood that the existence of fossils first came to Woodward's notice and he listed in the above work (Part II: 46) the first fossil he ever found:

(sp.) "f.225 In Sir Ralph Dutton's Vineyard, at Sherborne, Gloucestershire.
Jan. 13, 1696. The first Fossil Shell I ever found".

On the previous page he recorded that fossils of this type were to be found in great numbers round Sherborne, and that they were called Pandib. This was the name used one hundred years later by William Smith for fossil terebratulids that he found in the same formation in Oxfordshire, the Inferior Oolite (Lower Jurassic).

In the preface to the above work (Part II: 1), Woodward relates that the occurrence of fossils "was a Speculation new to me . . . of so great moment, that I resolv'd to pursue it thorough the other remoter parts of the Kingdom". This he is known to have done, visiting the west and northwest of England and also south Wales, and collecting specimens. He later employed agents to collect for him in various parts of England, and to them he issued his "Brief Directions for making Observations and Collections, and for composing a travelling Register of All Sorts of Fossils". These Directions are quite detailed—they occupy twenty-seven pages in his Fossils of all kinds digested into a method (London, 1728)—and they indicate that Woodward was concerned, not only to obtain specimens, but also to learn about their mode of occurrence, and the nature of the rocks in which they were found. So far as I know, these instructions were not published separately and probably were written out in manuscript for the collectors.

They refer to minerals as well as organic fossils. Woodward was also successful in persuading many other persons both in Great Britain and abroad to supply him with fossils and minerals. Many of the donors are named in the catalogue of his collection, his Natural history of the fossils of England (London, 1729), which includes also a catalogue of his foreign specimens. The names include many naturalists and other well-known persons of the period, too numerous to list here, but among the British donors, John Morton, author of The natural history of Northamptonshire (London, 1712), supplied numerous specimens, and gifts from Sir Isaac Newton are mentioned. Woodward also received many specimens from several European countries, and from America, too. The Swiss naturalist J. J. Scheuchzer of Zurich supplied 143 minerals and 81 'extraneous' (organic) fossils; and Monsieur de Schönberg, Berghauptmann or Superintendent of all the mines in Saxony, gave 168 minerals and five fossil teeth; and a major acquisition was that of about 100 fossils from the Italian Agostini Scilla. I am indebted to my wife for patiently going through Woodward's catalogue and extracting these figures and other information.
Woodward's particular merit as a collector was that he did not collect fossils and minerals solely to exhibit to his friends, as natural curiosities, but that he spent the latter part of his life studying them. His attempt to classify his fossils on scientific lines was among the earliest in Britain; and his classification of minerals the first by any British author which has any pretence to a scientific basis.

His Brief Instructions gives an indication of his intelligent approach to the study of natural history, and it is, I believe, unique in the inclusion of a list of instruments likely to be useful to a naturalist.
PAGE 9 IS BLANK
Imprimatur,

Decemb. 29. 1695. Robert Southwell, V.P.R.S.
Brief Instructions
For Making
OBSERVATIONS
IN ALL
Parts of the World:
AS ALSO
For Collecting, Preserving, and Sending over
NATURAL THINGS.
BEING
An Attempt to settle an UNIVERSAL CORRESPONDENCE for the Advance-
ment of Knowledge both Natural and Civil.

Drawn up at the Request of a Person of Honour:
and presented to the ROYAL SOCIETY.

L O N D O N:
Printed for Richard Wilkin at the King's Head in
St. Paul's Church-Yard, 1696.
12 PAGE IS BLANK
Brief Instructions for the making Observations, and
Collections, in order to the promotion of Natural History, in all parts of the World.

I. At Sea.

Keep a Journal of the Ship's Course: Of the Latitude, as often as taken: Of the Variation of the Compass: Of the Soundings, observing what sorts of Shells, Sand, or other Matter is brought up with the Plunger. In Calmes, or with any other Opportunity, both at Main Sea, or elsewhere, found to the Bottom, if all the Line or Tackle you have will reach it; but if not, only note what Length of Line you used. In the said Journal also keep an Account of the Currents: of the Brizes, and other Winds, as well those which are settled and constant, as those which are accidental: of Storms and Hurricanes: of the Rise and Fall of the Weather-glass: Of the Weather, Heat and Cold, Fogs, Mists, Snow, Hail, Rain, Spouts or Trombes, vast Discharges of Water from the Clouds, Thunder, Lightning, Meteors, &c. Observe whether some Seas be not saltier than others, or distant Parts of the same Sea differ not in Salinefs: Whether the Water of the Sea be not warmer than ordinary, or suffer not some unusual Bubblings or Commotions before Storms, or there do not some other like uncommon Accidents forerun them, whereby they may be foreseen: What Voragines or Whirlpools appear at Sea, to what Distance the Force of their Flux or Stream extends, whether they only receive and swallow in the Water, or spue it forth, or, if both, with what Periods, i.e. at what time doth each begin and end: What sorts of Fowls occur at Main Sea: What Fishes, what Weeds, Shrubs, or other things. In brief, take notice of every observable natural Occurrence throughout the whole Voyage, and this too in as full and circumstantial a manner as may be.
II. Upon the Sea-shores.

