Bulletin of the
British Museum (Natural History)

The Red Notebook of Charles Darwin

Sandra Herbert (Editor)

Historical series Vol 7 24 April 1980

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British Museum (Natural History),
Cromwell Road,
London SW7 5BD,
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[illegible] abbreviation: *Bull. Br. Mus. nat. Hist.* (hist. Ser.)

Historical series
Vol. 7 1–164 (Complete)

Issued 24 April, 1980

THE RED NOTEBOOK OF CHARLES DARWIN

Edited with an Introduction and Notes

by

SANDRA HERBERT

University of Maryland, Baltimore County
Baltimore, Maryland, 21228, U.S.A.

British Museum
(Natural History)
London

ISSN 0068–2306
Historical Series Volume 7 (Complete) 1–164

Published by British Museum (Natural History)
Cromwell Road, London SW7 5BD
Set by William Clowes & Sons, Limited, London, Colchester and Beccles
Printed by Henry Ling Ltd., Dorchester

To Sydney Smith

Introduction

Commonly used symbols and abbreviations code

CR	*The Structure and Distribution of Coral Reefs* (1842)
Diary	*Charles Darwin's Diary of the Voyage of H.M.S. Beagle* Edited from the MS by N. Barlow (1933)
GSA	*Geological Observations on South America* (1846)
JR	*Journal of Researches* (1839)
VI	*Geological Observations on the Volcanic Islands Visited during the Voyage of H.M.S. Beagle* (1844)

Editorial symbols

⌜ ⌝	Darwin's addition
⟨ ⟩	Darwin's cancellation
⌜ ⌝	Editor's remark
[. . . ?]	Uncertain reading
|	End of notebook page
e	Wholly or partly excised page

The Red Notebook is one of a series of notebooks kept by Charles Darwin during and immediately following his service as naturalist to the 1831–1836 surveying voyage of H.M.S. *Beagle*. It forms part of the collection of Darwin manuscripts at Down House in Kent, Darwin's former home, and, since 1929, a museum in his honour. The notebook came to Down House by arrangement with the Darwin family following Sir George Buckston Browne's purchase of the house for use as a museum.[1] It is a well-made but otherwise ordinary pocket notebook, measuring $6\frac{7}{16}'' \times 3\frac{15}{16}''$ (164 mm × 99 mm), leather bound with a metal latch, which still works, and, as the name suggests, red in colour, although the original brilliance has faded. The leather cover is embossed with a border design on both sides. The front cover of the notebook bears the initials 'R.N.', written on a rectangular piece of white paper. On the back cover is pasted a similar piece of paper with the identical initials and the additional phrase 'Range of Sharks', referring to an entry within the notebook. There is also an ominous epigram written in larger letters across the back of the notebook: 'Nothing For any Purpose'. All of these inscriptions are written in brown ink in Darwin's handwriting.

The pages of the notebook are of good quality paper, chain lined, and cut from stock bearing a 'T. Warren 1830' watermark. There are ninety leaves in the notebook or, in Darwin's occasionally irregular numbering, one hundred and eighty-one pages. Counting fractionally excised pages as half pages, seventy-five pages, or just over 41 per cent of the total, do not now appear in the bound notebook. All but twelve of these excised pages have been identified from among the general holdings of Darwin papers at Cambridge University Library.[2] In addition to the large number of excised pages, two other features of the notebook are worthy of notice with respect to its physical appearance. First, most entries are scored through with a single vertical line. Such scorings are common among Darwin manuscripts and were an indication to himself that he had made use of the material. Second, the notebook as a whole divides neatly into two parts on the basis of the medium in which the majority of entries were written and with respect to the direction in which they were written on the page. Up to page 113, entries are in pencil, except for a few later additions, and are written along the vertical of the page, that is, running across its narrower dimension. In contrast, from page 113 on, the majority of entries are in brown ink rather than pencil and are written across the horizontal of the page.

The obvious difference in appearance between the two parts of the notebook has a commonplace explanation. In appearance the first part of the Red Notebook resembles Darwin's field notebooks from the voyage, the second part the majority of notebooks kept after the voyage. Entries in notebooks from the voyage were typically made in pencil and written on the vertical of the page. In the field, pencil is obviously superior to pen and ink for writing. Also, for most right-handed people, a hand-held pocket-sized notebook is more easily written in when held vertically in the left hand, the palm of the left hand supporting the entire page, than when held horizontally, which leaves the right-hand edge of the page without support. Thus, so long as he was travelling, Darwin wrote in pencil with the notebook held vertically. Once back in England, however, Darwin wrote while sitting at a desk and used pen and ink as well as pencil. At home he found it easier to write horizontally across the page.

This explanation for the difference in appearance between the two parts of the notebook is borne out if an attempt is made to date the notebook on the basis of content. Fortunately the first part of the notebook can be dated with some confidence on the basis of places named in the text. The first part of the notebook yields a perfect progression of place names corresponding to points visited by the *Beagle* from late May to the end of September 1836. The *Beagle* arrived at the Cape of Good Hope on 31 May 1836 and departed 18 June; page 15 of the Red Notebook contains the entry 'off Cape of Good Hope 70 fathoms 20 miles from the shore', and page 32 mentions the names of two prominent English residents of Cape Town, Sir John Herschel and Dr Andrew Smith. Page 38 refers to similar detail for St Helena, the *Beagle*'s port from 8–14 July. Later in the notebook, on page 45, reference is made to Ascension Island which the *Beagle* visited from 19–23 July, and on page 77 a reminder is given to 'Mem. Ascension'. On page 94 Darwin wrote "I now having seen Pernambuco" which he visited from 12–17 August. Continuing this series, page 99 mentions the Cape Verde Islands, a port for the *Beagle* from 31 August–5 September. Finally, page 107 refers to the Azores where the *Beagle* stopped for mail on 25 September, eight days before anchoring at Falmouth. On 2 October 1836 Darwin departed the *Beagle* at Falmouth for his home in Shrewsbury.

Exact dates for the second part of the Red Notebook are harder to determine. With no written itinerary available, one must look to different types of evidence. One useful guide for dating pages 113–181 are the names of individuals Darwin cited in his entries. Chiefly they are of scientific men active in London, most of whom Darwin had not met before returning to England. Thus on page 113, the first extant page in the second part of the notebook, Darwin referred to consultations with Richard Owen, then a young anatomist working at the Royal College of Surgeons, later the first Superintendent of the Natural History Museum in South Kensington. Since Darwin first met Owen in October 1836, the month Darwin returned to England, entries from page 113 on in the notebook are post-voyage in date.[3] Reference on subsequent pages to other London men—among them geologists Roderick Murchison and Charles Lyell, the geographer Sir Woodbine Parish, and the conchologist James de Carle Sowerby—substantiates this view. Further, the impact that these London men had on Darwin's work from the voyage provides evidence for dating certain passages. For example, at the end of January 1837 Richard Owen provided identifications of a number of Darwin's fossil mammal specimens from South America to Charles Lyell for inclusion in his presidential address of 17 February 1837 to the Geological Society of London.[4] Among the specimens which Owen identified was a llama-like animal, the *Macrauchenia patachonica*. This specimen figured prominently in the Red Notebook since the 'extinct Llama' referred to on page 129 was in fact the *Macrauchenia*. As the llama-like character of this specimen was unknown before Owen examined it, the entry on page 129 of the Red Notebook must have been written after the end of January 1837. How long after can best be determined by considering the context in which Darwin's remarks on the *Macrauchenia* were made. To do so it is necessary to consider Darwin's remarks on species in the second part of the Red Notebook as a unit.

The whole run of entries on species in the second part of the Red Notebook is important for the limited purpose of dating specific passages, such as those referring to the *Macrauchenia*. It is also essential for the larger purpose of establishing a date for Darwin's arrival at a belief in the mutability of species. On this last point it should be stated that while Darwin's observations during the *Beagle* voyage were fundamental to his work on evolution, his notes from the voyage do not reveal him to have been an evolutionist. He was at the stage of asking basic questions.[5] It should also be stated that there has previously been no fully satisfying evidence to document Darwin's own claim that he began to form his views on the species question in 'about' March 1837.[6] Undoubtedly the chief significance of the Red Notebook is that it provides such evidence. In the Red Notebook are found explicit indications that Darwin was ready to assert the possibility that "...one species does change into another..." (Red Notebook, p. 130). Equally important, Darwin's remarks on the species question in the second part of the notebook are sufficiently extended to allow one to characterize his position in some detail.

Darwin's remarks on species in the second part of the notebook are directed towards three general topics: the geographical distribution of species, a comparison between the distribution of species through time and through space, and the generation of individuals and species. The central theoretical notion to emerge with respect to geographical distribution is that of the 'representation of species' (p. 130), or what Darwin referred to in his autobiography as 'the manner in which closely allied animals replace one another in proceeding southwards over the [South American] Continent...'.[7] From this notion Darwin drew the tentative conclusion that such representative species as (to take his example) the two South American rheas had descended from a common parent (p. 153e). It is important to point out that in drawing this conclusion, Darwin chose to avoid a Lamarckian understanding of the bounding of species.[8] For Lamarck, species graded indistinguishably into one another. In contrast, Darwin perceived differences between even the most closely related species, a perception captured by his notion of representative species and confirmed by the judgements of taxonomic authorities.[9] The word he employed to describe this situation was 'inosculation', a medical term referring to the joining of one blood vessel to another. Because he saw species inosculating rather than grading into one another, Darwin believed at the time he wrote this entry that species change, or transmutation, must be produced 'at one blow' (p. 217), or 'per saltum' (p. 130). Transmutation and representative species aside, however, there are other statements in the notebook which bear on Darwin's more general understanding of the identity of species as correlated with geographical location and range. One such passage argues that 'new creations' of species are independent of the size of the land area inhabited by the species (p. 127). Other statements challenge by way of example the notion that climate entirely determines the distribution of species (pp. 128, 134e) or that species are perfectly adapted to a particular set of physical circumstances (pp. 129, 133). Behind such statements lie broad questions concerning the relation of the history of the earth to the history of life. Yet in these passages the tentative and empirical nature of Darwin's inquiries is paramount.

The second topic of interest with respect to the species question in the Red Notebook is the analogy Darwin drew between the distribution of species over space and over time. Darwin's statement reads: "The same kind of relation that common ostrich bears to (Petisse, & diff kinds of Fourmillier): extinct Guanaco to recent: in former case position, in latter time. (or changes consequent on lapse) being the relation.—"(p. 130) If we can simplify this statement by omitting the phrase 'diff kinds of Fourmillier' (on this see footnote 154 to the text), we have the following proportion: the common rhea stands to the lesser rhea as the 'extinct Guanaco' stands to the present-day guanaco. (The common rhea is *Rhea americana*, the lesser rhea the *Rhea darwinii* [*Pterocnemia pennata*]. [See note 149 to the text.] The extinct Guanaco is *Macrauchenia patachonica*, the animal identified by Richard Owen; the present-day guanaco is *Lama guanicoë*. [See note 152 to the text.]) The first ratio, between the rheas, was based on spatial succession, the geographical ranges of the two birds being contiguous. The second ratio, between the *Macrauchenia* and the guanaco, involved temporal succession, although the exact nature of the succession is not specified in the text. The common element binding the two ratios derives from the fact that both involved the replacement of one species by an allied species. Moreover, in context it is clear that replacement implied transmutation, for immediately upon asserting an analogy between spatial and temporal succession, Darwin referred to species changing. In doing so Darwin returned to a point we have noted earlier, namely his belief that allied species do not grade into each other. The *Macrauchenia* (or its cousin) must have 'inosculated' into the present-day guanaco, just as one rhea 'inosculated' into the other. For Darwin this ruled out the Lamarckian notion that one species gradually changed into another in response to 'degenerating circumstances' as might be caused, for example, by a gradual change in climate. However, even if Darwin did not embrace a Lamarckian mechanism for species change, he did share Lamarck's conclusion that present-day species were descended from earlier related forms.

A third topic taken up in the Red Notebook with general relevance for the species question was generation, or, in modern terms, reproduction. In the notebook Darwin dealt briefly with the particular issue of how he might regard individuation as occurring in the zoophytes, a now-abandoned grouping of plant-like animals whose most familiar representatives are the corals. (Red Notebook, p. 130) The technical nature of zoophyte generation was not Darwin's primary concern. He was chiefly concerned to see where zoophyte generation might fit in the general analogy he was drawing between the generation of species and the generation of individuals. The chief advantage of the analogy was that it gave Darwin an alternative to environmental explanations for the origin and extinction of species. Thus, on p. 129: "Should urge that extinct Llama owed its death not to change of circumstances; reversed argument. knowing it to be a desert.—Tempted to believe animals created for a definite time:— not extinguished by change of circumstances: . . . " Approached in this manner, "There is no more wonder in extinction of species than of individual.—" (p. 133) Although the claim is not made explicitly in this notebook, Darwin presumed that the complementary relationship might also hold, that the birth of new species might be understood by analogy to the birth of individuals.

Such are the major questions concerning species which Darwin addressed in the Red Notebook: geographical distribution, the relation between the spatial and temporal distribution of species, and generation. But can the passages in which these topics are discussed be dated to 'about' March 1837? Three kinds of evidence suggest they can. First there is the direct evidence from the notebook itself. As has already been mentioned, the second part of the notebook is post-voyage in date and references to the 'extinct Llama' and 'extinct Guanaco' on pages 129–130 derive from Richard Owen's work of January 1837. The important passages on species on pages 129–130, and very probably the whole run of remarks on species from pages 127–133, therefore date from January 1837 at the earliest. Equally important, other datable entries in the notebook are consistent with a March 1837 dating for pages 127–133. These entries include: (i) a reference on page 143e of the notebook to the 29 April 1837 issue of the weekly journal the *Athenæum*, and (ii) a reference on page 178 to the subject matter of conversations Darwin was having with the botanist Robert Brown in April and early May 1837.[10] (Since the entry on page 178 is the last datable one in the notebook, it also provides an approximate closing date for the notebook of May 1837.) The second source of support for a March 1837 dating of the main run of entries on species is the positive, although incomplete, correlation between the contents of these entries and Darwin's description of his original insight into the species question where he wrote that he "Had been greatly struck from about month of previous March on character of S. American fossils—& species on Galapagos Archipelago. These facts origin (especially latter) of all my views."[11] By the phrase 'character of S. American fossils' Darwin undoubtedly had in mind the similarity between past and present South American forms.[12] The relationship between the *Macrauchenia* and the guanaco which figures so largely in the Red Notebook was of this sort. Thus, on the point pertaining to South American fossils, the correspondence between the Red Notebook and Darwin's 'Journal' entries is exact. With respect to Galápagos species the correspondence is less revealing, for Galápagos species are not mentioned directly in the notebook. It may be that Darwin had in mind the Galápagos mockingbirds when he referred to the 'Calandria' or South American mockingbirds.[13] However, this is uncertain. On the evidence therefore, the correlation between the Red Notebook and Darwin's description of his insights of March 1837 is positive although incomplete.

The third line of evidence joining the Red Notebook to Darwin's insights of March 1837 derives from a comparison between the passages on species in the notebook with those in the opening pages of a notebook, labelled 'B', begun in July 1837.[14] In general, Notebook B carries forward discussions on species begun in the Red Notebook. Identical elements appear in Notebook B as in the Red Notebook but they are handled with greater assurance and, in certain cases, with the addition of new material. Compare, for example, the opening sentence on page 130 of the Red Notebook with the statement on pages 16–17 of Notebook B: "I look at two Ostriches as strong argument of possibility of such change; as we see them in space, so might they in time.—" Similarly, the notion of representative species reappears in Notebook B, although now in conjunction with the idea of isolation as a mechanism for species change. A series of entries on pages 7–10 of Notebook B reads as follows:

> Let a pair be introduced and increase slowly, from many enemies, so as often to intermarry—who will dare say what result.
>
> According to this view animals on separate islands, ought to become different if kept long enough apart, with slightly differ[ent] circumstances.—Now Galapagos tortoises, mocking birds, Falkland fox, Chiloe fox.—English and Irish Hare.—
>
> As we thus believe species vary, in changing climate we ought to find representative species; this we do in South America closely approaching.—But as they inosculate, we must suppose the change is effected at once, something like a variety produced—every grade in that case [it] seems is not produced?—
>
> * * *
>
> If species (1) may be derived from form (2) etc.,—then (remembering Lyell's arguments of transportal) island near continents might have some species same as nearest land, which were late arrivals, others old ones (of which none of same kind had in interval arrived) might have grown altered. Hence the type would be of the continent, though species all different.—

The greater sophistication of this treatment of the notion of representative species—its ennumeration of examples, discussion of the transportal of species, and indication of isolation as a mechanism for change—suggests that it postdates the passages on species in the Red Notebook. It is therefore reasonable to conclude that Darwin made his entries on the species question in the Red Notebook before he opened Notebook B—that is, some time before July 1837.[15]

Evidence for dating the important run of entries on pages 127–133 of the Red Notebook can now be summarized. As already mentioned, the dependence of some entries in that series on Richard Owen's work of January 1837 makes that the earliest possible date for the series taken as a whole, while the existence of Notebook B suggests July 1837 as the latest possible date for the entries. Thus, the entries must have been written during the six months from late January to early July 1837. At this point it becomes relevant to weigh the author's own word carefully, for in the absence of any evidence to the contrary it provides the best reason to assign these passages to one month rather than another in this period. Overall, in Darwin's characterization of this period, the month of March stands out, for it was then that he claimed to have come to his new view of species. Since the passages in question from the Red Notebook are clearly transmutationist, it is plausible to assign them that date. Contributing evidence from the notebook—the rough correspondence of the insights Darwin described having in March 1837 with the passages from the notebook, and the compatibility of two dates further on in the notebook (the reference on page 143e to the 29 April 1837 issue of the *Athenæum* and the reference on page 178 to activities of April and early May 1837) with a March dating for pages 127–133—supports this conclusion. The run of entries on the species question in the Red Notebook should therefore be assigned, however loosely, to March 1837. To this dating two qualifications must be stressed: that Darwin himself was tentative in dating the origin of his new views (to 'about' March) and that it is more than likely that various entries were written at scattered times. Yet, on balance, the evidence supports an approximate dating of March 1837 for the entries on pages 127–133 of the Red Notebook.

The obvious next question is: why March? Fortunately, if one takes the passages on species in the Red Notebook to coincide with the origin of Darwin's new views that question can be answered, for insofar as passages on transmutation in the notebook depend on new information unavailable to Darwin before March 1837, they depend on the identification of specimens from his collection by London zoologists.[16] These identifications were of two kinds: (i) identifications of specimens of unknown character and (ii) the marking off and naming of good species. The utility of expert opinion is obvious in the first case, as, for example, where Richard Owen's knowledge of comparative anatomy enabled him to identify fossil specimens where Darwin could not. The utility of expert opinion in the second case was less obvious, for the naming and marking off of species entailed considerable judgement on the part of the taxonomist. Yet while the process of species definition was in part arbitrary it was not anarchic. What ordered the process was the existence of recognized arbiters, or, in a word, specialists. The concept 'species' was in fact defined by such men as John Gould and Richard Owen as they went about their daily work. It was their office, not Darwin's, to name his specimens. Hence what one finds in the Red Notebook (despite its retention of common names for species) are traces of Darwin's reflections on his own initial observations in the field as these observations were ratified or extended by professional judgements on various specimens. One can see the effect of professional judgement in the insights he recalled as central to his new views. His first insight pertained to the temporal succession of similar species in the same locality. In Darwin's autobiography he cited the glyptodon-armadillo relationship to this end;[17] in the Red Notebook it is the *Macrauchenia*-llama replacement which figures.

Although the final word on the fossil mammals came from Richard Owen in both cases, Darwin's dependence on professional judgement is more obvious in the case of the *Macrauchenia*, for, unlike the glyptodon-armadillo relationship, Darwin had not formed any judgement of his own on the specimen before learning Owen's opinion.

Professional judgement was equally important to Darwin's second insight respecting "species on Galapagos archipelago".[18] In a key passage in his Ornithological Notes, written before specialists had examined his collection, Darwin recorded his suspicion that the various Galápagos mockingbirds were "only varieties" since they differed very slightly from one another and "filled the same place in Nature".[19] The phrase "only varieties" is significant in this context since naturalists traditionally used the term 'variety' to indicate groups which had been subject to some departure from type. When John Gould declared that the mockingbirds comprised three good species, Darwin could the more easily believe that the "stability of Species" had been undermined. Further, Darwin was then free to consider geographical isolation as a vehicle for species change. John Gould's recognition of a species-level distinction between the two rheas was a similar case; it invited the speculations on pages 127 and 130 of the Red Notebook. Without Gould's judgements Darwin could not have proceeded as he did, and, conversely, everything Darwin later did referred back in some way to these early professional opinions for support. Indeed in his formal presentation of his *Beagle* material Darwin took pains to emphasize that professional judgement must be relied on. Speaking of the Galápagos mockingbirds in particular he wrote:

> I may observe, that [if] some naturalists may be inclined to attribute these differences to local varieties...then the experience of all the best ornithologists must be given up, and whole genera must be blended into species.[20]

The significance of a March 1837 date for the origin of Darwin's new views on species thus derives from his reception at that time of the views of recognized zoologists with respect to key specimens from his collection. In itself this is logical enough since for Darwin to attempt an answer to the species question he had first to understand what his colleagues meant by a species in relation to his own collections.

We can now return to consider the notebook as a whole. As already mentioned, Darwin opened the notebook in May or June 1836. From internal evidence, namely the reference on page 143e to the 20 April 1837 issue of the *Athenæum* and the reference on page 178 to the subject matter of conversations Darwin was having with Robert Brown in April and May 1837, the inference can be drawn that the notebook was completed by May 1837 at the earliest. More cautiously one might wish to set the closing date at June 1837. In either case the Red Notebook was in use for something like a year. Clearly it was an important year, spanning the closing months of the voyage and the first eight or nine months back in England. It was also a year of transition, the change from one way of life to another being reflected in the pages of the notebook. Indeed, the notebook itself served partly as an instrument of adjustment to the return, for Darwin used the first part of it to plan for future publications. Scattered throughout the first part of the notebook are reminders to himself respecting his writing: 'note in Coral Paper' (page 30), 'Introduce part of the above in Patagonia paper; & part in grand discussion' (page 49), 'In Rio paper...' (page 65), 'In my Cleavage paper...' (page 101), and so on. The term 'paper' applies here to various units of Darwin's geological writings from the voyage. Darwin also used the term in that sense when he wrote to J. S. Henslow shortly after arriving home, "There is not another soul, whom I could ask, excepting yourself, to wade through & criticize [those *del*] some of those papers which I have left with you.—"[21] One paper mentioned in the Red Notebook and presumably shown to Henslow (as well as Charles Lyell) was the 'Coral Paper'. The original draft of this manuscript, written in 1835, formed the basis for Darwin's presentation on 31 May 1837 to the Geological Society of London, and, later, for the first part of the published geology from the *Beagle* voyage.[22] While the histories of the other papers referred to in the Red Notebook are not as straightforward, Darwin's intent for them was likely the same. In addition to short pieces on individual topics, Darwin also intended to write a large-scale work on the geology of South America. In 1846 Darwin realized his ambition for this 'grand discussion' of South American geology with the publication of the third part of the geology of the voyage of the *Beagle*.[23]

Entries in the Red Notebook were also directed to the furtherance of another publishing project: the *Journal of Researches*, Darwin's narrative of the 1831–1836 voyage of the H.M.S. *Beagle*.[24] While the 'Diary'[25] Darwin kept during the voyage furnished the basic narrative for his *Journal*, he included two additional kinds of material in the published work. They included references to the work of previous travellers and brief summaries of his own scientific researches. Frequently the Red Notebook was used in compiling citations of the first kind, as is evidenced by the transfer of citations from the Red Notebook to the *Journal of Researches*. Less often, but at several points most strikingly, the Red Notebook also served as an instrument for recording scientific speculations. These too passed to the *Journal* although, because of the organization of the work, rather unobtrusively.[26] In any case, it is clear on inspection that the Red Notebook served Darwin in writing the *Journal of Researches*.