Observe to what perpendicular Height the Sea rises at high-water; what Space of Time passes between the Ebb and Flood, and again, between Flood and Ebb: What kinds of Fish reside near the Shores, particularly what Shell-fish: What Fowl are most frequent there: What Weeds, Shrubs, &c. also what Shells, and are flung up by the Sea: What Shrubs, Weeds, Mosses, Sponges, Corals, or Coraline Bodies, e.g. Sea fans, Sea roses, &c. grow out upon the Shores, Rocks, or Cliffs: What sorts of Pebbles, Flints, Marchastes, or other Stones, lie upon the Shores, or are washed out of the Cliffs, by the Tides, and beating of the Sea-waves: Whether there be not found Grains of Gold, or Silver, or Lumps of other Metals, or Minerals, Amber, Crystal-pebbles, Agates, Cornelian, or other Stones that have somewhat observable in them, either for Lustre, Texture, or Figure; and particularly Stones that resemble Muscles, Cockles, Periwinkles, or other Shells. But more especially take notice whether by great Inundations, Storms, or Hurricanes, there be not thrown up out of the Sea, some sorts of Shells that are not flung up ordinarily, and at other times; as also whether upon the Sea beating down, and washing away the Earth from the Cliffs, there be not disclosed Glossoptere, Teeth, Bones, or Shells of Fishes, that were originally lodged in those Cliffs, but since beaten and washed out, thefe being commonly somewhat decayed, as also more dusky, foul, and black, than those Shells, &c. which are thrown up by the Sea.

Directions to the Dyvers, for Pearl, Coral, and Amber.

In all such Places where there is any sort of Dyeing, and particularly for Pearls, observe what sort of Earth, Sand, or other Terrestrial Matter, is found at the Bottom of the Sea: What Weeds, Shrubs, &c. what Shells of all kinds, or other Bodies, taking a particular account of all the several kinds of Shell-fish that yield Pearl; as also at what Distance from the Shores the dyeing is made: To what Depth and how long the Dyvers can endure under Water. In the Coral-dyeing observe in what Manner or Posture the Coral, particularly that which is shrubby, and the Sea-Fans grow; whether upright, horizontally, or flat, or hanging with the Heads downwards: To what Bodies it grows or adheres: Whether it grow only in such Parts as are constantly covered by the Sea Water, or such only as are uncovered when the Tide is down, or
or both indifferently: If constantly under Water, whether in the
the Shaloner, or deeper Parts of it: And whether it grow chiefly in
such Places of the Water that are calm, and still, or where it is
more rough and agitated by beating against the Rocks, Cliffs, &c.
Of how many several Colours it is: And to what Bignes both the
rude Coralline Mass, and the Shrubs, and other Coralline Bodies ever
arrive. The same Directions may serve indifferently for the
Amberfisrs, with this only Addition, that they carefully observe
whether the Amber be not also found in the Earth, and Cliffs, in all
such Places where it is fou’d upon the Shores: And whether that
which is thrown up by the Seas Flood, may not justly be presumed
to have been born down from the Cliffs by its foregoing Ebb.

III. At Land.

1. TAKE an exact account of the Brizes, and other ordinar-
ry Winds, with the Quarter from whence they blow,
what time they begin, and how long they last: Also of other
Winds, Storms, and Hurrises: As likewise of the Weather, Heat,
Cold, Fogs, Mist, Snow, Hail, Rain, Thunder, Lightning, Meteors, &c.
with the Seasons of the Year most obnoxious to these Rains, &c.
Their Quantity: The Time of their Duration: keeping also a Re-
gister of the Weather-issiles, both Thermometer and Barometer.

2. The following Experiment being of considerable Im-
portance, as serving to determine several Difficulties in the Natural
History of Rains, Vapours, &c. and being likewise very easily try-
ed, it is desired it may be done with Care and Exactnefs in all
Parts of the World. Get some Vessel either of Copper, Wood, or
Earth, about 2. Foot wide, ( or if wider the better) and at least
a Foot and half deep; be sure it be firm and sound, and that it do
not leak in the leaf. Fill it about 4 full of Water: Cover it over
with a Net, or very thin fine Wier-grate, to keep off Birds, or other
Creatures from drinking the Water; and then set it forth, either
upon the Leads of some flat-rooff’d House, or in the midst of a
Garden, or some other fit Place, where the Sun may shine upon
it all Day from Sun-rising to Sun-setting, or at least as much as
may be. Then with some Rule or Measure take the just perpendicular
Depth of the Water, noting down the Depth, and the Day of
the Month, and so leave the Vessel standing out. Once or twice a
Week ( or oftner, if either the Rain be so much as to fill the Vef-
A 2
fel, and endanger its running over, or the Heat and Drought such as to quite dry up all the Water, for either of these Accidents will elude the Experiment; visit the Vessel, and take nicely the Depth of the Water, noting that Depth, (in a Register to be kept for the purpose) and the Day of the Month; and if it be dry Weather, so that the Water is evaporated and sunk lower than it stood when the Vessel was first set forth, then put in just as much more Water as will raise it to its original Height. But if it hath rained, so that the Water is raised higher than it was when first set forth, after that the just Measure of it is taken, and noted down, take out so much of the Water as to reduce it to the Level at which it stood when first set forth. This Experiment ought to be continued thus for one whole Year at least, but longer if possible; only during the Time of Frost, no Observation need be made, the Water in the Vessel then neither rising nor falling.

3. Let there be an account taken of all Springs; both the standing or stagnant ones, and those which emit forth their Water, forming Brooks, and Rivers; observing whether they rise out of high or low Grounds; whether they be turbid or clear; hot or cold: Whether they ebb or flow: Whether they inculc or petrify Sticks, Straws, or other Bodies that lie in them: Whether they contain Bitumen, Petroleum, Salt, Nitre, Vitriol, or other Mineral Matter in their Water: Upon what Occasions, or at what Seasons chiefly their Water increases or decreases. In the Running Springs observe the Quickness of the Stream, and Quantity of the Water discharged.

4. As to Rivers, observe their ordinary Depth, Breadth, and the Quickness of their Stream: The several sorts of Fishes, particularly the Shell-fish in them: All sorts of Plants that grow in them. On their Shores take notice whether there be not Amber, Cornelians, or other Stones valuable either for their Colour, Texture, or Shape, and particularly whether any Stones that in Figure resemble the Shells of Muscles, Cockles, Periwinkles, or the like. The same Directions for the main may serve for Lakes and Meers, only it were to be wished that these were carefully founded, and their Depths taken, in several Parts of them.

5. Observe the several sorts of Marls, Clays, Loams, or other Soils, at the Surface of the Earth: And whether there be not almost every where a Coat of one or other of these at the Surface, whatever else lies underneath. Take an Account of the several sorts of Metals
(§)

Metals that the Country yields: As also of the Minerals, Rocks, Salt, Alum, Fire, Sulphur, Nitre, Leadstone, Cinnabar, Antimony, Salt, Spar, Crystal, Diamonds, Amethysts, Topazes, Emeralds, and other precious Stones: Their Number, and the manner of their Growth: Likewise of Marchites, Amber (for it is found in the Earth and at Land as well as at Sea) Selenites, Belemnites, Flints, Pebbles, &c. in what manner they are found, and at what Depths: In what Quantities, and whether the Metals and Minerals are separate and pure, or mixed: Of what Figure they are, and whether the said Metals, Minerals, precious Stones, &c. lie in the Beds of Earth, Cole, Chalk, Stone, &c. or in the Veins, Clefts, or perpendicular Intervals, of the Stone, Marble, &c. Endeavour to get Information whether Metals or Minerals have a Natural Growth, or a Natural Decrease, in any Part of the Mine: And what Rules the Miners give for the Discovery of Metals and Minerals latent in the Earth; or by what Signs they find them. Also take Account of the several sorts of Stone, Marble, Alabaster, Cole, Chalk, Oker, Sand, Clays, and other Earths: Their Depths: The Thickness of their Strata or Beds: The Order in which they lie: the Situation of their Beds, whether level or not.

In deep Quarries, Mines, Cole-pits, &c. observe in what manner the Water comes in: in what Quantity, and at what Season of the Year it abounds most: and whether it be clear and tasteless, or be impregnated with mineral matter. Take an account of the Damps: of what kind they are: what harm they do: at what Season chiefly they happen: and whether there be not Sulphur, or Nitre, or both, in all Places where there are Damps. Observe also the Heat of Mines, by Assay of the Weather-glass, if to be had, both Summer, and Winter, noting how much it exceeds, or falls short of the Heat at the Surface of the Earth: and whether it be not greater at certain Depths, than at others. And enquire whether in Mines, Cole-pits, deep Grottoes, or Caverns, the Workmen are not sensible of Gusts of Wind breaking forth of the Brow of the Earth.

6. Get an Account of all Grottoes or Natural Caverns in the Earth: their Breadth, Depth, Length: what Rills or Rivers of Water pass through them: what Metallic, Sparry, or other Mineral Inclusions cover their Stones, or hang down, like Icicles, from them. Get an Account likewise of the several Mountains, and Rocks: the Stone, Marble, or other matter, of which they consist: what Plants grow upon

Concerning Grottoes, and Mountains.
upon them: what Metalls or Minerals they yield: what Springs or Rivers issue out of them: the Height of them: especially it is much to be defird that the height of Pico Teneriffe, of the highest Alps, and Pyrenees, of Mount Atlas, of the Mountain called the Table, nigh the Cape of good Hope, of the Armenian, Persian, and Chinese Mountains, and of the Andes, and other high Mountains in America, were exactly taken by Observation. Enquire farther, whether they are not by little and little drawn away by Rains, and so become lower: whether their Tops be not covered with a Fog, or Mist, especially before Rain: whether some of the highest of them have not their Tops covered with Snow, a great part, or all the Year: whether at some times great Quantities of Water do not burst forth of them; with the Season that this happens, and whether attended with Heat, Thunder, Lightning, Storms, or what other Circumstances: whether some of them emit not Sulphurous, or other Steams, Flores Sulphuris, Nitre, or Sal-Ammoniac: whether any fand forth Heat, Smoke, or Flames, as Lava, and other Volcanoes do: and whether near such there be not continually Therme or Hot-springs.