The Red Notebook is thus transitional in that a number of its entries are directed towards future publications. It is also transitional in that it marks a change in the use to which Darwin put pocket-sized notebooks. While on the voyage Darwin used notebooks for recording field observations. As a result, notebook entries from the voyage are primarily observational and often not in sentence form. In contrast, most other work from the voyage, including reading notes and the finished version of daily observations, with their 'theories', 'conjectures' and 'hypotheses' (Darwin used all these terms) was written out in good sentence form on larger sized paper.[27] The Red Notebook represents a departure from this pattern, for its entries are mixed. There are still some field notes, but there are also reading notes (which are in fact sometimes notes on earlier reading notes—hence their telegraphic brevity), and, most importantly, also notes on 'theories', 'conjectures', and 'hypotheses'. After June 1837, when the Red Notebook was presumably filled, Darwin began new notebooks where the presence of theoretical inquiries became even more marked. Indeed, if one takes all of Darwin's notebooks from the *Beagle* and immediately post-*Beagle* periods together, one can see a shift from observation to theory in the notebooks, with the Red Notebook occupying a mid-way position. This change can be summarized as follows:

DESCRIPTIVE NOTEBOOKS FROM THE VOYAGE → RED NOTEBOOK → POST–VOYAGE THEORETICAL NOTEBOOKS

The change is, however, less dramatic than is suggested by this scheme, for all the notebooks show some degree of mixture in their entries; yet as an overall shift it is clear.[28] Accompanying this shift there was also a parallel change in Darwin's labelling of his notebooks. Field notebooks were labelled in a straightforward manner according to the names of the places visited. Post-*Beagle* theoretical notebooks were labelled alphabetically, presumably in deference to the abstract nature of their contents. Again the Red Notebook stood between these two groups. Its label, 'R.N.', provided no clue to its contents, and its name, the Red Notebook, merely described its physical appearance. In all likelihood the notebook went without a name until Darwin had reason to refer back to it after it was completed.[29] This would not seem to indicate any lack of regard on Darwin's part for the notebook, for indeed it was a pivotal notebook in several respects, but rather its unique standing among his notebooks.

Once the Red Notebook was filled, Darwin reorganized his method of taking notes. Where the Red Notebook contained entries on all subjects of interest, subsequent notebooks were more restricted in content. In place of the Red Notebook Darwin opened two new notebooks, one devoted to geology which he labelled 'A'.[30] At about the same time Darwin opened a second notebook, 'B', already mentioned, which he devoted to questions pertaining to the mutability of species. The generative relationship between the Red Notebook and Notebooks A and B is suggested by Figure 1.

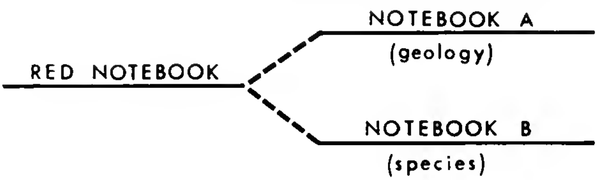


Figure 1

While it is beyond the scope of this introduction to describe Notebooks A and B in detail, they can be compared to the Red Notebook with respect to content. On the geological side Darwin considered a wide range of subjects in the Red Notebook. As might be expected from a notebook stimulated by field work, the largest number of geological entries in the Red Notebook pertained to specific formations and rock types. However, nearly as large in number were entries pertaining to the elevation and subsidence of the earth's crust—a subject in which Darwin was keenly interested—and what were for Darwin the attendant issues of the form of the earth—that is its shape and interior structure—and such patterns of disturbance in the earth's crust as were indicated by the occurrence of earthquakes and the presence of volcanoes and mountain chains. In addition to these major themes Darwin also made notes on other geological topics in the Red Notebook, among them the distribution of metallic veins, the preservation of fossils, erratic blocks, and life at the bottom of the sea. Equally noteworthy as the range of geological subjects considered in the Red Notebook is the enthusiasm with which they are treated, particularly those of a theoretical nature. indeed, Darwin's ambition as a theoretical geologist surfaced at several points in the notebooks; see, for example, the passage on pages 72–73 (see p. 51) beginning with the phrase, "Geology of whole world will turn out simple.—" Such passages must, of course, be read in context, and in this instance the context was provided by the Lyellian reconstruction of geology then in progress.[31]

Reflecting Darwin's enthusiasm for large theoretical issues, Notebook A follows the lead of the Red Notebook with regard to geology. For example, there is in the two notebooks a continuing interest in vertical movements of the earth's crust and an overlapping range of topics generally. Yet there are some differences between the two notebooks. Notebook A has fewer field notes than does the Red Notebook, and indeed the major piece of geological field research Darwin did in the 1837–1839 period he recorded in another notebook.[32] Also, Notebook A draws on contemporary journal literature far more than does the Red Notebook, for the obvious reason that Darwin had access to such literature only after his return to England. Another difference between the two notebooks is their relative value as documents for interpreting Darwin's geological views for the period when each was kept. In this respect the Red Notebook is the more revealing document. Yet the lesser import of Notebook A is not due to a declining interest in geology on Darwin's part during the 1837–1839 period. Indeed, in this time Darwin published seven papers on geological topics.[33] Two of these papers, that on the formation of mould and that on the 'parallel roads' of Glen Roy in Scotland, involved new field research. Further, during this same period Darwin continued working on his 'grand discussion' of South American geology, and on his studies of coral reefs and volcanic islands.[34] However, in quantity and substance Notebook A represents only a small portion, a sampler, of Darwin's geological work during the period, and for that reason it is less essential to interpreting Darwin's early geological views than is the Red Notebook.

In contrast, Notebook B and its successors represent the bulk of Darwin's theoretical work on the species question during the period when they were kept and are therefore essential in understanding his intellectual development. As is well known, Darwin did not publish his new views on species immediately upon their inception, being well aware of the generally critical attitude of his scientific colleagues towards theories asserting the mutability of species.[35] However, from the spring of 1837 on, Darwin himself was convinced of the merits of the transmutationist case and chose to pursue the subject in private without the explicit knowledge or direct support of his colleagues. In Notebook B, begun in July 1837, Darwin continued the inquiries on species begun in the Red Notebook. Once filled, Notebook B gave way to Notebooks C, D, and E, and to at least one other notebook known only from fragments.[36] By the close of Notebook C, however, Darwin's search for an explanation for adaptation had focused on the subject of behaviour, and he opened a new set of notebooks, labelled M and N, devoted in large part to the study of behaviour.[37] Like his predecessor and fellow transmutationist Jean Baptiste Lamarck, Darwin suspected that adaptive change at least in some instances might occur first in the behaviour of the organism, and Notebook M was opened with this hypothesis in mind. For the period July 1838–July 1839, Darwin was thus pursuing three related but distinguishable lines of inquiry.[38] Expressed schematically, his theoretical notebooks, which represent these lines of inquiry, developed from each other during the period from 1836–1839 as indicated in Figure 2.

It is of course possible, even probable, that other notebooks from the post-*Beagle* period await discovery and reconstruction, and that new dimensions to Darwin's work will emerge from a study of these manuscripts. Certainly within the last twenty years scholars have identified a large body of evidence which considerably illuminates the course of Darwin's labours.[39] The Red Notebook now forms part of that evidence. It stands at the beginning of that chain of events which led from Darwin's assertion of a belief in the mutability of species through his arrival at the notion of natural selection and then, after twenty years and by way of several drafts, to the publication in 1859 of the *Origin of Species*.[40] For that alone the Red Notebook is important. Moreover, apart from its place in the sequence of developments which led to the *Origin*, the Red Notebook has intrinsic merit. For example, the combination of geological, zoological, and botanical entries in the notebook is in itself important as reflecting the broad knowledge of nineteenth-century naturalists. The notebook also records much about the daily circumstances under which Darwin worked. His access to a large body of scientific and travel literature is apparent from the notebook and contradicts a common impression that he worked from only a handful of books while aboard ship. Further, the brilliance of the company Darwin kept on his return to England suggests his position, even early in his career, within one of the most influential circles of English science. Yet, and here the common view is confirmed rather than denied, Darwin's frequent mention of the names of Alexander von Humboldt and Charles Lyell substantiates his repeated references in later life to their influence on his early career. In sum the Red Notebook provides the means not only for documenting Darwin's early belief in transmutation and gauging the extent of his geological ambitions, but also for illustrating his passage from H.M.S. *Beagle* to the world of professional science.

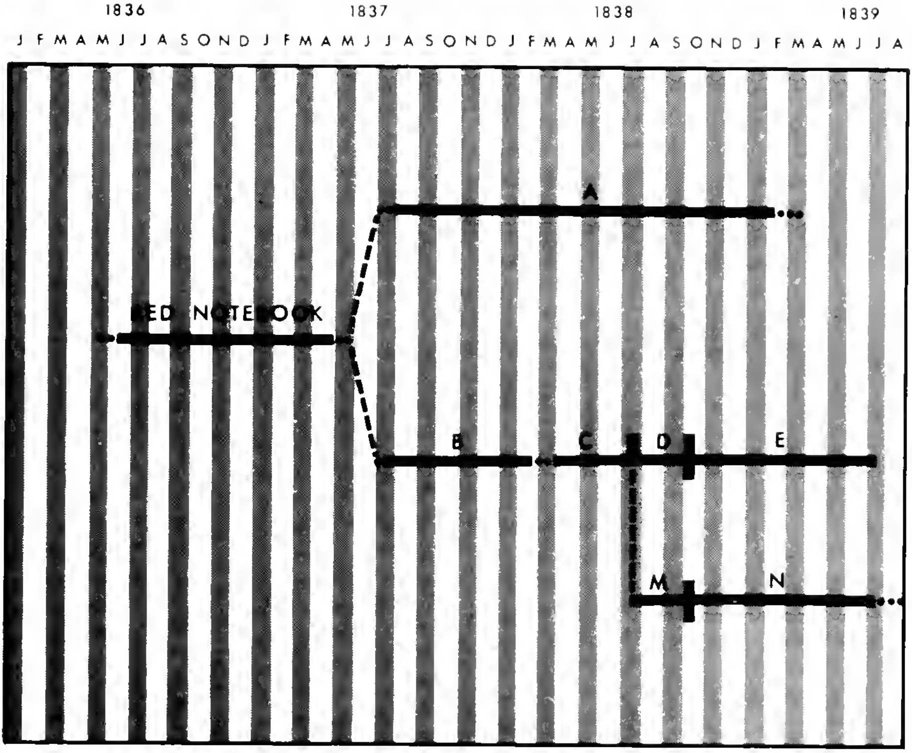


FIGURE 2. Eight Darwin notebooks kept during 1836–1839. Solid lines represent the notebooks, dotted lines uncertainties in dating, and broken lines divisions of subject matter among members of the set.

Editorial Considerations

In this edition I have intended to offer a literal transcription of the text while keeping editorial intrusions to a minimum.[41] I omitted or altered only certain obvious features of the manuscript. First, I have ignored the single-line vertical scoring which runs through most of the entries; Darwin scored his notes in this fashion when he had no further use for them. Second, I have signalled all announced changes in subject by paragraphing. In the notebook such changes are characteristically marked by a horizontal line between entries or, less frequently, by the start of a new page, rather than by paragraphing; third, except for insertions and interlineations, I have not indicated anything concerning placement of entries on the page; fourth, I have recorded the medium in which entries were written only in certain instances. In particular, up to page 113, where the original text is in pencil, I have noted those entries which are written in ink. After page 113, where the text contains both penned and pencilled entries, I have noted only those entries written in a distinctive light brown ink, which, like the penned entries in the first part of the notebook, were clearly added some time after the main text was complete. Fifth, and finally, only Darwin's text has been reproduced. The notations in other handwriting which appear in the notebook, namely the catalogue number of the notebook and some faint remains of what may have originally been a price mark, are not included in the transcription.

I have retained the other complexities of the text. Cancellations are kept where they are legible and are indicated by being enclosed in angled brackets. Those few cancellations which are omitted as illegible are mainly single letters whose identity is obscured by the cancellation mark. Darwin's alterations to the text, which include careted remarks, interlineations, and later additions, are enclosed in slanted brackets. I have not assigned dates to these alterations. Some were roughly contemporary with the original text; others, such as those in light brown ink, were made considerably later. Without surveying all of Darwin's writings from the post-*Beagle* period, it would be speculative to assign even approximate dates to all of the additions.

In spelling I have reproduced Darwin's words exactly as written where the individual letters are clearly formed. Where individual letters are indistinct, as is often the case, I have offered the probable reading of the word without comment. 'Rememb[?]g' on page 72 thus appears simply as 'remembering'. Where the reading is conjectural I have placed it within square brackets and indicated my uncertainty by a question mark. In orthography I have preserved all of Darwin's forms, except for the long 's', which I have modernized silently. In capitalization I have reproduced Darwin's usage where it is clear. Where it is unclear I have followed modern conventions. Representation of punctuation is a more serious problem, partly because nineteenth-century practice differed considerably from our own. As R. C. Stauffer has pointed out, Darwin followed a system similar to that suggested in Lindley Murray's *English Grammar*.[42] In that system commas, semicolons, colons, and periods indicate increasingly longer pauses more than they distinguish different constructions. Thus, Darwin might use a colon where a semicolon would now be employed. I have not altered his practice in this regard, which the reader should bear in mind. The representation of punctuation is also problematical since punctuation marks are by nature small and easily confused with stray marks on the page, or with pen rests. Rather than probe Darwin's intentions in this regard, I have reproduced all traditional marks of punctuation which appear within the text. Equally, I have not added punctuation where there is none. It is left to the reader, understanding the nature of the document, to tolerate inconsistencies in punctuation.

As for references I have provided footnotes on all persons named in the text. Further information on the majority of these persons can be obtained from standard biographical dictionaries. Particularly useful in this regard are the *Dictionary of National Biography* (65 vols. plus supplements; London, 1885–1900, 1901–) and the *Dictionary of Scientific Biography* (15 vols.; New York, 1970–1978). Other points I have footnoted as it seemed appropriate. I have identified or provided co-ordinates to place names only where they were not to be found in standard atlases or in Darwin's publications stemming from the voyage. In some notes I have offered cross-references to various early works of Darwin, but I have not attempted to supply a concordance between the Red Notebook and Darwin's published writings. In citing Darwin's publications I have relied primarily on R. B. Freeman, *The Works of Charles Darwin: An Annotated Bibliographical Handlist* (2nd ed.; London, 1977). Generally, in citing books in the notes, I have shortened titles; full titles are given in the bibliography. Journal titles are cited in full in both places. In the notes, unless otherwise stated, I have cited the edition of a work Darwin used if one could be determined from his citation. In many cases I was able to cite from Darwin's own copy of the work. Darwin's personal library is presently divided between Down House and the Cambridge University Library. The general catalogue of his library is H. W. Rutherford, *Catalogue of the Library of Charles Darwin now in the Botany School, Cambridge* (Cambridge, 1908). Those books presently at Cambridge University Library are described in a mimeographed pamphlet distributed by the Library entitled *Darwin Library: List of books received in the University Library Cambridge, March–May 1961.* Darwin's collection of scientific reprints is also presently housed at Cambridge University Library.

Acknowledgements

I would like to thank the present owners of Down House, the Royal College of Surgeons of England, and particularly the Secretary of the College, R. S. Johnson-Gilbert, for permission to publish the Red Notebook; the Syndics of Cambridge University Library for permission to publish excised pages from the notebook; and the Darwin family, as represented by George Pember Darwin, for their consent to the publication of the Notebook. I would also like to thank Jessie Dobson, former Curator of the Hunterian Museum, for arranging with the Royal College of Surgeons for permission to publish the Notebook.

At Down House, I am particularly indebted to the Honorary Curator of the Darwin Museum, Sir Hedley Atkins, Philip Titheradge, Custodian, and Sydney Robinson, the former Custodian. Their hospitality made working at Down House a great pleasure. For sustained assistance throughout the course of this editing project, I am also deeply indebted to Sydney Smith, Fellow of St Catharine's College, Cambridge, for sharing his rich knowledge of Darwin's writings; to Peter Gautrey, Assistant Under-librarian at Cambridge University Library, for deciphering difficult passages in the notebook and for checking my transcription of the entire notebook against the original manuscript; and to M. J. Rowlands, Librarian of the British Museum (Natural History), for encouraging and aiding the project at every point. I also wish to thank fellow Darwin scholars Frederick Burkhardt, M. J. S. Hodge, David Kohn, David Stanbury, and Frank Sulloway for specific points of information relating to the text; David Snow of the British Museum (Natural History) for supplying current scientific names for a number of Darwin's ornithological specimens; and Robert Cross, Head of Publications of the British Museum (Natural History) and Anthony P. Harvey of the British Museum (Natural History) for their aid in bringing this project to fruition. Of librarians, beyond those already mentioned, I am most indebted to the reference staff at the Library of Congress, particularly James Flatness, James Gilreath, Ann Hallstein, David Kresh, and Melissa Trevvett. I also wish to thank John Schroeder of the U.S. Geological Survey Library, Edeltraud R. Nutt, Librarian of the Geological Society of London, and M. I. Williams, Keeper of Printed Books, National Library of Wales. Photographs of the rheas which accompany this edition are from the San Diego Zoo, courtesy of Arthur Risser, those of the reconstructed *Macrauchenia patachonica* from the American Museum of Natural History, courtesy of Richard H. Tedford. Other photographs in this volume are from Cambridge University Library and the British Museum (Natural History). The diagrams in the introduction and the copies of Darwin's drawings were done by the Cartographic Service of the University of Maryland, Baltimore County. For financial support of this project, I am indebted to the National Science Foundation and the University of Maryland, Baltimore County. For encouragement and intellectual exchange, I am indebted at many levels to fellow scholars, friends, and family, of the last most particularly my parents, Emrick C. and Dorothy L. Swanson, and my husband James C. Herbert.

Notes

[1] In 1942 the Darwin family, represented by Sir Alan Barlow, husband of Nora Barlow, a grand-daughter of Charles Darwin and herself an editor of Darwin manuscripts, determined that the large collection of papers belonging to Charles Darwin in their possession would be made available to scholars. The family also determined to divide the collection, depositing the bulk of it at Cambridge University Library but reserving Charles's 'Diary' from the voyage, his *Beagle* notebooks, and some other items, particularly those relating to Down House, for the Darwin Museum.

In accordance with this arrangement twenty-four notebooks from the *Beagle* voyage are now located at Down House. These include six soft-cover notebooks, bound in two sets of three, which list specimens collected during the voyage, and eighteen hard-cover notebooks, these last having been numbered by an unknown cataloguer. Of the numbered notebooks, notebook '1' is entirely excised and bears a

London address, notebooks '2' (the Red Notebook) and '5' ('St Helena Model') are partly of post-voyage date, and the others are field notebooks from the voyage. None of the twenty-four notebooks at Down House has previously been published in its entirety, but selections from all of them are contained in Nora Barlow, ed., *Charles Darwin and the Voyage of the Beagle* (London, 1945). For information relating to the deposit of the notebooks at Down House see Darwin MSS, Cambridge University Library, vol. 156. On the founding and operation of the Darwin Museum see Sir Hedley Atkins, *Down: The Home of the Darwins* (London, 1974), chapters 8 and 9.

[2] Darwin MSS, Cambridge University Library. Divisions in this collection correspond to those in Darwin's own files. Excised pages from the Red Notebook were found in vol. 5, which contains an assortment of notes from Darwin's early life, and in vols. 40 and 42, which contain notes under several geological topics, including 'Earthquakes', 'Cleavage' and the like. A few portions of pages from the Red Notebook found at the University Library have not been included in this edition because I judged them too fragmentary to be of interest. As a rule Darwin cut out pages, or sections of pages, from his notebooks for use in future writing, placing them for reference under the appropriate heading in his files. For more information on the holdings of Darwin papers at Cambridge see the *Handlist of Darwin Papers at the University Library Cambridge* (Cambridge, 1960).

[3] Darwin and Richard Owen first met at the house of Charles Lyell on 29 October 1836. See Leonard G. Wilson, *Charles Lyell: The Years to 1841* (New Haven and London, 1972), p. 434. See also Darwin's letter to J. S. Henslow of 30 October 1836 in Nora Barlow, ed., *Darwin and Henslow: The Growth of an Idea* (Berkeley and Los Angeles, 1967), pp. 118–119.

[4] The earliest known reference to Richard Owen's identifications of Darwin's South American fossil mammals occurs in a letter from Owen to Charles Lyell dated 23 January 1837. The letter is reproduced in full in Leonard G. Wilson, *Charles Lyell: The Years to 1841* (New Haven and London, 1972), pp. 436–437. For Lyell's use of this information see Charles Lyell, 'Presidential Address to the Geological Society of London [17 February 1837]', *Proceedings of the Geological Society of London*, vol. 2 (1838), pp. 510–511. In reporting Owen's identifications Lyell summarized the results for science of the new specimens (p. 511): "These fossils...establish the fact that the peculiar type of organization which is now characteristic of the South American mammalia has been developed on that continent for a long period, sufficient at least to allow of the extinction of many large species of quadrupeds. The family of the armadillos is now exclusively confined to South America and here we have from the same country the Megatherium, and two other gigantic representatives of the same family. So in the Camelidæ, South America is the sole province where the genus Auchenia or Llama occurs in a living state, and now a much larger extinct species of Llama is discovered. Lastly, among the rodents, the largest in stature now living is the

Capybara, which frequents the rivers and swamps of South America and is of the size of a hog. Mr. Darwin now brings home from the same continent the bones of a fossil rodent not inferior in dimensions to the rhinoceros. These facts elucidate a general law previously deduced from the relations ascertained to exist between the recent and extinct quadrupeds of Australia; for you are aware that to the westward of Sydney on the Macquarie River, the bones of a large fossil kangaroo and other lost marsupial species have been met with in the ossiferous breccias of caves and fissures."

[5] The notes I refer to are contained in volumes 30 and 31 of the Darwin manuscript collection at Cambridge University Library.

[6] Darwin's earliest recollection of the origin of his new views occurs in a journal entry for the year 1837 and reads as follows: "In July opened first note book on 'transmutation of Species'—Had been greatly struck from about month of previous March on character of S. American fossils—& species on Galapagos Archipelago. These facts origin (especially latter) of all my views." This entry appears in a notebook begun in August 1838. A fair copy of the notebook was published as Sir Gavin de Beer, ed., 'Darwin's Journal', *Bulletin of the British Museum (Natural History)* Historical Series, vol. 2 (1959) where the quoted entry appears on page 7. The entry as quoted here is taken from the original notebook which has come to light since 1959.

[7] Darwin's full account of his conversion to transmutationist views as it appears in his autobiography written some forty years after the events reads as follows: "During the voyage of the *Beagle* I had been deeply impressed by discovering in the Pampean formation great fossil animals covered with armour like that on the existing armadillos; secondly, by the manner in which closely allied animals replace one another in proceeding southwards over the Continent; and thirdly, by the South American character of most of the productions of the Galapagos archipelago, and more especially by the manner in which they differ slightly on each island of the group; none of these islands appearing to be very ancient in a geological sense. It was evident that such facts as these, as well as many others, could be explained on the supposition that species gradually become modified; and the subject haunted me." The passage is taken from Nora Barlow, ed., *The Autobiography of Charles Darwin* (London, 1958), pp. 118–119.

[8] I refer here to Jean Baptiste de Lamarck (1744–1829) whose views Darwin encountered most forcefully although critically expressed in the second volume of Charles Lyell's *Principles of Geology* (1832).