7. But in regard that Sea-shells, Teeth, and Bones of Fishes, &c. are found very plentifully in England, and many other Countries, as well upon the Surface of the Earth, and the Tops of the highest Hills, as within the Earth, in Cole-pits, Mines, Quarries, &c. the said Shells, Teeth, &c. being lodged amongst the Cole, in the Mafs and Substance of even the hardest Stone, Marble, &c. tis very extremely desirable that careful search be made after these things in all Parts of the World, and an account kept where-ever they are found; particularly search ought to be made after these Shells, and other Bodies, at the Tops, and on the Sides of Rocks, and the Stone of the said Rocks be broken with Hammers, or other Tool Instruments, to discover the Shells lodged within the Stone. And it would be of very great Use if the Top of Pico Teneriffe, and of the rest recited in the foregoing Section, and indeed of all high Mountains whatsoever, were thus well examined by those who have Opportunity of doing it. Search like wise ought to be made upon the Surface of the Earth for the aforefaid Sea-shells, and for Stones that resemble them, especially upon the higher Grounds, as Hills, and particularly those which are plowed, where these Shells are very frequently found in great Numbers, and this too at great Distances from any Sea. But above all, where ever there is any digging for
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Metals, Minerals, Marble, Stone, Chalk, Coal, Gravel, Marl, or in short any other terrestrial matter whatever, if due Enquiry be made, there will be found of the abovenamed Shells in the said Marble, Stone, Chalk, Marl, &c. And in the Coal, and Stone above it, are frequently found Fern and other Plants, and sometimes in other Stone too, especially that which is very fine and compact. Wherever these Shells, Teeth, Plants, &c. are found, the Enquirer may please to note, along with the Place, what sorts of Shells they are: and whether they be of the same kinds with those found upon the Shores of those Parts or not; in what Numbers they are found: at what Depths: and what Earth, Sand, or other Matter, they contain in them.

8. In Stone, Marl, &c. there are sometimes found Trees of several kinds, buried, and, along with them, Nuts, Acorns, Pine-Apples, &c. but much more commonly are the said Trees found buried in Moor, Boggy, and Fen, especially th'out of which the Peat-Earth, or bituminous Turf's are digg'd for Fewel. Where Trees are thus found, be pleas'd to Note what sorts of Trees they are: and whether there be of the same sorts now growing in the Country: what bigger they are: and whether they be in size, with roots, and branches, as well as Trunks: in what numbers they are found: at what depth in the Earth: in what kind of Earth, or other matter, it is that they lye: and what else is found along with them.

9. Take an account of the more observable and peculiar Diseases of the Country, with what seasons of the year are most subject to them: and of the other Casualties, particularly Earthquakes, noting all circumstances that precede, attend, and follow after them: e.g., the condition and temperature of the Air, as to heat and cold, wet or dry, thick or clear, calm or windy, before the Earthquake: and whether the Springs are warm, turbid, or emit Sulphureous or other offensive stems: noting likewise the extent of the Shock, to what distance it was felt, and whether in all places precisely at the same minute of time: how great was the force of the Shock: whether it cracks and tore the earth: removed any tract of Ground: raised, or sunk it in: whether any heat, fire, water, &c. issu'd out at the said Cracks: whether, in case there be any Volcanoes, or burning Mountains, near, they emit not flames with greater violence and noise than usual, at the time of the Earthquake, or a little before, or after it: or whether they issu'd not forth water: whether the Water of the Wells,
Springs, and Rivers thereabouts do not become warm, turbid, or lend forth more Water than usual, at the time of the Earthquake: whether the Neighbouring Thermes, or Hot-springs, if any, become not more hot, and muddy, than before; whether the Sea adjacent does not become warm, or hot, and suffer great Commotions, and extraordinary Tides, at that time: whether there follow not great winds, rains, thunders and lightning after the Earthquake is over: and whether fevers, and other distempers do not then invade the inhabitants of those parts, yea the very beasts, fowl and fish: whether lastly, Earthquakes happen in any, unless mountainous, cavernous, and stony Countries, and in such as yield Sulphur and Nitre.

10. As to the vegetable and animal productions of the Earth, observe whether the Country be fruitful or barren: what kinds of Trees, shrubs, and herbs: if produceth that we have, and what kinds that we have not in England: whether in those Countries that lie betwixt the Tropicks, the Plants be not all in perpetual verdure, without ever falling all their leaves: and whether they have flowers, green, and ripe fruit upon them all the year round: or whether there be any of those sorts of Plants there which are called annual ones, and dye yearly: or any whose tops, and all, save their roots, dye away, and sink into the ground for some time, but afterwards spring forth and grow up afresh, as Daffodils, Tulips, and other bulbous Plants, do here: also what Fowls, what Beasts, Serpents, Lizards: what Flies, Moths, Locusts: what Beetles, Grasshoppers, Spiders, or other Insects: what Tortoises, Snails, or other Creatures cover'd with Shells, are found living upon the Earth.

An Appendix relating to the Natives of Guinea, Monomotapa, and other the least known parts of Africa; of the East, and West Indies: Tartary, Greenland, or any other remote, and uncivilized, or Pagan Countries.

1. As to their Bodies, observe the features, shapes, and proportions of them: but more particularly the features of their faces: their Eyes whether large, or small: their noses whether flat
flat and low, or sharp and railed: their Hair long, or short and curled or woolly: the colour of their Skin whether white, brown, tawny, olive, or black: the colour of their Infants when first born: whether white people removing into hot Countries become by degrees browner, &c. and Blacks removing into cold Countries, paler: whether People that inhabit the Countries which are hottest, be in Complexion of all the blackest: whether there be true Negroes Natives of any parts of the world, besides Guinea, and the adjacent parts of Africa. Observe also the size or bigness of their Bodies: their strength, agility, &c. and to what age they commonly live. Observe likewise whether they paint their bodies: what parts of them they paint, what colours they lay on: what figures they paint: and how they do it.

2. Observe their Tempers, Genius, Inclinations, Virtues, and Vices. Their Man.

3. Enquire into their Traditions concerning the Creation of the world, the universal Deluge, the People from whom they are de-

4. Enquire into their Notions touching the Supreme God, Angels, or other inferior Ministers: whether they pay any worship or re-

5. Get an Account of their Laws, and Civil Government: their Arts and Sciences, with their Cultures, and their Military.
their Language, their Learning: their Letters, and whether they write on Paper, the leaves of Palms, or other Plants, Bark of Trees, &c. or, instead of writing, use Painting, and Hieroglyphicks: their Musick: their Diet: their Agriculture, or Tillage: their methods of Hunting, Fowling, and Fishing: their Physick, Surgery, and the Simples they use: their Poysons; their Navigation, and the make of their Vessels: all their other Arts, and Sciences: their Manufactures, Traffic, Commodities, Money, Weights and Measures; whether they understand the melting and ordering Iron, and other Metals: their Apparel: their Houses, and other Buildings: their Utensils, and Instruments, whether made of Iron, Stones, Fish-bones, Shells &c. their Exercises, and Sports: their Government and Discipline in War: their Weapons, Bows, Arrows, Darts, &c. their Warlike Instruments, Drums, Tambours, Cymbals: their Punishments, and Executions. To be brief, make enquiry into all their Customs and Usages, both Religious, Civil, and Military; and not only those hinted in this Paper, but any others whatever.

Directions for the Collecting, Preserving, and Sending over Natural things, from Foreign Countries.

1. In the Choice of these Things, neglect not any, tho' the most ordinary and trivial; the Commonest Pebble or Flint, Cockle or Oyster-shell, Gras, Moss, Fern, or Thistle, will be as useful, and as proper to be gathered and sent, as any the rarest production of the Country. Only take care to choose of each the fairest of its kind, and such as are perfect or whole. As to the Number, fix or eight of each sort is enough; But where so many of the same sort are not to be easily got, send one, two, or more as they can be procured.

2. For the time of making Observations none can ever be amis; there being no season, nor indeed hardly any place wherein some Natural Thing or other does not present itself worthy of Remark: yea there are some things that require Observation all the Year round, as Springs, Rivers, &c. Nor is there any Season admir'd for the gathering Natural Things. Bodies of one kind or other
other presenting themselves at all times, and in Winter as well as Summer; only for Amber, Onyxes, and other Stones that lye in the Sea Cliffs: as also for the Glossopetrae, Teeth, and Shells that are there, search may be made to best purpose after Storms, because they are then chiefly beaten and washed out of those Cliffs. So likewise for the Gold Grains, Stones of all sorts, and Shells that are found upon Mountains, search ought to be made especially after Rains, because when washed of the Soil, and so discover them.

3. It were very well that there were sent over hither some Specimens of all Natural Bodies whatever: To begin with Fossils; Let there be sent Samples of all the several Varieties of Marble, Ores of Metals, Native Minerals of all sorts, e. g. of Antimony, Sulphur, Nitre, Alum, Talc, Sparr, &c. of the Metallick, Sparry, Vitriolick, Nitrous, Aluminous, and other Iceicles that are found hanging down in Grottoes, and the Fissures of Rocks: the Crystalized Spars, Salts and Ores: common Pebles, Flints, Marchites, &c. I call that a Variety wherein there is any difference as to Colour or outward Appearance, or in Weight, in the Quantity of the Metallick or Mineral matter, or in the manner of its mixture. Of the foregoing, three or four of each Variety will be enough: but for Agates, Cornelians, Amber, Crystal, Diamonds, Amethysts, Selenites, Belemnites, or (as the Vulgar calls them) Thunderbolts, and the like, be pleased to send (of those which are found single and loose) six or eight of each, wherein there is any difference in Figure, Bigness or Colour: but for those which grow together (in Clusters or Bunches) to the Rocks, send Samples of them with part of the Rock to which they grow. As to those Stones that resemble Cookies, or other Shells, be sure to send six or eight of each wherein there is any the least difference, &c. For the Sea-shells, Teeth and Bones, that are found at Land, on Hills, &c. and those which are dug up out of the Earth, and lye loose in Gravel, Chalk, Marle, &c. six or eight of each sort will be sufficient; but for those which are found lodged in Marble or Stone, and are not easily got out single, send pieces of the said Marble and Stone, of all sorts, with the Shells so lodged in them; choosing only to break off (for these Samples) such parts of the Stone that contain the fairest and most entire Shells, and such wherein they lye thick-er. The same likewise for the Fern, and other Plants found in Cole, Slate, &c. It were also not amiss that there were Samples sent over of the Nitre, Sal Ammoniac, Flores Sulphuris, Cinders, and.
and other Bodies, that are flung forth of the Volcanoes.

4. In order to the sending over these Stones, Minerals, Ores, Fossil-Shells, Teeth, &c. each ought to be packed carefully in a piece of Paper (the place where ’twas found being first noted thereon) by it self, to prevent rubbing, fretting, or breaking in Carriage: and then all put together into some Box, Trunk, or old Barrel, placing the heaviest and hardest at the Bottom. Those Minerals which are tender and easy to be broken, as also the tenderer kinds of Fossil-shells, ought to be put up carefully together in a Box that is not large, and (besides the Papers) Cotton, Chaff, or Bran, put up with them, the better to secure them.