[9] The most striking instance in Darwin's collection where professional judgement recognized small differences as indicating good species was the Galápagos mockingbirds. See note 159 to the text and subsequent discussion in this introduction.

[10] See notes 174 and 234 to the text of the Red Notebook.

[11] See note 6 to this introduction.

[12] In his later account Darwin recalled being particularly impressed by the similarity between "great fossil animals covered with armour" [glyptodonts] and living armadillos. See Nora Barlow, ed., *The Autobiography of Charles Darwin* (London, 1958), p. 118. Richard Owen confirmed Darwin's interpretation of the affinity of the 'glyptodont' and the armadillo in January 1837. See Leonard Wilson, *Charles Lyell: The Years to 1841* (New Haven and London, 1972), p. 437.

[13] Red Notebook, p. 130 and note 159. It should be stressed that the relationship of the South American and Galápagos mockingbirds is exactly that which Darwin described in his autobiography: "During the voyage of the *Beagle* I had been deeply impressed...by the South American character of most of the productions of the Galapagos archipelago, and more especially by the manner in which they differ slightly on each island of the group; none of these islands appearing to be very ancient in a geological sense." Nora Barlow, ed., *The Autobiography of Charles Darwin* (London, 1958), p. 118.

[14] Sir Gavin de Beer, ed., 'Darwin's Journal', *Bulletin of the British Museum (Natural History)* Historical Series, vol. 2 (1959), p. 7, refers to the opening of the first notebook on 'transmutation of Species' in July 1837. This is Notebook B. Darwin filled this notebook sometime in February or March 1838. The exact date is in doubt. Darwin referred in his heading to the notebook (probably added in 1844 when he was arranging his papers) that he completed the notebook at the beginning of February. In fact the notebook must have been completed somewhat later, for p. 235 refers to the issue of the *Athenæum* of 24 February 1838. Since the notebook ran to another 29 pages of text after p. 235, it was probably completed no earlier than the end of the month. Notebook B is numbered as vol. 121 in the Darwin MSS, Cambridge University Library, and is published as: Sir Gavin de Beer, ed., 'Darwin's Notebooks on Transmutation of Species. Part I', First Notebook (July 1837–February 1838), *Bulletin of the British Museum (Natural History)* Historical Series, vol. 2 (1960), pp. 23–73. A number of the excised pages to Notebook B, and to its successors, Notebooks C, D, and E, were later published as: Sir Gavin de Beer and M. J. Rowlands, 'Darwin's Notebooks on Transmutation of Species. Addenda and Corrigenda', *Bulletin of the British Museum (Natural History)* Historical Series, vol. 2 (1961), pp.185–200, and Sir Gavin de Beer, M. J. Rowlands, and B. M. Skramovsky, 'Darwin's Notebooks on Transmutation of Species, Part VI, Pages Excised by Darwin', *Bulletin of the British Museum (Natural History)* Historical Series, vol. 3 (1967), pp. 129–176.

[15] There is, incidentally, another passage in Notebook B which supports the more general conclusion that Notebook B was the successor to the Red Notebook. On page 153e of Notebook B Darwin referred to the Red Notebook as follows: "See R.N. p. 130 speculations range of allied species. p. 127 p. 132. There is no more wonder in extinction of individuals than of species." Clearly the Red Notebook, at least to page 130, was already in existence by the time Darwin made this entry in Notebook B.

[16] The dates when important specimens referred to in the Red Notebook were identified by professional zoologists are as follows: the *Macrauchenia* was referred to descriptively, although not by that name, in a letter written to Richard Owen dated 23 January 1837; the Galápagos mockingbirds were described at a meeting of the Zoological Society of London on 28 February 1837; and the new species of South American rhea was described at a meeting of the Zoological Society of London on 14 March 1837. See also notes 152, 159, and 149 to the text.

[17] Nora Barlow, ed., *The Autobiography of Charles Darwin* (London, 1958), p. 118. The similarity of the polygonal plates of the glyptodon specimen to those of the armadillo was noticed by Darwin "immediately I saw them." (Darwin to J. S. Henslow, 24 November 1832, in Nora Barlow, ed., *Darwin and Henslow: The Growth of An Idea* [Berkeley and Los Angeles, 1967], p. 61.) Darwin was not the first to note the similarity of the large plates to the smaller ones of the armadillo. On this point see Thomas Falkner, *A Description of Patagonia* (London, 1774), p. 55.

[18] Sir Gavin de Beer, ed., 'Darwin's Journal', *Bulletin of the British Museum* (*Natural History*) Historical Series, vol. 2 (1959), p. 7.

[19] Nora Barlow, ed., 'Darwin's Ornithological Notes', *Bulletin of the British Museum* (*Natural History*) Historical Series, vol. 2 (1963), p. 262. The full paragraph reads as follows: "I have specimens from four of the larger islands; the two above enumerated, and (3349: female. Albermarle Isd.) & (3350: male: James Isd).—The specimens from Chatham & Albermarle Isd appear to be the same; but the other two are different. In each Isld. each kind is *exclusively* found: habits of all are indistinguishable. When I recollect, the fact that the form of the body, shape of scales & general size, the Spaniards can at once pronounce, from which Island any Tortoise may have been brought. When I see these Islands in sight of each other, & [but *del.*] possessed of but a scanty stock of animals, tenanted by these birds, but slightly differing in structure & filling the same place in Nature, I must suspect they are only varieties. The only fact of a similar kind of which I am aware, is the constant asserted difference — between the wolf-like Fox of East & West Falkland Islds. — If there is the slightest foundation for these remarks the zoology of Archipelagoes—will be well worth examining; for such facts [would *inserted*] undermine the stability of Species." For more extended discussion of this passage see Sandra Herbert, 'The Place of Man in the Development of Darwin's Theory of Transmutation, Part I. To July 1837', *Journal of the History of Biology*, vol. 7 (1974), pp. 236–240.

[20] From Darwin's commentary on specimens in John Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds*. 5 numbers. (London, 1838–1841), pp. 63–64.

[21] Darwin to J. S. Henslow, 30 October 1836, in Nora Barlow, ed., *Darwin and Henslow: The Growth of An Idea* (Berkeley and Los Angeles, 1967), p. 122.

[22] The original draft and a fair copy of the paper are contained in vol. 41 of the Darwin manuscript collection at Cambridge University Library. A transcription of the original draft is available in print as 'Coral Islands by Charles Darwin', Introduction, Map and Remarks by D. R. Stoddart, *Atoll Research Bulletin*, No. 88 (1962). Darwin's theory of coral island formation first appeared in print as Charles Darwin, 'On Certain Areas of Elevation and Subsidence in the Pacific and Indian Oceans, As Deduced from the Study of Coral Formations', *Proceedings of the Geological Society of London*, vol. 2 (1838), pp. 552–554. A fuller version of the theory appeared later as Charles Darwin, *The Structure and Distribution of Coral Reefs. Being the First Part of Geology of the Voyage of the Beagle, under the Command of Capt. Fitzroy, R.N. during the Years 1832–1836* (London, 1842).

[23] Charles Darwin, *Geological Observations on South America. Being the Third Part of the Geology of the Voyage of the Beagle, under the Command of Capt. Fitzroy, R.N. during the Years 1832–1836* (London, 1846).

[24] Charles Darwin, *Journal of Researches into the Geology and Natural History of the Various Countries Visited by H.M.S. Beagle* (London, 1839). Also published as volume 3 of Robert Fitzroy, ed., *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle...1832–1836* (London, 1839).

[25] See Nora Barlow, ed., *Charles Darwin's Diary of the Voyage of H.M.S. Beagle* (Cambridge, 1933).

[26] Compare, for example, the Red Notebook (page 132) and the *Journal of Researches* (page 262) on 'associated life' or the Red Notebook (pages 129–130, 132–133) and the *Journal of Researches* (pages 208–212) on the successions of fossil and living forms and the causes of extinction of species. The references to the *Journal* are from Charles Darwin, *Journal of Researches into the Geology and Natural History of the Various Countries Visited by H.M.S. Beagle* (London, 1839). It is worth remarking that the presence of theoretical passages in the *Journal of Researches* is disguised by the organization of the work, which is chronological rather than logical, and by the lack of an adequate index.

[27] The primary series of formal notes from the voyage are contained in vols. 30–31 (zoology) and vols. 32–38 (geology) of the Darwin MSS at Cambridge University Library.

[28] There is one notable exception to this schema: the field notebook Darwin carried with him when he investigated the 'parallel roads' of Glen Roy in Scotland in June and early July 1838. It is almost entirely observational in character. The notebook is numbered as vol. 130 in the Darwin MSS at Cambridge University Library.

[29] In other writing Darwin usually referred to the notebook as 'R.N.' or even the 'R.N. notebook' rather than as the 'Red Notebook'. I am grateful to M. J. S. Hodge

of the University of Leeds for locating and informing me of an instance where Darwin used the full name of the notebook. It occurs on the verso of a scrap of paper in vol. 29 (iii) of the Darwin MSS at Cambridge University Library. I have since come upon other instances in Darwin's notes where he used the full name of the notebook, but they are rare.

[30] Notebook A was kept from about July 1837 to the late spring of 1839. Both dates are conjecture on my part. The first datable reference of relevance in the notebook occurs on p. 15e and is to the August 1837 issue of *L'Institut*. (Since Notebook A was filled fairly evenly and slowly, overall at the rate of fewer than ten pages a month, the August date on p. 15e would not preclude an earlier opening date than July for the notebook.) With respect to the closing date, nothing is certain, but Darwin was already abstracting from the notebook as early as 24 February 1839. In a sense the notebook had served its purpose by that date. Notebook A, which I am presently editing for publication, is numbered as vol. 127 in the Darwin MSS at Cambridge University Library.

[31] While no complete account of Darwin's geological work exists, the subject of Lyell's influence on Darwin during the post-voyage period is treated in Leonard G. Wilson, *Charles Lyell: The Years to 1841* (New Haven and London, 1972), chapter 7. For a brief account of Lyell's influence on Darwin with respect to one particular problem see: Martin Rudwick, 'Darwin and Glen Roy: A "Great Failure" in Scientific Method?', *Studies in the History and Philosophy of Science*, vol. 5 (1974), pp. 165–167.

[32] Darwin's major piece of field research in the 1837–1839 period was his investigation of the so-called 'parallel roads' of Glen Roy. He recorded his observations from this research in the notebook described in note 28 above.

[33] Darwin published the following papers on geological topics during the years 1837–1839: 'Observations of Proofs of Recent Elevation on the Coast of Chili, Made during the Survey of His Majesty's Ship Beagle, Commanded by Capt. Fitzroy, R.N.', [Read 4 January 1837] *Proceedings of the Geological Society of London*, vol. 2 (1838), pp. 446–449; 'A Sketch of the Deposits Containing Extinct Mammalia in the Neighbourhood of the Plata', [Read 3 May 1837] *Proceedings of the Geological Society of London*, vol. 2 (1838), pp. 542–544; 'On Certain Areas of Elevation and Subsidence in the Pacific and Indian Oceans, as Deduced from the Study of Coral Formations', [Read 31 May 1837] *Proceedings of the Geological Society of London*, vol. 2 (1838), pp. 552–554; 'On the Formation of Mould', [Read 1 November 1837] *Transactions of the Geological Society of London*, 2nd ser., vol. 5, pt. 3 (1840), pp. 505–509; 'On the Connexion of Certain Volcanic Phenomena in South America; and on the Formation of Mountain Chains and Volcanos, as the Effect of the Same Power by which Continents Are Elevated', [Read 7 March 1838] *Transactions of the Geological Society of London*, 2nd ser., vol. 5, pt. 3 (1840), pp. 601–631; 'Observations on the Parallel

Roads of Glen Roy, and of Other Parts of Lochaber in Scotland, with an Attempt to Prove that They Are of Marine Origin', [Read 7 February 1839] *Philosophical Transactions of the Royal Society of London*, vol. 129 (1839), pp. 39–81; and 'Note on a Rock Seen on an Iceberg in 61° South Latitude', *Journal of the Royal Geographical Society of London*, vol. 9 (1839), pp. 528–529. These citations are from Paul H. Barrett, ed., *The Collected Papers of Charles Darwin* (Chicago and London, 1977), vol. 1, pp. v–vi and 41–139.

[34] The three parts of Darwin's geological results from the *Beagle* voyage as published in book form were as follows: *The Structure and Distribution of Coral Reefs* (London, 1842); *Geological Observations on the Volcanic Islands Visited during the Voyage of H.M.S. Beagle* (London, 1844); and *Geological Observations on South America* (London, 1846). Although published over five years, Darwin regarded the three parts as forming a single work.

[35] Darwin's first public announcement of his theory of evolution through natural selection was at a meeting of the Linnean Society held on 1 July 1858. For an assessment of the meeting see J. W. T. Moody, 'The reading of the Darwin and Wallace papers: an historical "non-event"', *Journal of the Society for the Bibliography of Natural History*, vol. 5 (1971), p. 474–476. The resultant publication with Alfred Russel Wallace appeared under a general title as: 'On the Tendency of Species to Form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection', *Journal of the Proceedings of the Linnean Society of London, Zoology*, vol. 3 (1858), pp. 45–62. The next year saw the publication of Darwin's *On the Origin of Species by Means of Natural Selection* (London, 1859). On the relation of Darwin's theoretical work to his pattern of publication see Sandra Herbert, 'The Place of Man in the Development of Darwin's Theory of Transmutation, Part II', *Journal of the History of Biology*, vol. 10 (1977), pp. 157–196.

[36] Notebook B was begun in July 1837 and completed in February or March 1838. Notebook C was begun about March 1838. When completed, it was replaced by Notebook D, opened on 15 July 1838. When filled, Notebook D was in turn replaced by Notebook E, begun about 2 October 1838 and ended on 10 July 1839. Notebooks B to E comprise vols. 121–124 of the Darwin MSS at Cambridge University Library. They have appeared in print as Sir Gavin de Beer, ed., 'Darwin's Notebooks on Transmutation of Species. Parts I–IV', Sir Gavin de Beer and M. J. Rowlands, eds., 'Darwin's Notebooks on Transmutation of Species. Addenda and Corrigenda', and Sir Gavin de Beer, M. J. Rowlands, and B. M. Skramovsky, eds., 'Darwin's Notebooks on Transmutation of Species. Part VI. Pages Excised by Darwin', *Bulletin of the British Museum (Natural History)* Historical Series, vol. 2 (1960–1961), pp. 23–200; vol. 3 (1967), pp. 129–176. The unexcised portions of Notebooks B, C, D, and E correspond to Parts I–IV in this series. In addition to Notebooks B–E, twenty-two pages of another notebook on transmutation have been located among the Darwin

manuscripts at Cambridge University Library. This 'Torn-up Notebook' was first assembled by Sydney Smith and announced in his Sandars Lectures of 1966–1967. The notebook was opened in about July 1839 and, on the evidence of a dated page, was kept through June 1841. A plausible closing date for the notebook might be autumn 1841. This notebook is presently being edited for publication by Sydney Smith and David Kohn. From the collections at the Cambridge University Library, David Kohn has also located another notebook from the early period of Darwin's work on species. The six extant pages of this notebook date from the summer of 1842 and pertain to the subject of the cross-fertilization of flowers.

[37] Notebook M was opened on 15 July 1838. When filled it was replaced by Notebook N, opened on 2 October 1838. Entries in Notebook N declined by mid-summer 1839, though occasional entries were made as late as 1840. Notebooks M and N comprise vols. 125 and 126 of the Darwin MSS at Cambridge University Library. They were edited by Paul H. Barrett and appear in Howard E. Gruber and Paul H. Barrett, *Darwin on Man: A Psychological Study of Scientific Creativity* (New York, 1974).

[38] In September 1838 Darwin was in fact pursuing four separable lines of inquiry as indicated by his method of note-taking. The fourth line of inquiry was 'generation' meaning, loosely, reproduction. Generation was an important topic throughout Notebooks B–E but one given especial prominence in Notebook D by virtue of the fact that the end portion of the notebook (pages 152–180) was set aside for it alone. Darwin opened this section of the notebook on 11 September 1838; presumably it was filled by 2 October 1838 as the heading of the notebook indicates.

[39] For a review of work since 1959 see John C. Greene, 'Reflections on the Progress of Darwin Studies', *Journal of the History of Biology*, vol. 8 (1975), pp. 243–273.

[40] The Red Notebook contains the earliest known evidence of Darwin's belief in the mutability of species. From his own later accounts Darwin's arrival at the notion of natural selection was precipitated by reading Thomas Robert Malthus' *An Essay on the Principles of Population*. Darwin recorded his reading of Malthus in an entry in Notebook D dated 28 September 1838; see Sir Gavin de Beer, M. J. Rowlands, and B. M. Skramovsky, eds., 'Darwin's Notebooks on Transmutation. Part VI. Pages Excised by Darwin', *Bulletin of the British Museum* (*Natural History*) Historical Series, vol. 3 (1967), pp. 162–163. Darwin's earliest draft of his theory was his 'Sketch' of 1842, followed by his lengthier *Essay* of 1844. For these see Charles Darwin and Alfred Russel Wallace, *Evolution by Natural Selection* (with a foreword by Sir Gavin de Beer) (Cambridge, 1958). In 1856 Darwin began his longest exposition of his argument. For the reconstructed text of this version see R. C. Stauffer, ed., *Charles Darwin's Natural Selection* (Cambridge, 1975). The theory finally came before the public in 1858 in a brief announcement to the Linnean Society of London (see

note 35, above) and then, a year later, in the form in which it is generally known: Charles Darwin, *On the Origin of Species by Means of Natural Selection* (London, 1859).

[41] In setting an editorial standard I have made extensive use of the work of other Darwin editors, particularly: P. Thomas Carroll, *An Annotated Calendar of the Letters of Charles Darwin in the Library of the American Philosophical Society* (Wilmington, Delaware, 1976), pp. xxvii–xxxvii; Sir Gavin de Beer, ed., 'Darwin's Notebooks on Transmutation of Species. Part IV', *Bulletin of the British Museum (Natural History)* Historical Series, vol. 2 (1960), pp. 158–159; Howard E. Gruber and Paul H. Barrett, *Darwin on Man: A Psychological Study of Scientific Creativity* (New York, 1974), pp. xviii–xxii; and R. C. Stauffer, *Charles Darwin's Natural Selection* (Cambridge, 1975), pp. ix, 15–21. The 'Style Manual and Guide to Editorial Practice' governing the future publication of *The Collected Letters of Charles Darwin*, jointly edited by Frederick Burkhardt, Sydney Smith, David Kohn, and William Montgomery, has also been consulted. In addition I found helpful G. Thomas Tansell, 'The Editing of Historical Documents', *Studies in Bibliography* [Papers of the University of Virginia Bibliographical Society], vol. 31 (1978), pp. 1–56.

[42] R. C. Stauffer, ed., *Charles Darwin's Natural Selection* (Cambridge, 1975), pp. 20–21.

front
cover

R.N.

The front cover of the Red Notebook labelled R.N inside front cover

up to [1° / *or* 1^{st} of ?] July 1835. the excess of harbor = 180
See Daubisson both Volumes,[1] and Molina 1^{st} Vol[2] ⌈& Lyell⌋[3]
Sailed, [27^{th} ?]
⟨Friday, gale 29^{th}⟩
Friday
Thursday 29^{th} gale
⌈Lyell's Geology⌋[4]

⌈The living atoms having definite existence, those that have undergone the greatest number of changes towards perfection (namely mammalia) must have a shorter duration, than the more constant: This view supposes the simplest infusoria same since commencement of world.—⌋[5]|

⌈ ⌋	Darwin's addition
⟨ ⟩	Darwin's cancellation
[ ]	Editor's remark
[. . .?]	Uncertain reading
|	End of notebook page
e	Wholly or partly excised page

1–4e [not located] |

5e La. billardiere mentions the floating marine confervæ, is very common within E. Indian Archipelago, no minute description, calls it a Fucus. P [Vol I 287][6]

P 379. Henslow Anglesea, nodules in Clay Slate. major axis 2.1/2 ft. — singular structure of nodule, constitution [same as] of slate same. — longer axis in line of Cleavage. laminæ fold round them;[7] Quote this. Valparaiso Granitic nodules in Gneiss. |

6e Epidote seems commonly to occur where rocks have undergone action of heat. it is so found in Anglesea, amongst the varying & dubious granites. — Wide limits of this mineral in Australia. Fitton's appendix[8]

Would Slate. & unstratified rocks show any difference in facility of conducting Electricity? Would minute particles have a tendency to change their position? |

7e Carbonate of Lime disseminated through the great Plas Newydd dike. — Mem tres Montes. ((Henslow Anglesea))[9]

great variety in nature of a dike. — Mem. at Chonos & Concepcion. P. 417[10]

Veins of quartz exceedingly rare Mem C. [Cape] Turn P. 434 & 419[11]

As Limestone passes into schist scales of chlorites — Mem. Maldonado P 375[12]

Much Chlorite in some of the dikes. — P 432.[13] as in Andes. |

8e In Dampier's voyage there is a mine of metereology with respect to the discussion of winds & storms:[14] — [in Volney's travels also][15]

Dampier's last voyage to New Holland P 127. — Caught a shark 11 ft long.[16] "Its maw was like a leathern sack, very thick & so tough that a sharp knife could not cut it: in which we found the Head & Boans of a Hippotomus; the hairy lips of which were still sound and not petrified, and the |

9 jaw was also firm, out of which we pluckt a great many teeth, 2 of them, 8 inches long, & as big as a mans thumb, the rest not above half so long; The maw was full of jelly which stank extreamly." — This shark was caught in Shark's Bay. Lat 25°.[17] The nearest of the E Indian Islands. namely Java is 1000 miles distant! Where are Hippotami found in that Archipelago? Such have never been observed in Australia |

10 Dampier also repeatedly talks about the immense quantities of Cuttle fish bones floating on the surface of the ocean, before arriving at the Abrolhos shoals. — [18]

N.B. The view of the Volcanos of the chain of the Cordilleras as arising from [the expulsion of fluid nucleus through] faults or fissures, produced by the elevations of those mountains on the continent of S. America is inadmissible [may have happened from incipient elevation.] The volcanos originated |

11 in the bottom of the ocean. & the present Volcanos have been said to be merely accidental apertures still open. — The fault like appearance [arising from the manner of horizontal upheaval] of the shore of the Pacifick is 60 miles distant from the grand ancient volcanic axis [of the Andes]. — [Has this fault determined side of volcanic activity.] That axis was produced, from a fissure in a deep & therefore weak part of the ocean's bottom. |

12 With respect to Sharks distributing fossil remains: Sharks followed Capt. Henry's vessel from the Friendly Isles. to Sydney; know by having been seen & from the contents of its maw, amongst which were things pitched over board early in the passage!! — [19]

M. Labillardiere in Bay of Legrand, (SW part). describes a Small granite Isd. capped by Calcareous rock;[20] following |

13– [not located]

14e

15e Find instances; The whole coast of New Holland shoals much: Dampier remarks on great flats on the NW coast: —[21] 8 leagues, from Sydney 90 fathoms La Peyrouse.[22]

South of Mocha; 19 miles. 65 Fathoms

Vide facts in Beechey. on NW coast of America[23]

off Cape of Good Hope 70 fathoms 20 miles from the shore? Beagle

Coast of Brazil? where not rivers [in my Coral paper][24] |

		leagues		Fathoms
16e	Parallel of St Catherine [27° 30′ S.][25]	18	—	70
	Paranagua [25° 42′ S.]	12	—	40
	St Sebastian [23° 52′ S.]	12		50
	Joatingua SE [23° 22′ S.]	5		35
	R. de Janeiro SE [23° 58′ S.]	18		77
	C. Frio [23° S.]	7		60

Soundings about same as last to N. of C. Frio Except at Abrolhos. [18° S.]