5. As to Plants (as well those that grow at Sea, in Rivers, and Lakes, as those which grow at Land) four Samples of each kind (wherever there is any difference in Colour, or Figure, of the Leaf or Flower) will be sufficient. Where the Plant is large, as in Trees, Shrubs, and the like, a fair sprig, about a foot in length, with the Flower on it that be to be had, may suffice: but of the lesser Plants, such as Sea-Weeds, Grasses, Mosses, Ferns, &c. take up the whole Plant, root and all. Choose all these Samples of Plants when they are in prime, I mean in Flower, Head, or Seed, if possible; and if the lower or ground Leaves of any Plant be different from the upper leaves, take two or three of them, and put them up along with the Sample.

6. To preserve these Samples of Plants, put them each separately, betwixt the leaves of some large Book, or into a Quire of brown Paper, displaying and spreading them smooth and even. The next day, and afterwards three or four times at due distance, shift them into other Books or Paper, till they are sufficiently dried, when a weight may be laid upon them to press and smooth them; and so keep them, in some dry place, till they be sent over, sending them in Quires of brown Paper, and writing on the outside in what Country the enclosed Collection of Plants were gathered. For, both for these, and all other things, ’twill be proper to put up the Productions of each Country apart, or at least with such distinction that it may be known whence they all came.

7. Be pleased likewise to send Samples of Seeds of all kinds of Plants, even the most Wild and Common. But gather them not till they are Ripe, and then put each sort by itself in a piece of Paper, and, along with it (if to be had) a leaf and flower of the Plant off which ’twas gathered, writing on the said Paper the Names (if
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(if any) by which the Country people call the Plants to which they belong'd, and the Medicinal, or other uses, they make of them. Also Samples of such Nuts, Pods, Berries, or other Fruits, that will keep. But both these and the Seeds ought to be well dried before they are put up, and to be afterwards kept dry. I had like to have forgot to desire that Patterns might be sent over of all such Woods, Barks, Roots, Gumms, Resins, Nats, Balsoms, &c. that are of any use, or have any thing remarkable in them: likewise of all sorts of Fruits, and Mushrooms which are hardy and will keep, as most of those that grow out of Trees will: but for the Earth-Mushrooms, which are more tender, they ought to be put up in Glass vials filled with Rum or Brandy; many of them being so very elegant and curious, as well to deserve such care in the preserving of them.

8. In like manner Roots of Plants would be very acceptable. And there are many Sorts of them that, with very little trouble, might be so ordered that they would grow again when brought over, and set here, tho' after a long Voyage. Particularly those which are Bulbons, Tuberos, and Fleshy: Such as the Roots of Tulips, Lilies, Crocus's, Onions, Garlics, Squills, Anemones, Potatoes, Turnips, &c. These, I say, and all like Roots, may be sent as easily and safely as Seeds, if taken up out of the Ground, and laid to dry till the Ships come away, and then only put in very dry Moss, Cotton, or Sand.

Then for all kinds of Ferns, or Brakes, Maiden-Hairs, Polypodiaceae particularly Harts-tongues &c. which are indeed a very Beautiful Family of Plants, their Roots may be taken up, (to be in readiness) and laid again into the Ground, and covered there, in some shady place, till the Ships are ready to Sail; when each root must only be enclosed or wrap up in a lump of Clay or Loam, and then put up into a Box with Moss, and so sent over. In the same manner may Roots of Gingers, Turmeric, Flower-de-luces, and the like be sent. As also of all sorts of Arums, or Cuckooflax, Herb-Dragons, &c.

9. Yea the very entire Plants themselves will, several of them, some while keep so long that they may be securely sent over hither; and will, if Set, grow afterwards, and thrive well enough. Such as all the kinds of Aloe, Sempervirens House-leek, Prickly-Pears, Turk's-Caps, Euphorbias, Torch-thistles, or indeed any others that are of a very juicy, soft, or thick substance. These need only be hung up in the Air, at the top of some Cabin, to keep them from rotting, and they will come safe without any further trouble.

For
INSTRUCTIONS FOR MAKING OBSERVATIONS IN ALL PARTS OF THE WORLD JOHN WOODWARD 1696
any other thing, whatever it be, that either the Divers, the Nets, or the Engines, bring up out of the Sea along with them. These Shells, and several forts of Shells, Corals, &c. ought to be put up each in Paper, and then all into some Box, with Coton, Bran, or Chaff, and great care taken of those that are small, tender, and brittle.

12. The greatest Difficulty of all will be to preserve, and send over safe, the Flies and Insects, by reason of the great Tenderness of them. Endeavour to procure some of all the several sorts of these, not exceeding 3. or 4. of each. Worms, Grubs, Caterpillars, Spiders, Beetles, Grasshoppers, &c. will keep best if put up, as many as conveniently may together, in Bottles with Brandy, &c. But the several sorts of Flies, Bees, Wasps, Butterflies, &c. ought to be put upon Pins, and stuck to the Bottoms, Sides, and Tops of small Boxes; but care must be taken that they stick very fast, for if one of them fall off and get loose, 'twill tumble about, and so break and destroy all the rest that are in the Box.

13. It were likewise not amiss to send over some of the Idols of the East or West Indians, or any other of the less civilized Nations, as also of their Pictures: their Writing, whether upon Paper, or the Leaves or Bark of Trees: their Money, Weights, Measures: their Domestic Utensils: their Habits, or the things they wear, Skins of Beasts, Feather-dresses, Rings, Beads, &c. their Medicines: their Poylons: their Musical Instruments: their Weapons, Bows, Arrows, Darts, especially those that are headed or pointed with Flints, Bones, or Shells: their Drums and Tambours, &c.

But for these, and especially for the natural things, that are thus sent over, great Caution ought to be used that the Boxes wherein they are, be not turned topsyturvy, or much tumbled and broken in carrying to and from the Ship. And above all, that the things be not broken, or rifled and confounded by the Custom-house Officers and Searchers; which may be prevented by giving timely notice to your Correspondents here to get a Warrant, from the Honourable the Commissioners of the Customs, that the Cases and Boxes may not be searched on Ship-board, but brought into the Custom-house Warehouse, and that some careful person attend there at their opening, to see that no Inconvenience or Damage befall them.

There remains now only one thing more to be hinted, and that is, in regard the Observations to be made both at Sea and on Land are very many, and the Plants, Minerals, and Animals, to be...
be collected, are also very numerous, 'tis not expected that any one single Person will have leisure to attend to so many things, and therefore 'tis only requested that he make such Observations and Collections, more or less, as may be best suitable to his Convenience, and to his Business. If there be never so few Observations made, or things collected, yet even they will be very gratefully received. But for such curious, and inquisitive Persons who shall generously believe a yet greater Diligence and Application in the Promotion of these many of them to very useful and considerable Parts of Knowledge, the learned and better Part of Mankind will be so much the more highly obliged unto them. And here are many of these things, especially the gathering and preserving of Insects, Shells, Plants, Minerals, &c. may be done by the Hands of Servants, and that too at their spare and leisure times: or in Journeys, in the Plantations, in Fishing, Fowling, &c. without Hindrance of any other Business, the things herein desired being common, and such as (one or other of them) occur in almost all Places.

Some Additions to be inserted each in their proper Places.

W[ether some Seas be not saltier than others] This may be tried partly by boiling or evaporating an equal quantity of the Water of different Seas, and then observing what Proportion of Salt each yields: and partly by finding the several Gravities of the Waters of the said Seas by means of the Instrument mentioned Numb. 4. in the Lift beneath. By the same Instrument may the Weight of the Waters of Mineral-springs, Hot-baths, and Lakes, be tried; which it were to be well'd might be done in all Places. But above all, Enquiry should be made whether the Seas, in some Parts of it, and Lakes, have not their Water impregnated with Nitre and other Minerals besides Salt. This may be discovered by the Taste or Smell of the Water: by evaporating it, or some other proper means. The different Colour, Thickness, and Muddiness of the Water of the Sea and Lakes ought likewise to be noted.

What perpendicular Height the Sea rises at high-water. I mean how much it rises above the Level of low-water. Observe further at what time of the Moon, and seasons of the Year, the Sea ebbs lowest, or flows highest in any Place; not neglecting to note all other
other Accidents and circumstances of the Tides whatever they be.

Things flung upon the Shores by the Sea.] Amongst the rest look diligently for Amber-grit, the Natural History of which is yet very little known. 'Tis supposed to be cast up by the Sea; but whether it be so really, or be drawn out of the adjacent Cliffs (as many other Bodies are, that were supposed to be owing to the Sea) is to be determined by future Enquirers; who would do well not only to make this a Part of their Consideration, but to observe like-wise its colour, smell, and taste: The Quantity of it: what other Bodies are mixt with it, or lye near it: Also the condition of the Sea thereabouts, whether turbulent usually, or calm: whether the Water be frothy or oysy, and, to be short, all other circumstances that may give any light into this matter.

Of Winds.] Also of the different Effects, Constitutions, and Temperatures of Winds, which hot, which cold: which moist, or attended with Mist, or Rain: which dry, &c.

Of Springs.] And whether there do not sometimes happen extraordinary Eruptions, or vast discharges of water out of them, without any externally apparent Cause. The same also concerning Lakes: as likewise concerning Grottoes.

Rivers.] And whether these do not also suffer sudden and unusual Eruptions of Water forth of their Sources: whether they have not periodical Inundations, occasioned by the great Rains that fall at certain Seasons, as the Nile, Ganges, and several other Rivers have: how high the Tides rise at their Ofta or outlets, and how far they flow up them; with the periods of the flux or reflux.

Miners.] How deep are the deepest Mines and Copepits: whether there be not water continually draining and ouzing through the Ores of Metals, and the Spar, and other Minerals that lie in the Cliffs of the Stone: what are the peculiar Diseases that attend the Miners: what Mines are chiefly detrimental to Health, and whether there be not some that are observed considerably to shorten the Lives of the Miners: also whether the Smoke, Ashes, &c. that fall upon the Gruffs near the Forges and Smelting-works be not hurtful to the Cattle that feed upon it: Lastly, Whether the very Waters of the Springs, Rivers and Brooks near, especially about Lead-Mines, are not sometimes infected with the Mineral streams, so as to be likewise noxious to the Cattle which drink of them.
A List of such Instruments, and other things, as may be serviceable to those Persons who make Observations, and Collections, of Natural Things.