Bahia [12° 57′ S.]	8		$\dot{\overline{200}}$
Morro S. Paulo [13° 22′ S.]	9		$\dot{\overline{120}}$
Garcia de Avila [lighthouse] [12° 35′ S.]	9		124
Itapicuru [R.] [11° 46′ S.]	9		200
R. Real [11° 31′ S.] & [R.] Sergipe [11° 10′ S.]	20		190
R. San Francisco [10° 32′ S.]	10		50
Whole coast to Olinda [8° S.]	9–10	=	30–40

at twice or [18–20][26] ⟨60⟩ — 80 $\dot{\overline{120}}$ parallel of Olinda

Shoaler N. of Olinda. — a little WNW of C. Rock. [5° 29′ S.] still shoaler, coast composed of sand dunes. 15 — 15

Does not seem to consider this a very shoal coast.[27]

Beyond the 10 or 12 leagues sea deepens suddenly. coast of Brazil generally. — |

17 Mrs Power at Port Louis talked of the extraordinary freshness of the streams of Lava in Ascencion known to be inactive 300 years?[28]

No Volcanic Earthquakes or Hot Springs in T. del Fuego = The Wager's Earthquake the most Southern one I have heard of[29] |

18 In a preface, it might be well to urge, geologists to compare whole history of Europe, with America; I might add I have drawn all my illustrations from America, purposely to show what facts can be supported from that part of the globe: & when we see conclusions substantiated over S. America & Europe. we may believe them applicable to the world. — |

19e My general opinion from the examination of soundings, from about 80 fathoms & upwards. that life is exceedingly rare, at the bottom of the sea. —⌈certainly data insufficient, yet good⌉ ⌈(I suspect fragments of shells will generally be found to be old & dead)⌉ ⌈(I have not kept a record)⌉ In looking over the lists of organic remains in De la Beche,[30] for the older formations I must believe they ⌈the limestones⌉ have been formed in shallow water: so have the Conglomerates: Yet this view is directly opposed to common opinion |

20e The Tertiary formation South of the Maypo at one period of elevation must in its configuration have resembled Chiloe

In De La Beche, article "Erratic blocks" not sufficient distinction is given to angular & rounded. — [31]

Fox Philosoph. Transactions on metallic veins. 1830 P. 399. — [32] Carne. Geolog. Trans: Cornwall ⌈Vol II⌉[33] |

21 It is a fact worth noticing that cryst of glassy felspar in Phonolite arrange themselves in determinate planes ∴ such action can take place in melted rocks

The frequent coincidence of line of veins & cleavage is important; veins appearing a galvanic phenomenon, so probably will the Cleavage be

There is a resemblance at Hobart town between the older strata & the bottom of sea near T. del Fuego. — |

22 Is there account of Baron Roussin's voyage. —[34]

In Europe proofs of many oscillations of level, which in the nature of strata & Organic remains does not appear to have taken place in the Cordillera of S. America.

Study Geolog: Map of Europe

Conybeare. Introduct XII P. silicified bones not common in Britain. Mem Concepcion Says Echinites. Encrinites. Asteriæ, usually petrified into |

23 a peculiar cream-coloured Limestone:[35] the strange substitution of matter in shells, like Concretions & laminæ show what movements take place in semiconsolidated rocks

P xv. mentions in what formations Conglomerates are found. —[36]

The above oscillations remarkable because the formations are now seen in regular descending steps |

24 Mem.; rapidity of germination in young corals. — vide L. Jackson's paper. Philosoph Transact:[37] at R. de Janeiro. Coquimbo. Balanidæ. at Concepcion.

Humb: Pers. N. vii P. 56[38] Serpentine form: of Cuba for comparison (?) with St Pauls |

25–26e [not located]

27 The frequency of shells in the Calc. Sandstone Concret, is connected with frequency of shells in flints in Chalk

New Providence more hilly than others of the Bahama consists of rock & sand mixed with sea shells — about 500 Is$^{d.}$ & great banks. effect of Elevation. United service Journal[39] |

28 In the Iron sand formation ⟨would⟩ wood converted into siliceous pyritous & coaly matter. Mem: Chiloe

In the endless cycle of revolutions. by actions of rivers currents. & sea beaches. All mineral masses must have a tendency. to mingle; The sea would separate quartzose sand from the finer matter resulting from degradation of Felspar & other minerals containing

Alumen. — This matter |

29 accumulating in deep seas forms slates: How is the Lime separated; is it washed from the solid rock by the actions of Springs or more probably by some unknown Volcanic process? How does it come that all Lime is not accumulated in the Tropical oceans detained by Organic powers. We know |

30 the waters of the ocean all are mingled. These reflections might be introduced either in note in Coral Paper or hypothetical origin of some sandstones, as in Australia. — Have Limestones all been dissolved. if so sea would separate them from indissoluble rocks? Has Chalk |

31 ever been dissolved?

Singularity of fresh water at Iquiqui. not from rain, because alluvium saline; Mem: on coast of Northern Chili as springs become rarer, so does the rain, therefore such rain is cause, hence at least no water is absorbed into the earth

⟨I did not see one dike in the whole Galapagos Arch; because no sections, same cause as no [colour?]⟩|

32 Sir J. Herschels idea of escape of Heat prevented by sedimentary rocks, & hence Volcanic action, contradicted by Cordillera, where that action commenced before any great accumulation of such matter. — [40]

Dr A. Smith says. that Boulders do not occur in the South African plains. — [41] Sydney no |

33e I believe the secondary? formations of Brazil, all originate from the decomposition of Granitic rocks Mem. Chanticleers voyage at ⟨[J?] [Maranh?]⟩ Pernambuco.[42]

[the following is a newspaper clipping pasted on the page:[43] EARTHQUAKE AT SEA. — Extract from the log-book of the *James Cruikshank*, Captain John Young, on her voyage from Demerara to London: — "Feb. 12, 1835. At 10h. 15m. a severe shock of earthquake shook the ship in a most violent manner. Although it lasted about a minute, there was no uncommon ripple on the water. It was quite calm at the time. Latitude 8 deg. 47 min. N: longitude 61 deg. 22 min. W. mid. calm and clear.] Caermarthen Journal |

34e I look at the cessation northwards of the Coal in Chili as clearly bearing a relation to present position of ⟨Coal⟩ Forests. These thick beds of Lignite stratified with substances so like the Coal measures in England (Excepting Conglomerates?) [& absence of limestone?] have been collected on the open coast. Perhaps as at Concepcion. favoured by basin formed by outlying rocks; (such as between Mocha & main land). At Carelmapu. — Within Chiloe: — |

35e On open coast, near where Challenger was lost:[44] I know no reason for supposing these matters are not now collecting, in the bottom of an open & not deep sea. — (Character of coast regular & ⟨not very⟩ rather deep soundings, 60–100 fathoms 2 & 3 miles from shore. V. Chart) Every winter torrents must bring much vegetable matter from thickly wooded mountains, probably chiefly leaves. — This position agrees with character of.. [in Basins from rivers. & natural position] |

36e position at N.S. Wales & Van Diemen's land. —

Whole coast S. of Concepcion where there are Tertiary strata there is Coal — § $\boxed{\text{No}}$ shells in all cases. [.Mytilus. —][45]

[at Guacho] [on N. Chile? Washington. —][46]

Mem: Micaceous formation of Chonos. interesting from great quantity of altered Carbonaceous shales

Examine chart of Patagonian coast to see proportional <u>cliff</u> & low or sloping land

What are the "palatal Tritores" found in the coraliferous mountain Limestone |

37e are they allied to the jaws of the Cocos fish

Rio Shells argument for rise

In Cordillera, the dikes do not generally appear to have fallen into lines of faults

I do not think so many faults in Cordillera, as in English Coal field — because lowered & raised — so on — but gradually & simply raised

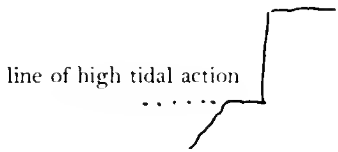
No Faults in Patagonia[,] enormous extent; if lowered again & covered no sign of upheaval |

38e To Cleavage add other instances in old world of symetrical structure. East India Archipelago. [Aleutian Arch. —] V. Fitton. Australia:[47] cases in Europe. —

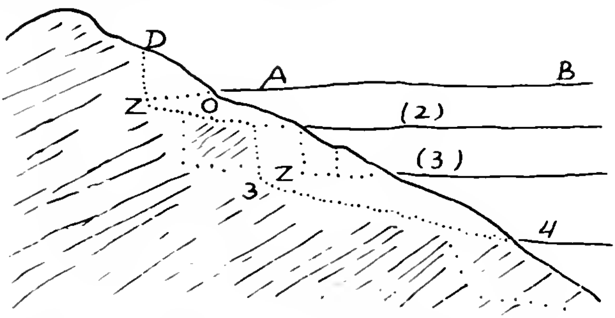
Auvergne. very little Pumice, though Trachyte. same fact in Galapagos. Daubeny P 24[48]

[V. back of page 1 of New Zealand Geological Notes.][49]

at St. Helena. This structure was very clear at base of great lava cliffs[50] [Fig. 1]

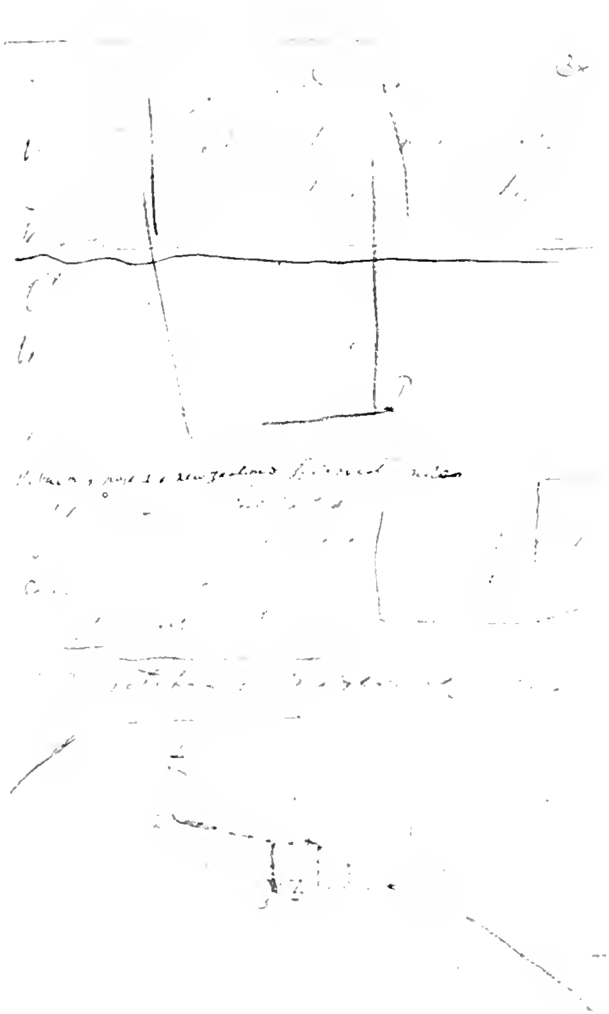


NB. patches of modern Conglomerates [Fig. 2]



|

39e The action of sea A.B. will be to eat in the land in line of highest tidal action. this will at length be checked by increased vertical ⟨height⟩ thickness (DZ) of mass to be removed & from the resistance offered to the greater lateral extension of the waves. by the part beneath the band of greatest action not having been worn away. — If the level of the sea was to sink by very slow & gradual movements to line (2). The part (O) which was before beneath band. of greatest action. would now by degrees be exposed



Page 38e with sketches of a possible explanation for the appearance of a section of lava cliffs along the coast at St Helera.

to it, & the result would [be] a uniform slope to base of cliff (Z). to which point the waves would not reach. If now the ocean should <u>suddenly</u> |

40e fall, (3) the case would be as at first. & according to the greater or less time of rest. so would the size of the triangular mass removed vary. — The gradual rising continuing. a another [*sic*] sloping platform would be made, & so on. — This is grounded on the belief of constant rising with successive periods of greater activity & rest. — Such changes could be shown (as represented), along line of coast. — [Fig. 2] Mem San Lorenzo; Valley of Copiapò & parts of coast of Chile. —

Must first explain *[top of]* tidal band of action. |

41 This case differs. I think. from Patagonian steps, because the deposition & accumulation is brought into play

As in Ocean & Air; there are *[likewise]* differences of temperature *[at equal distances from centre of rotation]* & a ⟨circulation owing⟩ rotation in fluid matter of globe. must there not be a circulation *[however slow & weak.]*; *[(cause of not accumulation of Coral limestone in intertropical)]* hence varieties of substances ejected from same point. & changes. *[(changes in variation?)]* as in Cordillera. —

From poles to Equator current downwards & to West. — From Equator to poles. nearer the surface & to the Eastward. — If matter proceeds from great depth. from axis to surface must gain a Westerly current: — If great changes of climate have happened. hurricane in bowels of earth cause: — does not explain cleavage lines./ possibly general symetry of world. — |

42 I feel no doubt. respecting the brecciated white stone of Chiloe, after having examined the changes of pumice at Ascension

In Calc: sandstone at Ascension, each particles coated by pellucid envelope of Lime. — form resembles the husks at Coquimbo: in that case, may not central and rather differently constituted lime have been removed? — As shell out of its cast which, although not very intelligible is a familiar case: If refiltered with other matter how very curious a structure: Have shells ever casts alone in Calc[areous?]. rocks!? — if so case precisely analogous: fragments instead |

43e Peak of Teneriffe. also Cotopaxi has a cylinder placed on the rim of conical crater: at Teneriffe Wall of Porph. Lava with base of Pitchstone; Mem Galapagos. chiefly red glassy scoriæ. — could walk round base: — not universal: could not climb up many parts, in James Is^{d}. — Mem St Helena — All Trachytic. — ⌈Daubeny⌉[51] P. 171. Vol I. Humboldt[52]

There is long discussion on Pumice ⌈& Obsidian:⌉ in the I Vol. Humb:[53]

There is rather good abstract of Humboldt. S. American Geolog. in Daubeny. P. 349[54]

Admirable little table showing long periods of great violence volcanic. from Humboldt: Comparison P 361. Daubeny[55] |

44e Von Buch is very strong about Trachyte being the most inferior rocks[56] — The stream at Portillo Pass example of do? ⟨[Poor?]⟩

Daubeny good account of ejected granitic fragments. P. 386[57]

⌈Mem. Lyell's fact about sulphuric vapours in East Indian Volcanos⌉[58]

Gypsum

Andes |

45e Mem. Beechey. account of regular change in soundings. on approaching the coast of NW. America P. 209–13 P & 444 ⌈(Yanky Edit)⌉[59]

⟨I think⟩ At[60] Ascension, the laminæ changes in rocks. connected with & alternating with obsidian must clearly be chemical differences. & not those of rapid cooling &c &c

My results go to believe that much of all old strata of England. formed near surface: Mem Patagonian pebbles beds, most unfavourable to preservation of bones &c &c — Yet ⟨silicified⟩ turn over[61] |

46e Silicified wood. Cordilleras, Chiloe. &c seems the organic structure most easily preserved. —

M^{r} Conybeare introduct to Geolog — "Between the height of same beds, deposited in different basins; little or no relation appears to ⟨exist⟩ be made out, but in those belonging to the same district there seems. I think, little ground for skepticism, as to the general truth of the proposition." —[62] If such can happen in troubled England; the more minute equalities |

47 of elevation, may well be preserved at Patagonia. The English fact is astonishing consult book itself. P. xx: same fact is indeed shewn [?][63] by the parallel bands of formations on any Geolog Map: Quoted from Daubeny P 402:[64] likewise, mean height of tertiary. being less than secondary: — consider arguments for oscillation of level independent of mineralogical nature & dependent: & then how wonderful level [of same beds] should have been kept; it shows that throughout all England, whole surface oscillated equably. — |

48 These facts become easy if we look at the action as a deep & extensive movement of viscid nucleus, which in any one country would produce equable effects. — [though so immense to short breathed traveller] Mountains, which in size are grains of sand, in this view sink into their proper insignificance; as fractures, consequent on grand rise, & angular displacement, consequent of injection of fluid rock. —

Try on globe. with slip paper a gradually curved enlargement |

49 see its increased length. which will represent the dilatation, which dilated cracks must be filled up by dikes & mountain chains. —

Introduce part of the above in Patagonian paper; & part in grand discussion

Consult. reconsult Geolog. Map of Europe |

50 Consult charts for distribution of pebbles. — Plains. off coast of Patagonia. — British channel &c &c.

There is a Hill. near Copiapò which is asserted to make a noise, — My impression. is not very distinct, from some of the lower orders; it was connected with movement of sand. — it is called "Bramidor" (?). — it was a strange story; I believe it was necessary to ascend the hill, — but my recollection is imperfect & was recalled by note in |

51 Daubeny. P. 438., of similar fact near the Red Sea. — which occurred in a sandy place. — (the sound was long & prolonged).[65] NB, Is it generally known. the acute chirping sound produced in walking over the sand: I am nearly sure, it is necessary to ascend the hill. —

The absence of Second form, except near submarine Volc: in harmony with the prevailing movement being one of elevation alone. — In England much subsidence: hence difference; action on land different |

52 Volney, P 351. Vol I. woody bushes, [gazelles] hares, grass-hoppers & Rats. characteristic of the deserts of Syria ⟨chara⟩ ditto for Patagonia, especially rocky parts of central Patagonia[66]

Does Andes in Chili. separate geographical ranges of plants. V. Lyell. Chap XI Vol II.[67]

Urge the entire absence of any rock situated beneath low water in the Southern ocean not being buoyed with Kelp. — |

53–54e [not located; entry on stub of page 53 reads, "With respect to degrad"]

55e Strong currents off the Galapagos. — strata must be accumulating which like the secondary strata of England, [besides ordinary marine remains] may contains ⟨shells few corals Tortoise⟩ [remains of Amphibia, exclusively.] & Turtle bones. & the bones of ⟨two graniniverous⟩ a herbivorous lizard. — from[68] the action of torrents. [marine] Tortoise & other species of large lizard. — There would probably be no other organic remains. — |

56e On Pampas looked in vain for a pebble of any sort; not one was found. — Miers saw them near?[69]

Mem. La Condamaine on the Amazons.[70] Consult

Insist on the frequency of dikes in Granitic countries, enumerate cases. — M. Video exception, but even there, hills of Basalt & other Volcanic rocks. Bahia, Rio de Jan: B. Oriental? level surface not disturbed. — Whole West coast. Chonos to Copiapo. — Sydney. K.G. Sound. C. of Good Hope. — [Carnatic |

57 It has been common practice of geologist.][71]

Lyell considers (P 84 Vol III.) whole of Etna series of coatings;[72] hence it will be necessary to state all arguments for believing that there must be a central core of melted rock — I think the strongest is the consideration of the state at a grand eruption when whole summit of mountain is blown off; & again when in great crater. different little craters are all burning, surely there must be [somewhere] below a field of fluid rock. — In the discussion it will be better not to refer to Lyell. but merely to |
58 state these reasons, & saying that they refer to central nucleus & that envelopes no doubt existed. These higher portions probably formed Isl^{ds} from which proceeded pebbles & on which trees grew. — [?][73] Are not the dikes in upper strata quite different from the Porphyries: certainly appearance leads me to believe mere fissures filled up. — the appearance will here be the strongest argument: — § Consider causes for subaqueous crater being of diff: form subaerial one? — In former not so much; or no rapilli;[74] & from action of water probably not so much aluminated. |

59 As argument in favor of lines of anticlinal violence crossing lines of crater, ⟨arg⟩ state that all the great Volcanos. have been elevated considerably. which shows an afflux of inferior melted rocks to those parts.

Are not the dikes generally vertical? if so posterior to elevations? & not sources of lava streams. — [Urge not tilted strata. —][75] It will be well to urge the case of St Helena, where dikes certainly have not been points of eruption.

Nobody supposes that all the dikes in Cornwall or in the coal measures have been conduits to volcanoes. — |

60 Talking of the cricket valley [the most remarkable feature in the structure of Ascension][76] give as an example the great subsidence at the famous eruption of Rialeja, & the more true analogy from the Galapagos —

M^{r} Lyell. P. 111 & 113. [seems to] considers that successive terraces mark as many distinct elevations;[77] hence it would appear he has not fully considered the subject. —

S. America in the form of the land decidedly |

61 bears the stamp of recent elevation. which is different from what Mr Lyell supposes.[78]

Lyell P 116 Vol III, says that in N. Pliocene formation of Limestone, casts of shells, as in some older formations:[79] Mem the envelopes at Coquimbo. the analogy is now perfect

⟨The grand propulsion of fluid rock. which elevates a continent⟩

We are more abound to take analogy of movements of W coast in explaining plains because such are found in perfection on that side. — |

62 Add from M. Lesson. character of Flora to New Zealand, which agrees with St Helena in being unique, yet no quadrupeds. —[80]

Is the white matter beneath pebbles. the degraded matter of such pebbles extending to seaward, the alternating with such matter at St Julians looks like such? — destructive to animal life. — Patagonia. |

63 In the Chonos Islds we must imagine bituminous shales have been metamorphised, as in Brazil feruginous sandy ones have undergone the same process. —

Neither lakes or Avalanches (Glaciers very rare) to cause floods in valleys, which must aid in preserving the terraces [Molina's Case][81]

At Vesuvius. Vol III P. 124. Lyell. dikes have a parting of pitchstone; which is described as very rare.[82] Mem. St Helena; probably more abundant in this case from intersecting a mass probably cold & not warm as sides of a crater as Vesuvius. — |

64 There may have been oscillations in the upheaval of Andes. — but as long as all below water no evidence — The depth of shells (which being packed. in beds) lived there, makes it very doubtful whether they could have lived in so deep a sea. — Perhaps agrees with formation of pebbles & vertical trees

Grand Seco at B. Ayres; mention about the deer approaching the wells. — the effect of Salt water of the Salado. — Mem. in Owens Africa it is mentioned that the Elephant came |

65e [line cut out at top of page] towns driving by the want of water. —[83] I believe in all flat countries. years of drought are common. — M^r^ Lyell has mentioned the drifting of carcases putrid.[84]

In Rio paper. when discussing probable rise of land: Mention M. Gay's fact about shells:[85] Hibernation of fresh water Shells. multitudes. —

The question of shell's concretions, living only in that spot & being cause of concretion, or being only preserved in that part. having lived over whole bottom is important; because in this latter case we cannot judge whether such fossils lived in groups or not. |

66e Ferruginous veins of this figure A in sandstone: evidently depend on a concretionary contraction: the fact is in alliance with those balls at Chiloe full of sand. — the ⟨scale⟩ [quantity of iron] being there in excess. — If veins (A) are secretionary, so are all those plates in Australia. New Red Sandstone. at Bahia in modern sandstone. a circle, , had in its middle a short [fissure] vein terminated each way, which little vein was like the rest of these thin veins which project outwards. — |

67e In Patagonia. the blending of pebbles & the appearance of travelling may be owing to successive transportal from prevailing swell, (as Shingle travels on the Chesil bank. V. De la Beche).[86] Ask Capt. F.: R:[87] how the swell, generally & during gales would tend to travel on a central line of Patagonia. [NB. M^r^ Lyell P. 211 Vol III. talks of line of cliff marking a pause][88]

When mentioning pumice of Bahia Blanca, mention black scoriaceous rocks of R Chupat. & fall of Ashes of Falkner, § how far is the distance?—[89] |

68e Fossil bones black as if from peat. — yet cetaceous bones so likewise [of miocene period]. — Mem Bahia blanca P. 204 Vol III. Lyell[90]

Owing to [open] faults in mountains: to elevated strata in eocene lakes of France, & unequal action of Earthquakes [on Chili & delta of Indus]. my belief in submarine tilting alone, must be modified. [Moreover, the Volcanos from sea there burst out, after rise from sea: ⟨As did⟩ as did those aerial Volcanos in Germany]

In the Valle del Yeso it is probable that point of Porphyry has been upheaved in a dry form

It is clear the forces have acted with far more regularity |

in S. America: in France we have freshwater lakes unequally elevated, which movements if present in the Andes, would have destroyed regularity of slope of valleys. — All my observations of period [& manner] of elevation Volcanic action, must be more exclusively confined to that country

Read description of channels or grooves in rocks at Costorphine hills. to compare with Galapagos. — Chiloe. M. Hermoso. & Coral reefs (imperfect in latter). |

Lyell. Vol I. P. 316. Earthquake of 1812 affected valley of Missisippi & New Madrid & Caraccas. — [91] Is this mentioned by Humboldt in his account of extensive areas. —[92]

P. 322 In any archipelago. & neighbouring Volcanos. eruption from [more than] one orifice does not occur at same time: this is contrasted to contemporaneous action over larger spaces of the globes & "periods" of increased activity. —[93] such as that of 1835. —

State the three [or 4] fields of Earthquakes in Chili: — |

Chiloe. Concepcion. Valparaiso (Copiapò & Guasco). yet whole territory vibrates from any one shock —

In S. America — continuity of space in formations & durability of similar causes go together. add. ⟨"from⟩ "in the same line" to "from the epoch of Ammonite to the present day.

at Mauritius. (consult Bory[94] [dip of strata on East]) cannot believe in a great explosion, nor would sea remove more internally than externally — I did not see any number of dikes in the |

cliffs. — wide valleys. — central peak small; yet great body of lavas have flowed from centre —

Pisolitic balls occur in the Ashes which fill up theatre of Pompeei (?). — Such have been seen to form in atmosphere. — Mem. Ascencion. concretions & Galapagos. —

Humboldts. fragmens.[95]

Read geology of N. America. India. — remembering S. Africa. Australia.. Oceanic Isles. Geology of whole world will turn out simple. — |

73 Fortunate for this science. that Europe was its birth place. — Some general reflections might be introduced on great size of ocean; especially Pacifick: insignificant islets — general movements of the earth; — Scarcity of Organic remains. — Unequal distribution of Volcanic action, Australia S. Africa — on one side. S. America on the other: The extreme frequency of soft materials being consolidated; one inclines to belief all strata of Europe formed near coast. Humboldts quotation of instability of ground at present. day. — applied by me geologically to vertical movements.[96] |

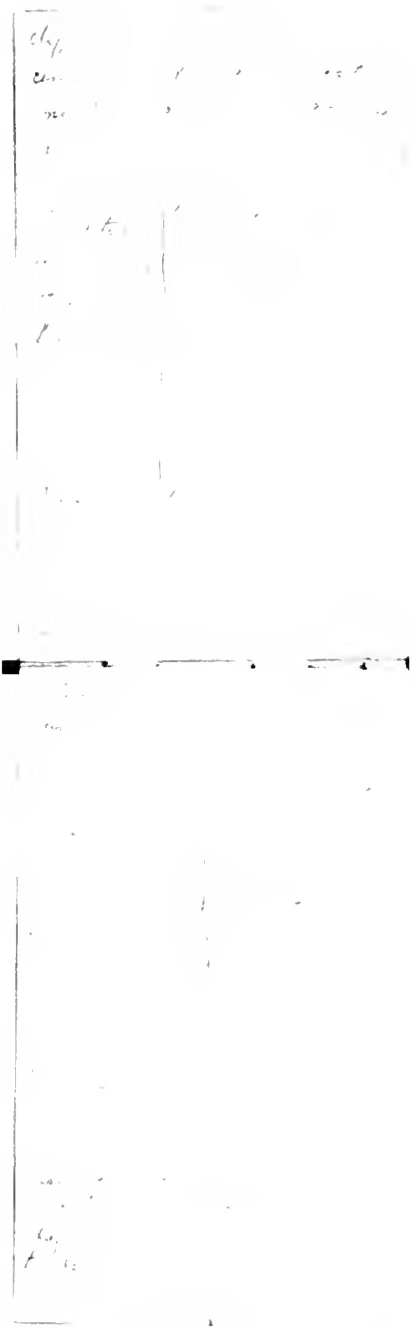
74 In Cord: after seeing small Bombs. without a vesicle. we may consider appearances of eruption at bottom. — solution under high pressure of gazes. especially the most abundant. Sulp. Hyd: Carb: A. Mur: A. = (& this effect of water thus holding matter in solution must be great: & in the fact of bombs in tufa there is proof of such gaz) steam condensed. — Perhaps these mighty changes might go on. & not a bubbles on the surface bespeak the changes. —

[metallic veins solution of silex & many other phenomena.][97] |

75 I do not believe that the extraordinary fissures of the ground at Calabria were present at the Concepcion earthquake. — expatiate on difficulty of evidence about eruptions of Volcanos. (where there are no country newspapers) — At the Calabrian earthquake things pitched off the ground. Ulloa states that Volcanos!! were in eruption at time of great Lima earthquake[98]

In the Chili earthquakes if rise was more ⟨than⟩ inland than on coast it would be invariably discovered; this may be mentioned with general slope of the country; (perhaps generally over whole world) |

76 Yet eruptions ⟨both⟩ at sea (as wells as in the Cordillera), they may be considered as accidents (if part of a regular system can be called accidental; the proportional force of crust of globe & injecting matter on the great rise). —



Pages 72–73 on geological topics, with a reference to Alexander von Humboldt's *Fragmens de géologie et de climatologie asiatiques* (1831), and the assertion that the 'Geology of whole world will turn out simple.—'

The great rains which attend severe Earthquakes [1822 § 1835?] alone, (& the general belief in N. Chili, where rains are so infrequent; so as to exclaim [as I have heard] how lucky! when they hear of a place having a pretty severe shock). are much more curious |

77 & perplexing. than those that attend Eruptions: M^r P. Scopes explanation of low Barometer?[99]

In a subsiding area. we may believe the fluid matter instead of afflux (always slightly oscillating as that of a spring) moves away.— Will geology ever succeed in showing a direct relation of a part of globe rising, when another falls. — When discussing connection of Pacifick & S. America. — |

78 Volcanos must be considered as chemical retorts. — neglecting the first production of Trachyte. look at Sulphur. salt. lime, are spread over [whole] surface; how comes it they do not flow out together? How are they eliminated. — [Sulphur last. —] Metallic veins likewise must separate ingredients if we look to a constant revolution. — Are we to consider that the dikes which so commonly (state facts) traverse granites, are granitic materials simply altered by circumstances; & not in chemical nature, or has a subterranean fluid mass itself changed. — No. — |

79 Yet the fluid granitic mass under less pressure might have its [proportional] particles altered. —

With respect to Volcanic theory. I want to ground, that the first phenomem. is an inward afflux of melted matter. — Volcanos perhaps may be admittance of water, through the rent strata: [M^r Lyell considers that Plutonic rocks are generated as often as Volcanic. I consider latter as accidental on the afflux of the former. —][100]

Ascension. Vegetation? Rats & Mices. At St Helena there is a native mouse. |

80 Did wave first retreat at Juan Fernandez: the first great movement was one of rise (any smaller prior ones might have been owing to absolute movement of ground). Michell (Philos:

Transacts) [seems to] consider that fall first movement (as in Peru 1746). —[101] At great Lisbon Earthquake Loch Lomond water oscillated between 2 & 3 ft. (as in Chili lake). Therefore motion of sea ought to be considered as a plain movement communicated to it as well as by the vertical as lateral movement. — At first one would think movement. owing to water keeping its level whilst land rose up & down. — But from above reasons, do not think so |

81 also elevating Earthquake of Valparaiso. (1822) no great wave on record. — [also neighbouring sea must partake in absolute movement] Moreover wave [with same general character] reaches far beyond coast, which has been raised. — It must be considered as an oscillation, from violence. Is it not same as swell travelling across Pacifick. — excepting in number of waves & in wind, instead of sea's bottom being in motion what difference? In watching heavy swell, sea retreats & then breaks: i e to form a wave in ocean. is not this [Fig. 3] 

form present, i e a part below [mean] level before the higher part. —
Does the |

82 sea fall on banks as a Bore wave rushes up? (NB. Earthquake wave is an oscillation, body of water manifestly does not travel up. —) If these view are right the coincidental retreat at Portugal & Madeira (Lyell. vol I. P. 471) is explained.[102] also the similar fact at Concepcion? Read the various accounts & see if fall is not the first very evident movement. — The swelling first on beach I cannot understand, without (c^s raised above a^s). — |

83 In great Calabrian wave did not sea break first? I can imagine from local form of coast (as seen in swell) the undertow & overfall must vary proportionally

Partial shrinking after elevation in perfect conformity with ⟨M^{r} Lyell's⟩ idea of an injected mass of fluid rock[103]

In Patagonia plains. long periods of rest & vice versâ more likely to be coincidental than single elevations along whole line of coast |

84 Darby mentions beds of marine shells on banks of Red River Louisiana. V. Lyell. Vol 1. P. 191[104]

State at St Helena. pebbles entirely coated with Tosca. which implies motion in the [loose] bed of pebbles. (On a sea beach under a cascade, one can understand pebbles thus coated. — The motion is most wonderful, from chemical attraction, as a blade of grass penetrating by action of Organic power a lump of hard clay — |

85 In the History of S America we cannot dive into the causes of the losses of the [species of] Mastodons. which ranged from Equatorial plains to S. Patagonia. To the Megatherium. — To the Horse. = One might fancy that it was so arranged from the forsight of the works of man

Feeling surprise at Mastodon inhabiting plains of Patagonia is removed by reflecting on the nature of the country in which the Rhinoceros lives in S. Africa: the same caution is applicable to the Siberia case |

86 We must not think alluvial plains [always] most favourable; In what part of the globe are there such vast numbers of wild animals. both species & individuals as in the half desert country of S. Africa. It would be well to quote Burchell. V. where the Rhinoceros was killed. — [105]

In Patagonia, are all beds same age? is white substance triturated Porphyritic rocks (mem white tufas with purple Claystones of P. Desire). = Where talking of such substances being worn into channels. |

87e mention submarine channels. such as that in front of Sts. of Magellan

In Chiloe curvilinear strata subsidence. — The sudden increased dip is not parallel case to Isle of White. but rather to one out of a series of faults. [Fig. 4] 

In Cordill: should basal lavas be called Volcanic or Plutonic The cellular state of all the Porphyry specimens, must be well examined

At M. Video [facts of Passages marked by do.] discuss quartz veins, there contemp — yet similar ones in Clay. Slates contemporaneous others subsequent. as in dikes. |

88e In Granite great crystals arranged on sides. V. Lyell P 355 Vol III. constitution of veins, is there said granite in close contact varies in nature,[106] — Does not granite at C. Tres Montes become more siliceous in close contact? — [Cordillera???] Porphyry at Valparaiso; Epidote —

Must we look at regular greenstone cones at S. T. del Fuego as nucleus of a Volcano or as an injected mass. — From conical form I incline to ⟨latter⟩ former; & thus occurring in groups. — As these greenstone rocks are seen to graduate into granites |

89 the ⟨conta⟩ passage from lava to Granite is much more perfect. than in believing mere agency of dikes: & indeed when do these dikes lead to a conical mass. will this conical mass be granite? Why not more probably greenstone? What probable origin can be given to the numerous hills of greenstone? —

Daubeny. P 95. Glassy & Stony Pearlstones alternate together in contorted layers:[107] Mem: Phillips Mineralogy some such fact stated to exist in Peru.[108] — Ascension |

90 At Ischia there is a pumiceous conglomerate with small & large fragments, nature of which is doubtful. P. 180.[109] I think my Ascension case very doubtful. —

In Iceland Bladders of Lava are described, & many minute craters as at Galapagos. Sir George Mackenzie must be worth reading[110]

Some earthquakes of Sumatra no connection with a neighbouring Volcano of Priamang. — Marsden Sumatra.[111]

M. De Jonnes seems to |

91 think that Volcanic eruptions form foundations for Coral reefs. —[112] does he mean in contradistinction to sand??

B. Roussin states that generally in North part of Brazil. ⟨gravel becomes⟩ sand less & gravel more common. the shoaler the water & nearer the Banks[113]

Is there not a sudden deepening on E. coast of Africa. as at Brazil |

92 [blank]

93e What is nature of strip of Mountain Limestone in N. Wales. was it reef. — I remember many Corals?? Breccia — Stratification?

Anomalous action of ocean. — at Ascension. (where occasionally most tremendous surf & loose sandy beach) deposits [calcareous] encrustations; At Bahia ferruginous. — At Pernambuco (great swell & turbid water) organic bodies protect like peat reef of sandstone. — Corals, & Corallina survive, in the most violent surfs: in both latter cases become petrified, & increase. — In Southern regions every rock is buoyed by Kelp, now Kelp sends forth branching |

94e roots which must protect surface: On [hard] exposed rocks near Bahia, whole surface to where highest spray (there pale green confervæ) coated with living beings; In smooth seas (& even turbulent as at St Helena) I have mentioned point of greatest action; I now having seen Pernambuco believe much is owing to protection of Organic productions. = Yet everywhere on coast (Il Defonsos [Kelp]) rocks show signs of degradation; (soft substances worn into bare cliffs evident); the action is anomalous; It is wonderful to see Coral reef — or confervæ in the breakers or in waterfall: Excepting by removal of large fragments by mere force of waves: & action on upper tidal band, I do not |

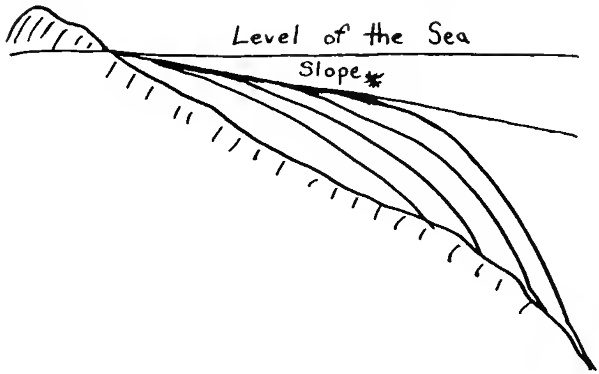
95e see how to account for oceans power. — excepting when pebbles are brought into play; most manifest example of degradation I ever saw on beach near Callao. — From Sir. H Davy experiment on the copper bottom. we see a trifling circumstance determines whether an animal will adhere to a certain part.[114] Apropos to question does animal adhere to rock because it does not decompose. or vice versâ. Clay slates unfavourable to attachment of many bodies |

96e [blank]

97e Beechey. — changes in bottom in NW coast of America. from shingle to sand &c &c. ⟨Vol II⟩ P. 209. 211. 213. 444 [Yanky edition][115]

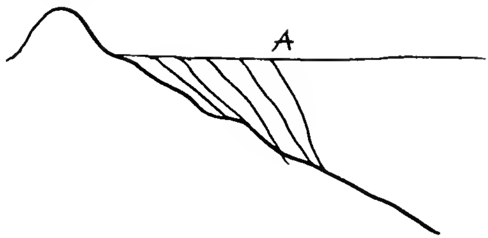
Shores of Pacifick, as compared to whole E. America. ⟨East⟩ Africa. Australia. profoundly deep: a great fault or rather many faults. —

Necessary form; as long as coast line fixed. — [Fig. 5][116]



*Slope necessary for seaward transportal of drift matter. — |

98e Give various cases. [Fig. 6]



A advancing coast to Seaward.

Retreating case in excess as first case.

When discussing Falkland soundings introduce this discussion.— Brazil bank: (& I believe SE coast of Madagascar, where a 40 line runs at equal distance?) 1st cases. —[117] |

99e The terraces in Valleys of Chili may be with much truth compared to the step = formed streams of lava at St Jago. C. de Verds

Quartz pebbles in the Cordilleras look as if some peaks elevated.—

Greywacke as a general fact absent in T. del Fuego, excepting in Port Famine

Mr Sorrell says that numerous icebergs are commonly stranded on shores of Georgia [Lat° ( )], he has rocks on surface applicable to Patagonia.[118] |

100e During a period of subsidence the shinglle of Patagonia would become more or less interstratified with sediment. — [& escarpment worn away like english escarpment][119]

The great conglomerate of the Amazons & Orinoco mentioned by Humboldt under name of Rothe-todte-liegende is perhaps same with that of Pernambuco?[120]

Quote Miers about shells at Quillota[121]

Lyell, states that contact of Granite & sedimentary rocks, in Alps becomes metalliferous. Vol III Latter Part[122] |

101 Are there Earthquakes in the Radack & Ralix Islds?

In my Cleavage paper Dr Fittons Australia case must be quoted at length.[123]

The Lines of Mountain appear to me to be effect of expansions acting at great depths (mem: profound earthquakes), which would cause parallel lines, but the rectangular intersections are singular —

M. Lesson considers the Sandstone & Granite districts to be separated by profound valley[.] Sydney. —[124] |

102 Lesson Zoologie[125]

Grand tertiary formation of Payta: N. part of New Zeeland entirely volcanic!! New Zeeland rich in particular genera of plants: All St. Catherine & coast Granite: P. 199; Falkland account of cleavage differs wonderfully from mine: phyllade covered by quartzose sandstones: refers to broken hill described by Pernetty: account of streams of stones agrees with mine. — At Conception, cleavage E & W! at Payta. talcose slates, do at latter place. sandy. sandstone with gypsum, covered by limestone with recent shells 200 ft, how exact agreement with Coquimbo; |

103–104e [not located]

105e Is[d] near coast of America not reached. Juan. Galapagos. Cocos —
Ulloas voyage

North of Callao, the country, to the distance of 3 or 4 leagues [from the coast] may be concluded to have been covered by the sea — judge from the pebbles such as those on the beach — "This is particularly observable in a bay about five leagues North of Callao, called Marques, where in all appearances not many years since, the sea covered above half a league of what is now Terra Firma & the extent of a league & a half a long the coast. The rocks in the most inland part of this bay are perforated & smoothed like those washed by the waves, a |

106e sufficient proof, that the sea formed these large cavities," &c &c &c Vol II. Chapt VIII. p. 97[126]

at Potosi the veins run from North ⟨inclining⟩ to South. inclining a little to the West: the veins which follow this direction are thought by the ⟨oldest⟩ most intelligent miners to be the richest Vol II 147[127]

Shells at Concepcion 50 toises above the sea. = talks of them being packed clean. & without earth. — Moreover that such do not occur on the beaches. Perhaps these facts attest a ⟨more⟩ decided elevation of sea's bottom. beds of shells. 2–3 toises thick.— Vol II. p. 252[128] |

107 Urge cliff form of land, in St Helena. Ascension. Azores. ([sandstone first gives] half demolished craters). — worn into mud & dust. — connection with age, & agreement with number of craters. No cliffs at Ascension (or modern streams of St Jgo) yet no historical records of eruptions how immense the time!! How well agrees with number of Craters! — At S. Cruz. there is no occasion to wonder what has become of the Basalt. Gone into fine sediment Look at St Helena!! — |

108 There are some arguments which strike the mind with force. — the exact yearly rise of the great rivers prove better than any meterological table the precise periods over immense areas. (& the counterbalancing variations) of rain. = The Bulk of sediment [daily] yearly brought down by every torrent proves the decay atmospheric

of the most solid rocks. — The grand cliffs of a thousand feet in height, of the solid lavas. — proportionally high to age. (we do not wonder to see tertiary plains consumed) Where slope [plainly] indicates former boundary. (as in other unworn |

109 islands) we take in at once the stupendous mass which has been corroded. — If man could raise such a bulwark to the ocean, who would ever suppose that its age was limited? Who could suppose such trifling means could efface & obliterate so grand a work? — In valleys one is not sure whether fissures may not have helped it, or diluvial waves. but when we see an entire island so encircled, the one slow cause is apparent. [I confess I never see such islands whose inclination natural [out limits?] [illeg.] deepest astonishment.] Perhaps scarcely a pebble might remain to [tell?] of these losses. — |

110 Cause of chimney. to crater. as at Galapagos. St. Helena. —

[Fig. 7]  effect of heat on inner wall, hence resists degradation longer than outer parts. —

The common occurrence of a breccia of primitive rocks between that formation and the secondary (stated in Playfair to be the case p. 51).[129] presupposes an elevated country of granite, not greater for all Europe, than from the Plata to Caraccas, which is all of granite: |

111 In discussing circulation of fluid nucleus, — the similarity of Volcanic products [over whole world] argument, as well as separating causes by water. — Or rather begin & explain how water separates. — (intertropics at present fix lime). ⟨Also Volcanos separate.⟩ Volcanos blend all substances together; & products being similar over whole world. general circulation. But Volcanic action separates some sulphur (perhaps lime) salt. & metallic ores. — which mingling & separating is well adapted to |

112 use of mankind. — ⟨Hutton show⟩[130] Earthquakes part of necessary process of terrestrial renovation & so is Volcano a useful chemical instrument. — Yet neglecting these final causes. — What more

awful scourges to mankind than the Volcano & Earthquake. — Earthquakes act as ploughs Volcanos as Marl-pits: |

113e Consider well age of Bones. = slowness of elevation proved at St Julian. = do not these bones differ as much nearly as the Eocene. = Should Mr Owen consider bones washed about much at Coll. of Surgeon's?[131] I really should think probably that B. Blanca & M. Hermoso contemp:. — Inculcate well that Horse at least has not perished because too cold: — With discussion of camel urge S. Africa productions. — |

114e I think in Patagonia white beds having proceeded from gravel proved. — curious similarity of rocks of very diff. ages. at Port Desire on plain & interstratified. —

Urge fact of Boulders not in lower strata. only in upper. in accordance in Europe with ice theory. —

Capt Ross found in Possession Bay in 73° 39 N. living worms in the mud which he drew up from 1,000 f[athoms], & the temp of which was below freezing point!!![132] |

115 Remember idea of frozen bottom [or beach] of sea to explain preserved animals. — Mem: stream of water in the country. —

Sir J. Herschel says precip. of Sulph. B. all the infinitesimal cryst. arrange themselves in planes. [Mem silky lustre][133] ask Erasmus. whether electricity would affect this. — [134]

State the circumstances of appearance at Concepcion[.] no sign of elevation. Effects of great waves to obliterate all land marks. — At [the?] first it |

116 would though be easy to see on beach successive lines of sea weed —

Histoire Naturelle des Indes

Acosta. p. 125 of French [?] Edition states that the same earthquake has run from Chili to Quito a distance of more than 500 leagues. A little time after a bad earthquake in Chili; Arequipa in 82 was overthrown, & 86. Lima. next year Quito. considers these earthquakes travel in order. —[135] |

117 If we look at Elevations as constantly going on we shall see a cause for Volcanos part of same phenomena lasting so long. —

The great movements (not mere patches as in Italy proved by Coral hypoth. agree with great continents). |

118 Voyage aux terres Australs Vol. I. p. 54. M. Bailly says. "en effet toutes les montagnes de cette île se developpent autour d'elle comme une ceinture d'immenses remparts; toutes affectent une pente plus ou moins inclinée vers le rivage de la mer, tandis, au contraire, que vers le centre de' l île, elles presentent une coupe abrupte et souvent tailée a pic. Toutes ces montagnes |

119 sont formées de couches paralleles et inclinées du centre d'lile, vers la mer; ces couches ont entre elles une correspondance exacte, et lorsquelles se trouvent interrompues par quelque vallées ou par quelque scissures profondes, on les voit se reproduire a des hauteurs communes sur le revers de chacune des montagnes qui forment les vallées ou les scissures. — M. B. thinks these parts incontestably formed the parts of one whole |

120 burning mountain, & that the central part fell in. — Says posterior craters in centre:—[136] Bailly talks of much granite on all East side of Van Diemen Land.[137]

All the Calcareous rocks which harden by themselves cannot be pure. for if so Chalk would |