1. The Weather-glass now lately contrived by Robert Hook, M. D. Professor of Geometry in Gresham College, and S. R. S. of use at Sea as well as at Land.
2. The common Barometer.
3. The common Thermometer.
4. The Hygrometer, or small Glass Instrument, with the Neck or Stem graduated into small Divisions, serving to try and compare the Gravity of Liquids, Waters, &c.
5. A Dipping-needle; in order to observe the several Degrees of its Inclination in all Parts, both at Sea and Land.
6. A large Quadrant, for taking the Height of Mountains, &c. also for the making Astronomical Observations, &c.
7. A Level, whereby to judge of the Situation (in respect of the Horizon) of the Beds of Earth, Stone, Marble, Coal, &c. in Mines, Quarries, Coal-pits, &c.
8. A two-foot-rule, or other like Measure, exactly graduated, as well to take the Depth of the Water in the Experiment related above page 3. as for other Uses.
9. Hammers, bigger and smaller, to break, and examine the interior Constitution of Ores, Native Minerals, Stones, &c. with a Chisel wherein to differ or strike off shells from the Mists of Stone, Marble, &c. conf. pag. 6. and pag. 11. above.
11. An Eradicator, or small Iron Instrument to take up the Roots of Herbs out of the Earth.
12. Several Quires of brown Paper to dry and keep Plants in.
13. Several Neats of Dutch, or Pill-Boxes: also Deal Boxes of several Sizes, in which to put up, and send over Natural Bodies.
14. Bottles, Jars, Gally-Pots, or other like Vessels, wherein to put the more tender Creatures, with Spirits &c.
15. Spirit of Wine, Rum or Brandy, to preserve the said Creatures, e. g. Insects, Lizards, Serpents, &c.

16. A
16. A Solution of Mercury Sublimate; or the same in Powder, a small part of which may be dissolved in a little Water, by boiling it gently in a Pipkin; which Pipkin ought to be kept for this only purpose, it being dangerous to put it to any other use, the Sublimate being a Poison. When the Liquor is Cold, a little Spirit of Wine may be added to it, if to be had. The use of this Solution is to chase and rub upon the Insides of such Animals whose Entrails are taken forth (as Page 14. above) in order to dry and preserve them; this serving to fence off Worms and Insects from prey ing upon them, preventing also the falling off of the Hair or Feathers, and securing them against Putrefaction, Stinking, &c.

It would be of incredible advantage to this Design, were all the Thermometers and Hygrometers used in it adjusted nicely and exactly after some common Standard. Which would be a Thing very easy to be done, were they all bought of the same Person. Nor can I, if I may presume to recommend one for this purpose, nominate a fitter than Mr. Hunt, Operator to the Royal Society at Gresham College; who will not only procure the two mentioned, (graduated very carefully) or indeed any of the other Instruments, but likewise be ready to direct any one, who shall desire it, in the method of using them; or to advise and assist them in any other thing tending to the promoting of this Design. For the Thermometers were they thus all of them, adjusted to the same Standard, (to be kept constantly in the Repository at Gresham College, where any Man might have recourse to it) 'twere easy to make a true and certain Estimate of the Heat or Cold in any part of the World where these Thermometers were used, for they would all of them constantly answer to one another, in what Country soever they were. By this means the Heat or Cold of all Places in the same Climate or under the same Latitude may be compared and known, for any, or all, Seasons of the Year. The same way may a comparative judgment be made of the Heat or Cold of Climates tho never so different and distant: the Heat of one Country or Place may be conferred with another; of one Mine, Coke-pit, Grotto, or other Subterranean Cavern, with another: the temperature of Valleys or Plains with that of higher Ground, and with the sides or Tops of Mountains; which would be a thing of real and very great use in many respects. So likewise for the Hygrometers, were they all adjusted after the same Standard, there would be a fixed and standing Rule whereby to judge of the Gravity of Fluids all over the World wherever.
ever these Instruments were used. The Gravity of the Water of one Sea might be compared with that of another: of the Northern with the Southern Seas: of the Seas under the Equinoctial, with those at the Poles. So also of different parts of the same Sea, the Shores with the Main, or the Waters of the very same place, taken up at different depths, with each other. In the same manner may be examined the Water of Lakes, of Rivers, of Mines, Coal-Pits, &c. of Springs of all Sorts, both the Mineral ones and others, all over the World.

FINIS.
The Sherborn Fund of the Society for the Bibliography of Natural History commemorates the first President of the Society, Charles Davies Sherborn (1861–1942), the distinguished bibliographer and compiler of *Index Animalium*.

The basis of the Fund is a sum of money bequeathed to the Society by Dr Sherborn. It is intended to be used for the publication of facsimile reproductions of rare works on natural history.

The first Sherborn Fund Facsimile, Alexander von Humboldt’s *Essai sur la Géographie des Plantes*, was produced in 1959. It is still available at a price of £0.50 ($1.50 U.S.).

John Vaughan Thompson’s *Zoological Researches and Illustrations* (1828–1834), with an introduction by Alwyne Wheeler of the British Museum (Natural History), was produced in 1968 as the second facsimile. This also is still available at a price of £2.00 ($6.00 U.S.).

Charles Darwin’s *Questions about the Breeding of Animals* [1840], with an introduction by Sir Gavin de Beer, F.R.S., was published in 1968 at a price of £1.25 ($3.00 U.S.).