121 harden. — Climate.!? or small Proportion of Alum: matter. — all pale cream colour. —

The Brecciated structure of all the Pitchstone (which I have seen) is a kind of concretionary structure, for the interlineal spaces are of diff conts: & even in one case contained lime. — All bear close analogy to Obsidian, & all show chemical action as well as effects of cooling |

[misnumbering, no page 122]

123 In Igneous rocks. — which have the cryst of glassy F. fractured. have been melted with little pressure. & perhaps cooled suddenly. —

As the rude symmetry of the globe shows powers have acted from great depths, so changes, acting in those lines. must now proceed from great depths. — important. — |

124 Decemb 10. 1802. Earthquake at Demerara. The earthquakes "seem to arise from some efforts in the land to lift itself higher & to grow upwards; for the land is constantly pushing the sea (which of course must retain same level) to a greater distance". — Afterwards speaks of this phenomenon in connection with "shooting upwards" of the ⟨ground⟩ land in the W Indies. — p. 200. Bollingbroke voyage to the Demerary[138] |

125 Earthquakes at St Helena. 1756. June 1780, Sept 21st. 1817. — p 371. Webster Antarctic veg:[139]

Study Ulloa to see if Indian habitation above regions of vegetation. — ⌈I can find nothing.⌋[140] Mem Carolines quotation from Temple[141]

Urge the <u>mineralogical</u> difference of formations of S. America & Europe. — If great chain of Volc. had been in action during secondary period how diff. would the rocks have been. The red Sandstone of Andes fusible? |

126 no. mad dogs. Azores. although kept in numbers. p. 124. Webster[142]

Consult W. Parish.[143] & Azara.[144] about dry season[.] 1791. seen commonly bad over whole world. ⌈(Was it so in Sydney, consult history? Phillips.⌋[145]

1826.27.28. grt. drought at Sydney. which caused Capt. Sturt expedition. —[146]

ʕAnother one in 1816 (?). — |

127 Mr Owen's curious fact about Crust [word begun: Br...] in Brine.[147] Springs. (Henslow)[148]

Speculate on neutral ground of 2 ostriches; bigger one encroaches on smaller. —[149] change not progressif⟨e⟩: produced at one blow. if one species altered: ⟨altered⟩ Mem: my idea of Volc: islands. elevated. then peculiar plants created. if for such mere points; then any mountain. one is falsely less surprised at new creation for large. — Australias = if for volc. isld. then for any spot of land. = Yet new creation affected by Halo of neighbouring continent: ∤ as if any |

[illegible]

Speculate on neutral ground of 2 Ostriches; bigger one encroaches on smaller.— change not progressive: produced at one blow if one species altered: ~~[illegible]~~ Mem: my idea of Volc. islands. elevated. then peculiar plants created, if for such small points; then any mountain one is justified up[illegible] new creation for large—Australia's = if for Volc. isl^d than for any spot of land.= Yet new creation affected by halo of neighbouring continent: = as if any

creation, taking place over certain area must have peculiar character: 128

Contrast no march of Palms, evergreen trees, expressive cocoa, insects, lizards: & southern limits of no vegetation at S. Shetland: =

Great contrast of two sides of Cordillera where climate similar — do not know botanically = but Lizards &c Both hot[illegible] not contrast. from nature of climate =

Perpetual snow, — subterranean lake near Volcanoes, lakes of brine all mixed;

So strongly [illegible], on the limits of birds & animals in S. America Cordillera:

Pages 127–128 on the species question.

wire whistle [illegible] sounds: ascension [illegible] : [illegible] seen. at long distances: generally [illegible] [illegible]:—

New Zealand rats offering in the history of rats, in the antipodes a _parallel_ case.—

Should urge that extinct Llama owed its death not to change of circumstances; reversed argument knowing it to be a desert.— Tempted to believe animals created for a definite time:— not extinguished by change of circumstances:

The same kind of relation that common ostrich bears to (Petise & diff kinds of Fourmillier): extinct Guanaco to recent: in former case position, in latter time (or changes consequent on lapse) being the relation.— As in first cases distinct species inosculate, so must we believe ancient ones: not _gradual_ change or degeneration. from circumstances: if one species does change into another it must be per saltum— or species may perish.— This ~~inosculation~~ representation of species important, each its own limit & represented.— Chiloe creeper: Furnarius. ~~Caracara~~ Calandria; inosculation alone shows not gradation;—

Pages 129–130 on the species question.

128 creation [taking place] over certain area must have peculiar character:

Contrast low limit of Palms, evergreen trees, arborescent grasses, parasitic plants, Cacti: & with limits of no vegetation at S. Shetland. = [150] Great contrast of two sides of Cordillera, where climate similar. — I do not know botanically = but picturesquely = Both N & S. great contrast from nature of climate. =

Perpetual snow. — subterranean lakes, near Volcanoes. lakes of brine all inhabited:

Go steadily through all the limits of birds & animals in S. America. Zorilla:[151] |

129 wide limits of Waders: Ascension. Keeling: at sea so commonly seen. at long distances; generally first arrives: —

New Zealand rats offering in the history of rats, in the antipodes a parallel case. —

Should urge that extinct Llama owed its death not to change of circumstances; reversed argument. knowing it to be a desert. —[152] Tempted to believe animals created for a definite time: — not extinguished by change of circumstances: |

130 The same kind of relation that common ostrich bears to (Petisse.[153] & diff kinds of Fourmillier)[154]: extinct Guanaco[155] to recent: in former case position, in latter time. (or changes consequent on lapse) being the relation. — As in first cases distinct species inosculate, so must we believe ancient ones: [∴] not <u>gradual</u> change or degeneration. from circumstances: if one species does change into another it must be per saltum — or species may perish. = This ⟨inosculation⟩ representation of species important, each its own limit & represented. — Chiloe creeper:[156] Furnarius.[157] ⟨Caracara⟩[158] Calandria;[159] inosculation alone shows not gradation; — |

131 An argument for the Crust[160] of globe being thin, may be drawn. from. Cordillera. rocks. — When beneath water. — together with hypothetical case of Brazil. — |

132 Propagation. whether ordinary. hermaphrodite. or by cutting an animal in two. (gemmiparous. by nature or accident). we see an individual divided either at one moment or through lapse of ages. — Therefore we are not so much surprised at seeing Zoophite producing distinct animals. still partly united. & egg[s?] which become quite separate. — Considering all individuals of all species. as [each] one individual [divided] by different methods, associated life only adds one other method where the division is not perfect. — |

133 Dogs. Cats. Horses. Cattle. Goat. Asses. have all run wild & bred. no doubt with perfect success. — showing non Creation does not bear upon solely adaptation of animals. — extinction in same manner may not depend. — There is no more wonder in extinction of species than of individual. — |

134e Mr Birchell says Elephant lives on very wretched countries thinly covered by vegetation.[161] Rhinoceros quite in deserts. — Much struck with number of animals at Cape of Good Hope

Says at Santos [M Birchel[s?]] at foot of range some miles from shore. rock of oysters quite above reach of tides. — thinks them same as recent species. —[162] |

135e May I not generalize the fact glaciers most abundant in interior channels. there no outer coast. — important effect. — ? Capt. Fitz Roy. — [163]

Limited Volcanic action & limited earthquakes & great but local elevations of the land in Europe — |

136e Urge difference of plutonic rocks & Volcanic metalliferous —

Urge enormous quantity of matter from crevice of Andes — therefore flowed towards it. a mass on each side 3000 ft thick & 150 broad. neglecting Cordillera itself now remaining — |

137e Lyell [⟨p 419⟩ p 428] states that Von Buch has urged that Java volcanos differ from all others in quantity of Sulph. acid emitted:[164] mem: Grand gypseous formation of Cordillera

In describing structure of Cordillera it must be said, that lines of elevation have connected ⟨lines⟩ [points] of eruption[.] give instance of Etna, Stromboli & Vesuvius |

138 Investigate with greater care. vegetation & climate of Tristan D. Acunha. Kerguelen Land. Prince Edwards Is^{d}. Marion & Crozet. L. Auckland. Macqueries. — Sandwich Is^{d} —

Specimens of rocks were brought home in [written over 'by'] Capt. Forster expedition from ⟨Deception Isl^{d}.⟩ South Shetland Cape Possession. Syenite § Andite? —[165] |

139 Degrading of inland bays. like St. Julian & Port Desire applicable to Craters of Elevation. — The longer diameter of Deception Is^{d} is six Geographical miles and width 2 & 1/2 miles[166]

S. Shetland. Lat. 62° 55′. ⟨onl⟩ one lichen only production. a body which had long been buried, from rotten state of coffin [buried in a mound] long consigned to the earth. yet body had scarcely undergone any decomposition: countenance so well preserved. that it was thought not to have belonged to an Englishmen. — On 8th of March cove began to freeze. correspond [to September][167] |

140e §Did I make any observations on springs at S. Cruz.??? —

Form of land shows subsidence in T. del Fuego, and connection of quadrupeds. — although recent elevation, there may have been great subsidence previously. Mem. pebbles of Porphyry. — Falklands. — off East Coast. — Capt. Cook found soundings. (end of 2^{d} voyage outside coast of T. del Fuego. off. Christmas sound. —[168]

[(Think some 60 fathoms, none thicker than thumb] Sea weed said at Kerguelen Is^{d}. to grow on shoals like Fucus giganteus! 24 fathoms deep 24 |

141e under 50. Kerguelen Land, = the way it stands gales = very strong. Stones as bigger than a man's head. — [Kerguelen 40 by 20 leagues. dimensions:][169]

Bynoe informs me that in Obstruction Sound, in the narrow parts which break through the N & South lines the tides form eddies with its extreme force.[170] Yet, no outlet at head. Important in forming transverse valleys

Ice |

142e Sir W. Parish says they have Earthquakes in Cordoba. one of which dried up ⟨all⟩ a lake in neighbourhood of town[171]

Mr Murchison insisted strongly. that taking up a piece of Falkland Sandstone. he could not distinguish from stone Caradoc from lower of third Silurian division — Together with same general character of fossils deception complete. —[172]

Silliman Journal. year 1835 excellent account of N. American geology. Conybeare[173] |

143e Lava in Cordillera & on Eastern plains [by Antuco]. Athenæum April 1836 (p 302)[174]

Coleccion de obras. 2 Vols fol: Buenos Ayres 1836:[175] W. Parish?? [by Pedro de Angelis.][176]

This work is reviewed in present Edinburgh March 1835[177]

Sir W. Parish says. that beds of shells are found on whole coast from P. Indio to Quilmes. & at least seven miles inland.[178] |

144e The Cordoba earthquake a very remarkable phenomenon. showing line of disturbance inside Cordillera: It is not therefore so wonderful that volcanic rocks at M. Video [Volcano in Pampas]

Pasto Earthquake. Happened on January 20th. 1834

Mr Sowerby. younger. says that Falkland fossils decidedly belong to old Silurian system.[179]

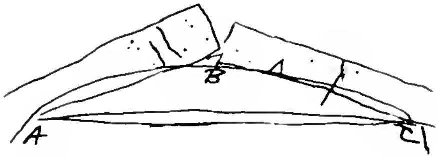
Apply degradation of landlocked harbors to Craters of elevation. — |

145e Lyell suggested to me that no metals in Polynesian Islds — .[180] Volcanic plenty in S. America !! Metamorphic |

146 Volcanos only <u>burst</u> out where strata in act of dislocation (NB. dislocation connected with fluidity of rock ∴ [in earliest stage] when covered up beneath ocean). — The first dislocations & eruptions can only happen during first movements, and therefore beneath ocean, for subsequently there is a coating of solidifying igneous rocks which would be too thick to be penetrated by the repeted trifling injections. — Old vents would keep open long after emersion, but improbably so long, that to be surrounded by continent. — change of volcanic focus. — |

147 ⟨it is certain, if strata can be⟩

Problem dislocate strata without ejection of the fluid propelling mass. If one inch can be raised then all can, for fresh layers of igneous rock replace strata. & it is nothing odd to find them injected by veins & masses [Fig. 8]



(A.B.C. now grown solid.) |

148 Red Sea near Kosir, land appears elevated. Geograph. Journal p 202 Vol IV[181]

When recollecting Gulf of California. Beagle Channel. — One need never be afraid of speculating on the sea |

149 The 24 ft. elevation at Concepcion. from impossibility of such change having taken place unrecorded must be insensible.

Quantity of matter from Cordillera. horizontal movement of fluid matter not (for instance) expansion of solid matter by Heat |

150 Consider profoundly the sandstone of the Portillo line. — connected with ⟨gneiss⟩. — (Mica Slate) [Fig. 9]

((3) like Bell of Quillota.) (A) in this strata may be older than (B). Most important view Urge curious fact felspar melted gneiss/// Quartz!!! Analogous to Von Buch. Basalt where Basalt. trachyte where trachyte.[182] |

151 There must have been as much conglomerate on West of Peuquenes as on East.

Where gone to.? —

There must have been some conglomerate East of Portillo

Where gone to? Intermediate space protected. —

Oh the vast power of the ocean! |

152 Make a grand analogy between Wealden & Bolivia

Transportal of conglomerate between two ranges mysterious!—

Mem. Subsidence Uspallata of which no trace except by trees |

153 The structure of ice in columns. show that granite when weathering into balls. must exhibit orbicular structure. — When we recollect connection of columnar & orbicular in basalt. —

When we see Avestruz two species. certainly different. not insensible change. —[183] Yet one is urged to look to common parent? why should two of the most closely allied species occur in same country? In botany instances diametrically opposite have been instanced: it is |

154 Let it not be overlooked that except by trees, I could not see trace of Subsidence at Uspallata. —

§If crust very thick would there be undulation? would it not be mere vibration? but walls & feeling shows undulation ∴ crust thin. — Concepcion earthquake |

155 Draw close Analogy Lake of Cordill: of Copiápò & Desaguadero. — three ridges in Copiapo, as well as in latter. —

According to Mr Brown,[184] a person (whom I met at S.W.P.) the Cordillera extend to near Salta. & not far from Tucama[n]. & at Chuquisaca. half across the continent. — He states plains of Mendoza smooth. Sir W.P. states that in Helm's travels accounts of travelled boulders from the Cordovise range.[185] Signor Rozales tells me at seven oclock Novem ⟨5th⟩ Concepcion most violently shaken by earthquake. but no serious injury. —[186] |

156 ⟨Analysis of Atacama. Iron in Edinburgh. Phisoph. Transactions. = Mem: Olivine. Volcanic product. = ⟩[187]

⟨Did Peruvian Indians use arrows or Araucanians? —⟩

If wood now preserved over world Dicotyledons far preponderant, if so coniferous must formerly have been most abundant tree —

Metamorphic action: ⟨most⟩ coming so near surface most important |

157e There is map of Cordillera by Humboldt in Geolog. Society[188]

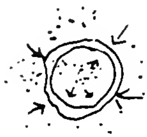
Sir Woodbine Parish informs me that town near Tucuman and Salta. towards the Vermejo was utterly overthrown by earthquake with great destruction of human life. — [189] Temple mentions some earthquake at Cordova. — [190] There the Cordova earthquake |

158e in which lake was absorbed. — Earthquakes felt. different case from shore of Pacific. — Isabelle's volcano, many amygdaloids. — [191] Boussingault ⌈(Lyell)⌉ cracks mountains falling in. — [192] Earthquakes at Quito. tranquility ⌈at Mendoza⌉ exception. — ⌈formerly perhaps otherwise⌉ Mendoza never overthrown, — no mountains |

159 Mackenzie has talked of lava flowing up Hill; (what does he mean?)[193] Consult Dr Holland about bubbles. — [194]

No Volcanic action on coast line of Old Greenland, close to W of Jan Meyen Isld. — Mr Barrow[195] thinks N & S. line connects western isles of Scotland & Iceland. — ⌈Bosh⌉[196] nor on Norway, or Spitzbergen. — Spitzbergen animals (?). |

160 The Hollowness of ⟨sep⟩ Chiloe concretions somewhat analogous to septa. — would particle attracted towards space tend to form ring. [Fig. 10]



motion from within and without

H. Kingdom N. Spain. Vol III p. 113 "Nature exhibited to the Mexicans enormous masses of Iron and Nickel, & these masses which are scattered over the surface of the ground are fibrous. malleable & of so great tenacity, that it is with difficulty that a few fragments can be separated from them with steel instruments."[197] |

161 In R. Brown (Collect: [of F. W.])[198] where the stalactiform masses have layers been accumulated, round knobs, or pushed where soft, or [redissolved?] soft. — /is there any flexure ⟨fr⟩ in the fragmentary jasper. — do undulations (as Hutton says)[199] always come from without. —

[continued from previous page] "True native iron that to which we cannot attribute a meteoric origin & which is constantly found mixed with lead & copper is infinitely rare in all parts of the globe". p. 113[200] |

162 How utterly incomprehensible that if meteoric stones simply pitched from moon, that the metals should be those which have magnetic properties.

Study well products of Solfatarias. some general laws. association of lead & silver. Sulp. of Barytes: Fluoric. Barytes: — |

163e Humboldt. New Spain. Vol III. p. 130[201] Metals in Mexico rarely in secondary always in primitive & transition; the latter rarely appear in central Cordillera. particularly between 18° & 22° N. = formations of amph: porphyry. greenstone[,] amygdaloid. basalt & other trap cover it to great thickness. = Coast of Acapulco granitic rock. — in parts of table granits & gneiss with gold veins visible: — "Porphyries of Mexico may be considered for most parts as rock eminently rich in mines of gold & silver." [p. 131][202] |

164e The above porphyries characterized by no quartz & amphibole frequently only vitreous felspar: = gold veins in a phonolitic porphyry. = several parts of N. Spain great analogy to Hungary. = Veins of Zimapan offer zeolite. stilbite. grammalite. pyenite. native sulphur.. fluor spar. bayte. asbestos garnets. — carb & chrom. of lead. orpiment. chrysoprase. opal: —[203]

Veins in Limestone & Grauwacke: Silver appears far more abundant in the upper limestone, which H. calls by several secondary names[204] |

165e ⌈Study Hoffmans account of steam acting on trachytes. also Azores. We here have case of such vapours washing a rock[205]⌉ Veins concretionary; concretions determined by fissures as in septaria. (& Chiloe case, at least corelation) — Galapagos vein. vein of secretion. — metallic veins follow mountain chain. there after NW ⟨W⟩. — ⌈same chemical laws as in concretions perhaps makes intersections richest — Humboldt has urged phenomena in veins, chemical affinities like in composed rock.[206] granites syenite⌉ ⌈strangling &c of veins can only be accounted for by concretionary action, conjoined with other⌉ ⌈state simplest case. concretions of clay iron stone; iron pyrite in a fossil⌉ Insist strongly on the grand fact of Volcanic & non Volcanic. Then Solfataras. ⌈Mem: Micaceous iron ore.⌉

N.B. To show how metals may be transported by complicated chemical law & steam of salts, quite curious case of oxided Iron by Mitterschlich. Vol. II Journal of Nat. & Geograph Siciences? —[207] |

166e H says in Potosi the silver is contained in a primitive slate, covered by a clayey porphyry, containing grenats. In Peru, on other hand, mine of Gualgayoc or Chota & Pasco in "alpine limestone" = "The wealth of the veins in most part totally independent of the nature of the beds they intersect". = In the Guatemala part. (& Chiloe do) no veins discovered. Humboldt suggests covered up by volcanic rocks.[208] |

167e S^t^ Helena has been slightly broken up, & has there not been vein ⌈of iron⌉ discovered? —

Klaproth analysed silver ores from Peru consisted of native silver. & brown oxide of Iron in Mexico. sulphuretted silver, arsenical grey copper, and antimony, horn silver, black silver & red silver, do not name native silver because not very abundant. — muriated silver. which is so rare in Europe. common there accompanied by molybdated lead & ⌈argentiferous lead⌉; sulfated Barytes very ⌈un⌉common in Mexico. Fluor spar only in certain mines.[209] |

168e ⌈Vol. III⌉ "In general it is observed both in Mexico & Peru, that those oxidated masses of iron which contain silver are peculiar to that part of the veins, nearest to the surface of the earth." —

p. 156.[210] Mines of Batopilas in New Biscay, "Nature exhibits the same minerals there, that are found in the veins of Kongsberg in Norway. — namely dendritic silver intersecting carbonate of lime —[211] native silver in Mexico |

169e is always accompanied by Sulp. silver sometimes by selenite. —[212] in New Spain, contrary to Europe argentiferous lead not abundant. =[213] considerable quantity of silver procured from martial pyrites; great blocks of pure silver not common in ⟨S.⟩ America: In all climates distribution of silver [in veins] very unequal, sometimes disseminated sometimes concentrated: wonderful quantity of pure silver in S. America.[214] |

170e Geology of Guanuaxuato. — Clay slate. passing into talcose & chloritic slate. with beds of syenite & serpentine dipping to SW at 45° to 50° — covered by conformable greenstone porphyrys & phonolites do. amphibole quartz & mica very rare. —[215] ancient freestone & breccia is the same with that on surface of plains of Amazon, no relation — there is more modern breccia, chiefly owing to destruction of porphyries. whereas other to ancient rock. — this N° 2. superimposed on N° 1. even No. 2. might be mistaken for Porphyry |

171e above ancient freestone, limestone & ⟨many⟩ [other secondary] rocks.[216]

Vein traverses both Clay slate, Porphyry North 52 W, & is nearly the same with that of the veta grande of Zacatecas, & veins of Tasco & Moran — of Guanaxuato to SW. with respect to latter doubts whether bed or vein (very like that of Spital of Schemnitz in Hungary.) Humboldt says fragments from roof & penetrating overlying beds tells the secret. — [217] p. 189. "The small ravins into which the valley of Marfil is divided, appear to have a decided influence on the richness of the veta madre of [continued on page 175] |

170e [misnumbered page]

[172e]

D^r D. remarks. bad conductor of Heat do of Electricity[218]

Does not iron, combined with nickel & cobalt (meteoric) resist oxidation? — Mem Sir W. P. stone[219]

It is clear to me, there are laws of solution & deposition under great pressure. (? fact!) unknown to us.

M. Chladni. — on meteoric Mexican stone. Journal des Mines 1809. No. 151. p. 79.[220] |

[misnumbering, no page 173]

174e Under name of Sagitta Triptera D'Orbigny has figured animal with setæ like my undescribed[.] p. 140. Flèche of Quoy et Gaimard. — D'Orbigny has described it with care to 3 species. I think I have much additional information[221] |

175e [continued from page 171] Guanaxuato, which has yielded the most metal, where the direction of ravins, and the slope of the mountains (flaqueza del Cerro) have been parallel to the direction & inclination of the vein". —[222]

at Zacatecas the veta grande has same direction as Guanax. — the other E & W. — veins richest not in ravins or along gentle slopes. but on the most elevated summits, where mountains most torn. — (anticlinal line?). —[223]

Mines of Catorce [(Principal veins)] 25° to 30° to NE. vein of Moran 84° NE. of Real del Monte 85° to S. // Tasco 40° to NW (afterwards said to be [all with some exception] directed NW & SE).[224] |

176e [Vol III] Mexican Cordillera "immense variety of Porphyries which are destitute of quartz, & wh abound both in hornblend & vitreous felspar". — p. 215[225]

Same metal in Tasco vein in Mica Slate & overlying Limestone[226]

Balls of Silver ore occur in do veins.[227] At Huantajaia. Humboldt says, mur of Silv.[,] Sulph. of do.[,]galena[,]quartz, Carb. of Lime. accompany. — Ulloa has said silver in the highest & gold in the lowest. Humboldt states that some of the richest gold mines on ridge of Cordillera near Pataz, also at Gualgayoc. where many petrified shells[228] |

177e Bougainville says P 291. —

The Fuegians treat the "chefs d'œuvre de l[']industrie humaine, comme ils traitent les loix de la nature & ses phenomenes." —[229]

Ulloa's Voyage, Shell fish purple die, marvellous statements on, Vol I, P. 168. on coast of Guayaquil, same as Galapagos.[230]

no Hydrophobia at Quito. P 281. do do[231]

Australia, C. of Good Hope. — Azores Is^{ds} [nor at St Helena. —][232]

Humboldt. New Spain Vol. IV. [p. 58.] At Acapulco earthquakes are recognized as coming from three directions. from W. NW & S. — last to Seaward[233] |

178 partaking of the character of a Araucarian tribe, with point affin of yew & intermediate[234]

Puncture one animal with recent dead body of other. & see if same effects, as with man

Does Indian rubber & black lead unite chemically like grease & mercury |

179 [blank]

180 N.B. P. 73. General reflections on the geology of the world

P. 14. } gradual shoaling of coasts
91 }

93 action of sea on coast.

27. Bahama Is^{d} |

181 De Lucs travels[235]

Beauforts Karamania[236]

Capt. Ross.[237] & Scoresby[238] deep soundings

Gilbert Farquhar Mathison travels Brazil. Peru. Sandwich [Isd][239]

Mawes travels down the Brazil. —[240]

Did Melaspena publish his travels?[241] |

Bellinghausen in 1819[242]

Kotzebue 1816[243] |

inside back cover

Constant log always additive to convert French Toise into English [ft.] 0.8058372

French metre into English ft. 0.5159929

	Toises	Pieds		
Myriametre =	5130.,	4.	5 inches	
Kilometre	513.,	0.	5	
Hectometre	51.	1.	10	
Metre		3.	0.	11 lines
Decimetre			3.8	
Centimetre				4.4

[C. Darwin] |

back
cover

R.N.

Range of Sharks
[Nothing For any Purpose]

The back cover of the Red Notebook, labelled 'R.N.', with the additional notations 'Range of Sharks' and 'Nothing For any Purpose'.

Editor's Notes

[1] Jean François d'Aubuisson de Voisins, *Traité de géognosie*. 2 vols. (Strasbourg, 1819).

[2] Juan Ignacio Molina, *Compendio de la historia geografica...del reyno de Chile* (Madrid, 1788), vol. 1.

[3] Sir Charles Lyell, F.R.S. (1797–1875), prominent British geologist, twice president of the Geological Society of London (1835–1837, 1849–1851), and author of the *Principles of Geology*. 3 vols. (London, 1830, 1832, 1833). This work exercised a formative influence on the development of geology as a science in the nineteenth century and on the career of Charles Darwin, F.R.S. (1809–1882). This entry in the notebook is in light brown ink.

[4] Lyell, *Principles of Geology*. This entry is in light brown ink, and written over the immediately preceding series of dates. The dates pertain to the departure of H.M.S. *Beagle* from England. The *Beagle* sailed from England Tuesday 27 December 1831. The ship encountered heavy seas, caused by gales elsewhere, on Thursday 29 December 1831. For Darwin's description of the *Beagle*'s departure see his letter to his father of 8 February–1 March 1832 in Nora Barlow, ed., *Charles Darwin and the Voyage of the Beagle* (London, 1945), p. 52. Also see N. Barlow, ed., *Charles Darwin's Diary of the Voyage of H.M.S. Beagle* (Cambridge, 1933), pp. 18–19. Darwin could have recorded the date of the *Beagle*'s departure in this notebook at any time during the voyage.

[5] The probable stimulus for this passage was Christian Gottfried Ehrenberg, 'On the Origin of Organic Matter from simple Perceptible Matter, and on Organic Molecules and Atoms; together with some Remarks on the Power of Vision of the Human Eye' in Richard Taylor, ed., *Scientific Memoirs* (London, 1837), vol. 1, pp. 555–576. This entry is in light brown ink, indicating a later dating than the original entries on this page.

[6] Jacques Julien Houton de Labillardière, *Relation du voyage à la recherche de La Pérouse...1791*–[1794] (Paris, 1800), vol. 1, p. 287: "Je revis le fucus que j'avois auparavant rencontré tout près de la Nouvelle-Guinée; il ressemble à de l'étoupe très-fine coupée par petis morceaux longs d'environ trois centimètres: ce sont des filamens aussi fins que des cheveux. On les voyoit souvent réunis en faisceaux, et si nombreux qu'ils ternissoient l'eau de la rade."

[7] John Stevens Henslow, 'Geological Description of Anglesea', *Transactions of the Cambridge Philosophical Society*, vol. 1 (1821–1822), p. 379: "The major axis of

some of the larger nodules is two feet and a half, and the minor one foot and a half; and the conical structure extends to the depth of three or four inches. The direction of the longer axis is placed parallel to the schistose laminae, which pass round the nodules."

[8] William Fitton, 'Geology' in Phillip P. King, *Narrative of a Survey of the Intertropical and Western Coasts of Australia Performed between the Years 1818 and 1822* (London, 1827), vol. 2, p. 585: "The Epidote of Port Warrender and Careening Bay, affords an additional proof of the general distribution of that mineral; which though perhaps it may not constitute large masses, seems to be of more frequent occurrence as a component of rocks than has hitherto been supposed."

[9] Henslow, 'Geological Description of Anglesea', p. 403: "Carbonate of lime is very generally disseminated through every part [of the Plas-Newydd dike]."

[10] Henslow, 'Geological Description of Anglesea', p. 417: "The most interesting phenomena exhibited by this dyke, are the various changes which it assumes in its mineral character."

[11] Henslow, 'Geological Description of Anglesea', p. 434: "Through this dyke there run several veins of quartz, which also abound in the surrounding rock, a fact which I do not recollect witnessing in any other dyke in Anglesea." Also p. 419: "At its [the dyke's] Northern termination the trap has been removed by the continued action of the sea, and its original walls, composed of quartz rock, form a small bay about eighty feet wide."

[12] Henslow, 'Geological Description of Anglesea', p. 375: "As the limestone passes into the schist [at Gwalchmai], it assumes a fissile character, and scales of chlorite are dispersed over the natural fractures."

[13] Henslow, 'Geological Description of Anglesea', p. 432: "The whole [mass of trap] assumes a greenish tinge, but the colouring substance does not appear to be of a very crystalline nature, and is probably chlorite."

[14] See William Dampier, *A New Voyage round the World* (4th ed.; London, 1698–1703), vol. 2 [1699], part 3 subtitled: *A Discourse of Trade-Winds, Breezes, Storms, Seasons of the Year, Tides and Currents of the Torrid Zone throughout the World: With an Account of Natal in Africk, its Product, Negro's, &c.*

[15] Constantin François Volney, *Voyage en Syrie et en Égypte...1783–1785* (2nd ed. rev.; Paris, 1787), vol. 1, chapter 20 the section entitled 'Des vents', and chapter 21 entitled 'Considérations sur les phénomènes des vents, des nuages, des pluies, des brouillards et du tonnerre'.

[16] Dampier, *A New Voyage round the World*, vol. 3 [1703], p. 125: "Of the Sharks we caught a great many, which our Men eat very favourily. Among them we

caught one which was 11 Foot long." I have not found an edition of this work which fits Darwin's page citation exactly. (Ed.)

[17] Dampier, *A New Voyage round the World*, vol. 3 [1703], pp. 125–126: "Its Maw was like a Leather Sack, very thick, and so tough that a sharp Knife could scarce cut it: In which we found the Head and Boans of a *Hippopotomus*; the hairy Lips of which were still sound and not putrified, and the Jaw was also firm, out of which we pluckt a great many Teeth, 2 of them 8 Inches long, and as big as a Mans Thumb, small at one end, and a little crooked; the rest not above half so long. The Maw was full of Jelly which stank extreamly:...'Twas the 7th of *August* when we came into *Shark*'s Bay;..."

[18] Dampier, *A New Voyage round the World*, vol. 3 [1703], p. 114: "At about 30 Leagues distance [from the Abrolhos shoals] we began to see some Scutle-bones floating on the Water; and drawing still nigher the Land we saw greater quantities of them." Also p. 115: "The 30th of *July*, being still nearer the Land, we saw abundance of Scutle-bones and Sea-weed, more Tokens that we were not far from it;..."

[19] Capt. Samuel P. Henry (1800–1852), author of *Sailing Directions for Entering the Ports of Tahiti and Moorea* (London, 1852); personal communication. Darwin met Capt. Henry and his father, a missionary, at Tahiti. See Robert Fitzroy, ed. *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle...1826–1836* (London, 1839), vol. 2, pp. 524, 546, 615; and John Williams, *A Narrative of Missionary Enterprises in the South Sea Islands* (London, 1837), p. 471.

[20] Labillardière, *Relation du voyage à la recherche de La Pérouse*, vol. 1, p. 394: "L'îlot sur lequel nous étions est composé d'un beau granit, où le quartz, le feld-spath et le mica dominent;..." and, p. 395, "La partie occidentale de cet îlot offre, dans un des points les plus élevés un plateau de pierre calcaire...."

[21] Dampier, *A New Voyage round the World*, vol. 3 [1703], p. 151: "The Land hereabouts was much like that part of *New Holland* that I formerly described....'tis low, but seemingly barricado'd with a long Chain of Sand-hills to the Sea, that let's nothing be seen of what is farther within Land."

[22] Jean François Galaup de La Pérouse, *A Voyage round the World Performed in the Years 1785, 1786, 1787, and 1788* (London, 1799), vol. 2, p. 179: "From Norfolk Island, till we got sight of Botany Bay, we sounded every evening with a line of two hundred fathoms, but we found no bottom till we were within eight leagues of the coast, when we had ninety fathoms of water."

[23] Frederick William Beechey, *Narrative of a Voyage to the Pacific and Beering's Strait...1825, 26, 27, 28* (Philadelphia, 1832). See note 59.

[24] This entry is in light brown ink.

[25] The sequence of points on this list runs from south to north along the Brazilian coastline. Place-names and latitudes were checked against British Admiralty charts of the period. Useful in this regard was the *Index to Admiralty Published Charts*, (London, 1874) published by the Hydrographic Office. A bar with a dot over a number indicates that no bottom was found at that depth. Undoubtedly Darwin compiled this list from information available to him aboard ship.

[26] This entry is in light brown ink. As a later addition it would appear to be a correction to the two figures immediately following, although only the '60' is actually cancelled. The sense of the passage would be that at 18–20 leagues from shore no bottom was found at 120 fathoms.

[27] Probably Robert Fitzroy, F.R.S. (1805–1865), Captain of H.M.S. *Beagle* during its surveying voyage of 1831–1836, later vice-admiral in the navy and a meteorologist of considerable repute. It was with Fitzroy's assent that Charles Darwin became the *Beagle*'s naturalist. For reference to Fitzroy's account of the *Beagle*'s voyage see note 19.

[28] Mrs Power, presumably a resident of Port Louis, Mauritius; personal communication. Mrs Power is not mentioned otherwise in Darwin's notes.

[29] The shipwrecked crew of the H.M.S. *Wager* identified their position as 47° 00′ S., 81° 40′ W. Capt. Fitzroy recalculated the probable position of the ship as 47° 39′ 30″ S., 75° 06′ 30″ W. See John Bulkeley and John Cummins, *A Voyage to the South-Seas. . .1740–1* (London, 1743), p. 48; and Fitzroy, ed., *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle. . .1826–1836*, appendix to vol. 2, p. 78. The earthquakes of August 25, 1741 experienced by the shipwrecked crew of the *Wager* were described as "four great Earthquakes, three of which were very terrible; notwithstanding the violent Shocks and Tremblings of the Earth, we find no Ground shifted. Hard Gales of Wind at North, with heavy Showers of Rain." (Bulkeley and Cummins, p. 70.) Also see *JR*, p. 287.

[30] Henry Thomas De La Beche, *A Geological Manual* (London, 1831), sections 5–10.

[31] De La Beche, *A Geological Manual*, section 3, 'Erratic Blocks and Gravel'. In his treatment of the subject De La Beche did not discuss the shapes of individual pieces of gravel.

[32] Robert Were Fox, 'On the electro-magnetic properties of metalliferous veins in the mines of Cornwall', *Philosophical Transactions of the Royal Society of London*, vol. 120 (1830), pp. 399–414.

[33] Joseph Carne, 'On the relative age of the Veins of Cornwall', *Transactions of the Royal Geological Society of Cornwall*, vol. 2 (1822), pp. 49–128.

[34] Baron Albin-Reine Roussin (1781–1854), French naval commander and later admiral, member of the Académie des Sciences, did not write a general account of the hydrographical expedition he led in 1819–1820 to South America. Darwin was already familiar with the technical publication stemming from the voyage, Roussin's *Le Pilote du Brésil* (Paris, 1826).

[35] William D. Conybeare and William Phillips, *Outlines of the Geology of England and Wales* (London, 1822), p. xii: "...one instance of a bone penetrated by silex has occurred to the author, on the beach at Reculver. The calcareous substance of shells, echinites, encrinites, corals, &c. in its slightest change seems only to have lost its colouring matter and gelatine; next they become impregnated with the mineral matrix in which they lie, especially if that matrix be calcareous; hence they become much more compact; often at the same time their original calcareous matter undergoes a change of internal structure, assuming a crystalline form, and in some cases, viz. asteriæ, encrinites, and echinites, a calcareous spar of very peculiar character results, of an opaque cream colour:..."

[36] Conybeare and Phillips, *Outlines of the Geology of England and Wales*, p. xv: "These consolidated gravel beds are called conglomerates, breccias, or pudding-stones; we find them among the transition rocks, in the old red sandstone, in the millstone-grit and coal-grits, in the lower members of the new red sandstone, in the sand strata beneath the chalk, and in the gravel beds associated with the plastic clay, and interposed between the chalk and great London clay."

[37] Despite the faulty citation the reference is certainly to Joseph Jackson Lister, 'Some Observations on the Structure and Functions of tubular and cellular Polypi, and of Ascidiæ', *Philosophical Transactions of the Royal Society of London*, vol. 126 (1834), pp. 365–388.

[38] Alexander von Humboldt, *Personal Narrative of Travels to the Equinoctial Regions of the New Continent...1799–1804* (London, 1829), vol. 7, p. 56: "Farther south, towards Regla and Guanabacoa [to the east of Havana], the syenite disappears, and the whole soil is covered with serpentine, rising in hills from 30 to 40 toises high, and running from east to west." Darwin's copy of Humboldt's *Personal Narrative* is inscribed, "J. S. Henslow to his friend C. Darwin on his departure from England upon a voyage round the World. 21 Sept 1831." It consists of vols. 1–2, 3rd ed.; vol. 3, 2nd ed.; vols. 4, 5, 6, 7, 1st ed. (London, 1819–1829). Alexander von Humboldt (1769–1859), a member of all major scientific academies, was the foremost scientific traveller of his day and a principal contributor to the science of geography.

[39] ['Proteus'], 'The Bahama Islands', *United Service Journal and Naval and Military Magazine*, vol. 3 (1834), p. 215: "[New Providence] is more hilly than most of the islands, the surface being composed of rock and sand intermixed with sea shells." Also see pp. 216 and 226 for mention of the banks.

[40] Sir John F. W. Herschel, F.R.S. (1792–1871), distinguished English astronomer and man of science; presumably personal communication. Darwin met Herschel—"the most memorable event which, for a long period, I have had the good fortune to enjoy"—sometime between 8–15 June 1836 during the *Beagle*'s call at the Cape of Good Hope where Herschel was living, being then engaged in his four-year study of stars visible in the southern hemisphere. See *Diary*, p. 409. Months before, Herschel had described his new notion of the cause of volcanic action in a letter to Charles Lyell dated 20 February 1836. Probably he repeated the same explanation to Darwin in June. Herschel's letter to Lyell has been published by Walter F. Cannon in 'The Impact of Uniformitarianism', *Proceedings of the American Philosophical Society*, vol. 105 (1961), pp. 301–314. See, for example, Herschel's summary comment to Lyell on p. 310: "I don't know whether I have made clear to you my notions about the effects of the removal of matter from...above to below the sea.—1st it produces mechanical subversion of the *equilibrium of pressure*.—2^{dly} it also, & by a different process (as above explained at large) produces a subversion of the equilibrium of temperature. The last is the most important. It *must be an excessively slow process*. & it will depend 1st on the depth of matter deposited.—2^{d} on the quantity of water retained by it under the great squeeze it has got—3^{dly} on the tenacity of the incumbent mass—whether the influx of caloric from below— which MUST TAKE PLACE acting on that water, shall either heave up the whole mass, as *a new continent*—or shall crack *it* & escape as a submarine volcano—or shall be suppressed until the mere weight of the continually accumulating mass breaks its lateral supports at or near the coast lines & opens there a chain of volcanoes."

[41] Sir Andrew Smith, F.R.S. (1797–1872), English army medical doctor and zoologist, later director-general army medical department; personal communication. Darwin's *Diary*, p. 409, records for 8–15 June 1836: "During these days I became acquainted with several very pleasant people. With Dr A. Smith who has lately returned from his most interesting expedition to beyond the Tropic, I took some long geological rambles." On his return to England in 1837 Smith began work on his *Illustrations of the Zoology of South Africa*. 5 parts. (London, 1838–1849).

[42] The meaning of this entry is obscure. The H.M.S. *Chanticleer* did not stop at Pernambuco [Recife] during its 1828–1831 voyage, nor was Pernambuco on the *Beagle*'s itinerary in June of 1836, when this entry was presumably made. In the narrative from the *Chanticleer*'s voyage, however, there are passages which describe decomposing granitic rock at Rio de Janeiro, and refer to what seem to be related formations at Para [Belém] and Maranham [São Luís]. Given Darwin's apparent uncertainty in this entry about location, as indicated by his two cancellations, it may have been these passages which he had in mind. See William H. B. Webster, *Narrative of a Voyage to the Southern Atlantic Ocean...1828–1830* [sic] (London, 1834), vol. 1, pp. 52–53: "The country about Rio in a geological point of view has large claims to attention. Granite and gneiss are the prevailing formation....The rocks in some

parts are decomposed into sand and petunse; the sand having been carried down into the plains, while the petunse remains, and forms extensive beds of porcelain clay admirably adapted for the use of the potter. The lower parts of the granite hills were found chiefly in this condition; the granite having crumbled into micaceous sand and greasy unctuous clay." Also vol. 2, pp. 367: "The geology of Para will detain us a very little while; as there is very little variety or novelty. Precisely the same materials are found here as at Maranham, so that it would be impossible to distinguish them. It is a rare and unusual circumstance to find such a striking coincidence, in two different places. The soil upon which the city stands is of clay and sand. The beds of clay are very extensive, and frequently thirty or forty feet deep. There is scarcely any rock, and that only in particular and isolated masses; it is a coarse dark iron sand-stone, with numerous particles of quartz in it.... This dark iron sand-stone, with fragments of white quartz, is observable at Maranham, and is the predominant formation at St. Paul's, a little to the southward of Rio."

[43] The clipping, entitled 'Earthquake at Sea' is from the *Carmarthen Journal*, 3 April 1835. The story was reprinted verbatim from *The Times* (London), 28 March 1835, p. 5, with the unfortunate error of a lost digit in the quotation of the ship's latitude. The ship's coordinates as given in *The Times* were 18° 47′ N., 61° 22′ W., which would place the ship in the Atlantic Ocean to the northeast of the Leeward Islands, rather than, as in the incorrectly printed version, in Venezuela.

[44] The H.M.S. *Challenger* ran aground on the Chilean shore at Punta Morguilla [Point Molguilla] (37° 46′ S., 73° 40′ W.) on 19 May 1835. See Fitzroy, ed., *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle*, vol. 2, pp. 451–456. Capt. Fitzroy led the party which rescued the *Challenger*'s crew.

[45] This paragraph is double scored in the left margin with brown ink.

[46] In this series of place names the locations of Guacho and Washington are uncertain. There is presently a Quebrado del Guacho, a small stream, at 33° 58′ S., 71° 09′ W. in Chile, and a Cerro Guacho, a mountain, nearby. 'Washington' may refer to the Canal Washington at 55° 40′ S., 67° 33′ W. in Tierra del Fuego.

[47] Fitton, 'Geology', in King, *Narrative of A Survey of the Intertropical and Western Coasts of Australia*, vol. 2, p. 604: "The tendency of all this evidence is somewhat in favour of a general parallelism in the range of the strata,—and perhaps of the existence of primary ranges of mountains on the east of Australia in general, from the coast about Cape Weymouth to the shore between Spencer's Gulf and Cape Howe." And on p. 605: "If... future researches should confirm the indications above mentioned, a new case will be supplied in support of the principle long since advanced by Mr. Michell which appears (whatever theory be formed to explain it,) to be established by geological observation in so many other parts of the world,—that the outcrop of the inclined beds, throughout the stratified portion of the globe, is every

where parallel to the longer ridges of mountains,—towards which, also, the elevation of the strata is directed."

[48] Charles Daubeny, *A Description of Active and Extinct Volcanos* (London, 1826), p. 24: "It [a formation at the hill of Mouton] should be noticed, as one of the few localities in Auvergne where pumice is to be found, which seems the more remarkable, as this substance is a common product of that class of volcanos, which consists of trachyte."

[49] This entry is in light brown ink. The back of page 1, of Darwin's geological notes on New Zealand is fol. 802 verso in the Darwin MSS, Cambridge University Library, vol. 37 (ii). The page contains a sketch of the silhouette of an island in the Bay of Islands, New Zealand. Darwin noted that at high water the island had the figure of a hill and at low water the figure of a hill surrounded by a level ledge of naked rock. He associated the formation of the ledge with the action of the tides. This page in Darwin's geological notes also contains a cross-reference to 'R.N.' page 38.

[50] See *GSA*, pp. 25–26, for the published version of this description of the origin of the cliffs at St Helena.

[51] Daubeny, *Volcanos*, reference uncertain, possibly to the author's representation of Humboldt's 'unpublished' views on pp. 345–351. 'Daubeny' is written in light brown ink.

[52] Humboldt, *Personal Narrative*, vol. 1, p. 171: "The Peak of Teneriffe, and Cotopaxi, on the contrary, are of very different construction. At their summit a circular wall surrounds the crater; which wall, at a distance, has the appearance of a small cylinder placed on a truncated cone." Also, with respect to the peak of Teneriffe, on p. 176: "The wall of compact lava which forms the enclosure of the Caldera, is snow white at it's surface. . . .When we break these lavas, which might be taken at some distance for calcareous stone, we find in them a blackish brown nucleus. Porphyry with basis of pitch stone is whitened externally by the slow action of the vapors of sulphurous acid gas."

[53] Humboldt, *Personal Narrative*, vol. 1, pp. 219–232.

[54] Daubeny, *Volcanos*, p. 349. Not easily summarized, see note 51.

[55] Daubeny, *Volcanos*, p. 361: "Humboldt gives us the following series of phænomena, which presented themselves on the American Hemisphere between the years 1796 and 97, as well as between 1811 and 1812.

1796.—September 27.	Eruption in the West India Islands; volcano of Guadaloupe in activity.
. . . . . . .November . . .	The volcano of Pasto begins to emit smoke.
. . . . . . .December 14.	Destruction of Cumana by earthquake.

1797.—February 4...	Destruction of Riobamba by earthquake.
1811.—January 30...	Appearance of Sabrina Island in the Azores. It increases particularly on the 15th of June.
.......May	Beginning of the earthquakes in the Island of St. Vincent, which lasted till May, 1812.
.......December 16.	Beginning of the commotions in the valley of the Mississippi and Ohio, which lasted till 1813.
.......December ...	Earthquake at Carracas.
1812.—March 26....	Destruction of Caraccas; earthquakes which continued till 1813.
.......April 30.....	Eruption of the volcano in St. Vincents'; and the same day subterranean noises at Caraccas, and on the banks of the Apure."

[56] Daubeny, *Volcanos*, pp. 382–383: "With regard to the mineralogical characters of lava, I shall appeal to the authority of [Leopold] Von Buch....Almost all lavas he conceives to be a modification of trachyte, consisting essentially of felspar united with titaniferous iron, to which they owe their colour and their power of attracting iron.... This felspar is derived immediately from trachyte, that being the rock which directly surrounds the focus of the volcanic action; for if we examine the strata that successively present themselves on the sides of a crater, we are sure to find that the lowest in the series is trachyte, from which is derived by fusion the obsidian, as is the case at Teneriffe." Leopold von Buch (1774–1853), German geologist and mineralogist, a member of the Royal Academy of Berlin, was distinguished for the versatility of his interests in geology and for the high quality of his extensive field work.

[57] Daubeny, *Volcanos*, p. 386: "...in the collection of Dr. Thomson, now in the Museum of Edinburgh, there is said to be a fragment of lava enclosing a real granite, which is composed of reddish felspar with a pearly lustre like adularia, of quartz, mica, hornblende, and lazulite. I have likewise seen among the specimens from the Ponza Islands,...a piece of granite, or perhaps rather of a syenitic rock,...found in the midst of the trachyte from this locality. But the most interesting fact perhaps of this description, is...the presence of a mass of granite containing tin-stone, enveloped in the midst of a stream of lava from Mount Ætna....It may be remarked, that these specimens of granitic rocks have, in general, a degree of brittleness, which accords very well with the notion of their exposure to fire."

[58] Lyell, *Principles of Geology*, vol. 1, p. 318 refers to Java "where there are thirty-eight large volcanic mountains, many of which continually discharge smoke and sulphureous vapours." This entry is written in light brown ink.

[59] Beechey, *Narrative of a Voyage to the Pacific and Beering's Strait*, p. 209: "In latitude 60° 47′ N. we noticed a change in the colour of the water, and on sounding found fifty-four fathoms, soft blue clay. From that time until we took our final departure from this sea the bottom was always within reach of our common lines. The water shoaled so gradually that at midnight on the 16th, after having run a hundred and fifty miles, we had thirty-one fathoms." P. 211: "We soon lost sight of every distant object, and directed our course along the land [St Lawrence Island], trying the depth of water occasionally. The bottom was tolerably even; but we decreased the soundings to nine fathoms, about four miles off the western point, and changed the ground from fine sand, to stones and shingle. When we had passed the wedged-shaped cliff at the north-western point of the island, the soundings again deepened, and changed to sand, as at first.... [Zoological specimens were procured] in seventeen fathoms over a muddy bottom, several leagues from the island." P. 212–213: "In our passage from the St. Lawrence Island to this situation, the depth of the sea increased a little, until to the northward of King's Island, after which it began to decrease; but in the vicinity of the Diomede Islands, where the strait became narrowed, it again deepened, and continued between twenty-five and twenty-seven fathoms. The bottom, until close to the Diomedes, was composed of fine sand, but near them it changed to course stones and gravel, as at St. Lawrence Island...." P. 213: "Near the Asiatic coast we had a sandy bottom, but, in crossing over the [Beering's] strait, it changed to mud, until well over on the American side, where we passed a tongue of sand and stones in twelve fathoms which, in all probability, was the extremity of a shoal, on which the ship was nearly lost the succeeding year. After crossing it, the water deepened, and the bottom again changed to mud, and we had ten and a half fathoms within two and a half miles of the coast." P. 444: "In this parallel [61° 58′ N] the nearest point of land bearing N. 74° W. true, thirteen miles, the depth of water was 26 fathoms; and it increased gradually as we receded from the coast....We made the land [St Lawrence Island] about the same place we had done the preceding year, stood along it to the northward, and passed its N.W. extreme, at two miles and a half distance, in 15 fathoms water, over a bottom of stones and shells, which soon changed again to sand and mud....On the after-noon of the 2d we...anchored off Point Rodney...in seven fathoms, three miles from the land...."

[60] In 'at' an upper case 'a' has been superimposed on a lower case 'a'.

[61] The 'turn over' indicates that the entry continues on the next page. The entire paragraph at the bottom of page 45e is scored for emphasis in light brown ink.

[62] The quotation is from Daubeny, *Volcanos*, p. 402 which summarizes the argument presented in Conybeare and Phillips, *Outlines of the Geology of England and Wales*, p. xx.

[63] The question mark is written in light brown ink.

[64] See note 62.

[65] See Daubeny, *Volcanos*, p. 438 for the following note: "Cet endroit [near the Red Sea] recouvert de sable, environné de rochers bas en forme d'amphitheatre, offre une pente rapide vers la mer dont il est eloignè d'un demi mille, et peur avoir trois cent pieds de hauteur sur quatre-vingts de largeur. On lui a donné la nom de Cloche, parcequ'il rend des sons, non comme faisait autrefois la statue de Memnon, au lever du soleil, mais à toute heure du jour et de la nuit et dans toutes les saisons. La premiere fois qu'y alla M. Gray, il entendit au bout d'un quart d'heure un son doux et continu sous ses pieds, son, qui en augmentant ressembla à celui d'une clocha qu'on frappe, el qui devient si fort en cinq minutes, qu'il fit detacher du sable, et effraya les chamaux jusqu'â les mettre en fureur." Also see *JR*, p. 441.

[66] Volney, *Voyage en Syrie et en Égypte*, vol. 1, p. 351 with reference to the deserts of Syria: "Presque toujours également nue, la terre n'offre que des plantes ligneuses clair-semées, et des buissons épars, dont la solitude n'est que rarement troublée par des gazelles, des lièvres, des sauterelles et des rats."

[67] Lyell, *Principles of Geology*, vol. 2, chap. 11 bears the following summary heading: "Theory of the successive extinction of species consistent with their limited geographical distribution—The discordance in the opinions of botanists respecting the centres from which plants have been diffused may arise from changes in physical geography subsequent to the origin of living species—Whether there are grounds for inferring that the loss from time to time of certain animals and plants is compensated by the introduction of new species?—Whether any evidence of such new creations could be expected within the historical era, even if they had been as frequent as cases of extinction?—The question whether the existing species have been created in succession can only be decided by reference to geological monuments."

[68] In this case 'from' is written over 'the'.

[69] John Miers, *Travels in Chile and La Plata* (London, 1826), vol. 1, p. 77: "About two miles to the eastward of Barranquitos [32° 35′ S., 64° 20′ W.] I picked out of the sand a small fragment of quartz, about half the size of a hazel nut. This was the first pebble or stone of any sort I had seen since I left Buenos Ayres."

[70] Charles Marie de La Condamine, *A Succinct Abridgment of a Voyage Made within the Inland Parts of South-America* (London, 1747), p. 24: "Below *Borja*, even for four or five hundred leagues, a stone, even a single flint, is as great a rarity as a diamond would be. The savages of those countries don't know what a stone is, and have not even any notion of it. It is diversion enough to see some of them, when they come to *Borja*, and first meet with stones, express their admiration of them by signs, and be eager to pick them up; loading themselves therewith, as with a valuable merchandize; and soon after despise and throw them away, when they perceive them to be so common." See *JR*, p. 289.

[71] The phrase 'Carnatic | It has been common practice of geologists' appears in very small handwriting in light brown ink, which indicates that it was written some time after the other entries on pages 56e–57. Fortunately, however, despite the fragmentary nature of the entry, there exists a reference in Darwin's notes from the voyage, again by way of addition made in light brown ink, which identifies the use of 'Carnatic' in this context. See Darwin MSS, Cambridge University Library, vol. 33, fol. 115 verso, for citation of the following reference. James Allardyce, 'On the Granitic Formation, and direction of the Primary Mountain Chains, of Southern India', *Madras Journal of Literature and Science*, vol. 4 (1836), pp. 332–333: "It has been remarked that granite in America is found at a much lower level than in Europe: this is also the case throughout the south of India, by granite—meaning always granitic rocks; for a regularly crystallized compound of quartz, felspar and mica, is not to be expected. The Carnatic, and several other similar tracts, occurring along both coasts, are, as granitic plains, surprisingly level: the slight tertiary diluvium with which they are covered, cannot be considered as a principal cause of this uniformity, for the rock itself is everywhere found near the surface: every appearance here indicates the granitic formation has at one time been a great deal more flat than it is generally understood to have been."

[72] Lyell, *Principles of Geology*, vol. 3, p. 84: "It is clear, from what we before said of the gradual manner in which the principal cone [of Etna] increases, partly by streams of lava and showers of volcanic ashes ejected from the summit, partly by the throwing up of minor hills and the issuing of lava-currents on the flanks of the mountain, that the whole cone must consist of a series of cones enveloping others, the regularity of each being only interrupted by the interference of the lateral volcanos."

[73] This question mark and a line of scoring alongside the preceding sentence are in light brown ink.

[74] 'Rapilli' was equivalent in meaning to 'lapilli'. See, for example, the use of 'rapilli' by Daubeny (*Volcanos*, p. 251) and Humboldt (*Personal Narrative*, vol. 1, p. 232).

[75] This entry is in light brown ink.

[76] An oval depression towards the eastern end of Ascension Island was described by the resident English marines as the cricket ground because "the bottom is smooth and perfectly horizontal." See Darwin MSS, Cambridge University Library, vol. 38(ii), fol. 941 verso.

[77] Lyell, *Principles of Geology*, vol. 3, p. 111 begins the section entitled "Sea-cliffs—proofs of successive elevation." Lyell's point is stated most succinctly on page 113 where he cites the testimony of another author writing on the alterations produced by the sea on calcareous rocks on the shores of Greece "that there are four or five

distinct ranges of ancient sea cliffs, one above the other, at various elevations in the Morea, which attest as many *successive* elevations of the country."

[78] In this passage Darwin would seem to be addressing Lyell's argument (*Principles of Geology*, vol. 3, p. 114) that "...a country that has been raised at a very remote period to a considerable height above the level of the sea, may present nearly the same external configuration as one that has been more recently uplifted to the same height."

[79] Lyell, *Principles of Geology*, vol. 3, p. 116: "...we have seen [for the newer Pliocene] that a stratified mass of solid limestone, attaining sometimes a thickness of eight hundred feet and upwards, has been gradually deposited at the bottom of the sea, the imbedded fossil shells and corallines being almost all of recent species. Yet these fossils are frequently in the state of mere casts, so that in appearance they correspond very closely to organic remains found in limestones of very ancient date."

[80] René Primevère Lesson and Prosper Garnot, *Voyage autour du monde...1822–1825. Zoologie* (Paris, 1826), vol. 1, part 1, p. 14: "...mais il est à remarquer que cette île vaste et composée de deux terres séparées par un détroit, quoique rapprochée de la Nouvelle-Hollande et par la même latitude, en diffère si complétement, qu'elles ne se ressemblent nullement dans leurs productions végétales. Toutefois la Nouvelle-Zélande, si riche en genres particuliers à son sol et peu connus, en a cependant d'indiens, tels que des piper, des olea, et une fougère réniforme qui existe, à ce qu'on assure, à l'île Maurice." Also p. 22: "Il est à remarquer qu'on ne connaît aucun quadrupède comme véritablement indigène de la Nouvelle-Zélande, excepté le rat, si abondamment répandu sur les îles de l'Océanie, comme sur presque l'univers entier."

[81] Molina, *Compendio de la historia geografica...del reyno de Chile*, vol. 1, p. 30: "La erupcion mas famosa de que tenemos noticia, fue la del volcan del monte de *Peteroa*, que el dia tres de Diciembre del ãno 1762 se abrió una nueva boca ó *cratéra*, hendiendo en dos partes un monte contiguo por espacio de muchas millas. El estrepito fue tan horrible, que se sintió en una gran parte del Reyno, pero no causó vibracion alguna sensible. Las cenizas y las lavas rellenaron todos los valles inmediatos, y aumentaron por dos dias las aguas del rio *Tingiririca*; y precipitandose un pedazo de monte sobre el gran rio *Lontué*, suspendió su corriente por espacio de diez dias, y estancadas las aguas, despues de haber formado una dilatada laguna que exîste en el dia, se abrieron por ultimo con violencia un nuevo camino, é inundaron todos aquellos campos." Darwin noted this passage in his own copy of the work with the remark, "P 30 — Piteron Earthquake caused lake & deluge — state of valleys." This entry is in light brown ink.

[82] Lyell, *Principles of Geology*, vol. 3, p. 124: "Towards the centre [of the dikes at Somma, the ancient cone of Vesuvius]...the rock is coarser grained, the component elements being in a far more crystalline state, while at the edge the lava is sometimes

vitreous and always finer grained. A thin parting band, approaching in its character to pitchstone, occasionally intervenes on the contact of the vertical dike and intersected beds. M. Necker mentions one of these at the place called Primo Monte, in the Atrio del Cavallo; I saw three or four others in different parts of the great escarpment."

[83] William F. W. Owen, *Narrative of Voyages to...Africa, Arabia, and Madagascar* (London, 1833), vol. 2, pp. 274–275: "[at Benguela]...the elephants were likewise common, but at present are scarce. A number of these animals had some time since entered the town in a body, to possess themselves of the wells, not being able to procure any water in the country. The inhabitants mustered, when a desperate conflict ensued, which terminated in the ultimate discomfiture of the invaders, but not until they had killed one man and wounded several others."

[84] Lyell, *Principles of Geology*, vol. 2, p. 189: "Thousands of carcasses of terrestrial animals are floated down every century into the sea, and, together with forests of drift-timber, are imbedded in subaqueous deposits, where their elements are imprisoned in solid strata...." Also p. 247: "...we see the putrid carcasses of dogs and cats, even in rivers, floating with considerable weights attached to them...."

[85] Claude Gay, 'Aperçu sur les recherches d'histoire naturelle faites dans l'Amérique du sud, et principalement dans le Chili, pendent les années 1830 et 1831', *Annales des sciences naturelles*, vol. 28 (1833), p. 371: "Ces contrées [Rio de Janeiro, Monte Video, Buenos Aires] m'offrirent aussi une assez belle collection d'insectes et plusieurs coquilles fluviatiles et marines, telles que des Mytilus, des Solens, des Ampullaires, etc., qui offraient ce phénomène digne de remarque, de vivre pêle-mêle dans les eaux simplement saumâtres." See *JR*, p. 24.

[86] De La Beche, *Geological Manual*, p. 73: "The Chesil Bank, connecting the Isle of Portland with the main land, is about sixteen miles long, and...the pebbles increase in size from west to east...The sea separates the Chesil Bank from the land for about half its length, so that, for about eight miles, it forms a shingle ridge in the sea. The effects of the waves, however, on either side are very unequal; on the western side the propelling and piling influence is considerable, while on the eastern, or that part between the bank and the main land, it is of trifling importance."

[87] Capt. Robert Fitzroy (note 27).

[88] Lyell, *Principles of Geology*, vol. 3, pp. 210–211: "The situation of this cliff [at Dax, France], is interesting, as marking one of the pauses which intervened between the successive movements of elevation whereby the marine tertiary strata of this country were upheaved to their present height, a pause which allowed time for the sea to advance and strip off the upper beds a,b, from the denuded clay c."

No. 53.

Section of Inland cliff at Abesse, near Dax.

a, Sand of the Landes. *b*, Limestone. *c*, Clay.

[89] Thomas Falkner, *A Description of Patagonia* (London, 1774), p. 51: "Being in the Vuulcan, below Cape St. Anthony, I was witness to a vast cloud of ashes being carried by the winds, and darkening the whole sky. It spread over great part of the jurisdiction of Buenos-Ayres, passed the River of Plata, and scattered it's contents on both sides of the river, in so much that the grass was covered with ashes. This was caused by the eruption of a volcano near Mendoza; the winds carrying the light ashes to the incredible distance of three hundred leagues or more."

[90] Lyell, *Principles of Geology*, vol. 3, p. 204: "Some of these bones [in certain strata in the basin of the Loire] have precisely the same black colour as those found in the peaty shell-marl of Scotland; and we might imagine them to have been dyed black in *Miocene peat* which was swept down into the sea during the waste of cliffs, did we not find the remains of cetacea in the same strata, bones, for example, of the lamantine, morse, sea-calf, and dolphin, having precisely the same colour."

[91] Lyell, *Principles of Geology*, vol. 1, p. 316: "We have before mentioned the violent earthquakes which, in 1812, convulsed the valley of the Mississippi at New Madrid, for the space of three hundred miles in length. As this happened exactly at the same time as the great earthquake of Caraccas, it is probably that these two points are parts of one continuous volcanic region...."

[92] Humboldt, *Personal Narrative*, vol. 4, pp. 11–12: "The extraordinary commotions felt almost continually during two years on the borders of the Missisippi and the Ohio, and which coincided in 1812 with those of the valley of Caraccas, were preceded at Louisiana by a year almost exempt from thunder storms."

[93] Lyell, *Principles of Geology*, vol. 1, pp. 321–322: "Syria and Palestine abound in volcanic appearances, and very extensive areas have been shaken, at different periods, with great destruction of cities and loss of lives. It has been remarked...that from the commencement of the thirteenth to the latter half of the seventeenth century, there was an almost entire cessation of earthquakes in Syria and Judea; and, during this interval of quiescence, the Archipelago, together with part of the adjacent coast of Lesser Asia, as also Southern Italy and Sicily, suffered extraordinary convulsions; while volcanic eruptions in those parts were unusually frequent. A more extended comparison...seems to confirm the opinion, that a violent crisis of commotion never

visits both at the same time. It is impossible for us to declare, as yet, whether this phenomenon is constant in this, or general in other regions, because we can rarely trace back a connected series of events farther than a few centuries; but it is well known that, where numerous vents are clustered together within a small area, as in the many archipelagos for instance, two of them are never in violent eruption at once."

[94] Jean Baptiste Bory de Saint-Vincent, *Voyage dans les quatre principales îles des mers d'Afrique...1801–1802* (Paris, 1804), vol. 1, chap. 6 describes the physical geography of Mauritius but does not answer Darwin's question directly. While at Mauritius Darwin was unable to inspect the entire island himself and sought information from other sources. See *VI*, pp. 28–31 and pp. 118–120 of this notebook.

[95] Alexander von Humboldt, *Fragmens de géologie et de climatologie asiatiques*. 2 vols. (Paris, 1831).

[96] The exact quotation is uncertain, but the following sentence suggests Humboldt's views (*Fragmens...asiatiques*, vol. 1, pp. 5–6): "La *volcanicité*, c'est-à-dire, l'influence qu'exerce l'intérieur d'une planète sur son enveloppe extérieure dans les différens stades de son refroidissement, à cause de l'inégalité d'agrégation (de fluidité et de solidité), dans laquelle se trouvent les matières qui la composent, cette action du dedans en dehors (si je puis m'exprimer ainsi) est aujourd'hui très affaiblie, restreinte à un petit nombre de points, intermittente, moins souvent déplacée, très simplifiée dans ses effets chimiques, ne produisant des roches qu'autour de petites ouvertures circulaires ou sur des crevasses longitudinales de peu d'étendue, ne manifestant sa puissance, à de grandes distances, que dynamiquement en ébranlant la croûte de notre planète dans des directions linéaires, ou dans des étendues (cercles d'oscillations simultanées) qui restent les mêmes pendant un grand nombre de siècles."

[97] This entry is written in brown ink.

[98] George Juan and Antonio de Ulloa, *A Voyage to South America* (4th ed.; London, 1806), vol. 2, p. 84: "According to an account sent to Lima after this accident, a volcano in Lucanas burst forth the same night and ejected such quantities of water, that the whole country was overflowed; and in the mountain near Patas, called Conversiones de Caxamarquilla, three other volcanoes burst, discharging frightful torrents of water...."

[99] George Poulett Scrope, *Considerations on Volcanos* (London, 1825), chap. 2, sections 41–42 including the statement on p. 60: "It is obvious how the powerful ascending draught of air which constitutes a hurricane, and which acts so strongly in depressing the barometer, will have an equal effect in setting loose the imprisoned winds of the earth." Also see *JR*, p. 431.

[100] Lyell, *Principles of Geology*, vol. 3, p. 364: "If...we conceive it probable that plutonic rocks have originated in the nether parts of the earth's crust, as often as the

volcanic have been generated at the surface, we may imagine that no small quantity of the former class has been forming in the recent epoch, since we suppose that about 2000 volcanic eruptions may occur in the course of every century, either above the waters of the sea or beneath them."

[101] John Michell, 'Conjectures concerning the Cause, and Observations on the Phænomena of Earthquakes; particularly of that Great Earthquake of the First of November 1755, which proved so fatal to the City of Lisbon, and whose Effects were felt as far as Africa, and more or less throughout almost all Europe', *Philosophical Transactions of the Royal Society of London*, vol. 51 (1760), p. 617: "The great earthquake that destroyed Lima and Callao in 1746, seems also to have come from the sea; for several of the ports upon the coast were overwhelmed by a great wave, which did not arrive till four or five minutes after the earthquake began, and which was preceded by a retreat of the waters, as well as that at Lisbon." Darwin's own copy of this article was a reprint which had been repaginated by the printer and is separately bound; this quotation appears on p. 54 of his copy.

[102] Lyell, *Principles of Geology*, vol. 1, pp. 471–472: "Sometimes the rising of the coast must give rise to the retreat of the sea, and the subsequent wave may be occasioned by the subsiding of the shore to its former level; but this will not always account for the phenomena. During the Lisbon earthquake, for example, the retreat preceded the wave not only on the coast of Portugal, but also at the island of Madeira and several other places."

[103] Lyell did discuss 'partial shrinking after elevation', but, as Darwin's cancellation indicates, did not relate it to the existence of an underlying injected mass of fluid rock. See Lyell, *Principles of Geology*, vol. 1, p. 477: "It is to be expected, on mechanical principles, that the constant subtraction of matter from the interior will cause vacuities, so that the surface undermined will fall in during convulsions which shake the earth's crust even to great depths, and the sinking down will be occasioned partly by the hollows left when portions of the solid crust are heaved up, and partly when they are undermined by the subtraction of lava and the ingredients of decomposed rocks." In his own copy of this work Darwin commented: "if there are hollows left what forces up the lava" and then crossed out his remark. A few pages previously (p. 468) he had challenged Lyell's association of the occurrence of submarine earthquakes with the percolation of sea water to underlying masses of incandescent lava with the remark, "We may more easily imagine the fluid stone injected (as occurs in every mountain chain) amongst damp strata." He also questioned whether water could percolate through strata already under great pressure. In short, it would seem that Darwin realized he was describing his own idea rather than Lyell's in the course of writing this entry.

[104] Lyell, *Principles of Geology*, vol. 1, p. 191: "Darby mentions beds of marine shells on the banks of Red River, which seem to indicate that Lower Louisiana is of

recent formation: its elevation, perhaps, above the sea, may have been due to the same series of earthquakes which continues to agitate equatorial America." The work referred to is William Darby, *A Geographical Description of the State of Louisiana* (Philadelphia, 1816).

[105] William J. Burchell, *Travels in the Interior of Southern Africa* (London, 1824), vol. 2, pp. 71–79 describes the killing of two rhinoceroses south of the Hyena Mountains (30° 10′ S., 24° 0′ E.). In his own copy of the work Darwin scored the passage on p. 78 where Burchell described his sensation of the heat on a day of the hunt: "Although so chilling at sunrise, the weather had, by noon, changed to the opposite extreme. Exposed in the middle of a dry plain, where not a tree to afford shade was to be seen, I scarcely could endure the rays of the sun, which poured down, as it were, a shower of fire upon us." See also *JR*, pp. 101–102.

[106] Lyell, *Principles of Geology*, vol. 3, p. 355: "The main body of the granite here [in Cornwall] is of a porphyritic appearance with large crystals of felspar; but in the veins it is fine-grained and without these large crystals.... The vein-granite of Cornwall very generally assumes a finer grain, and frequently undergoes a change in mineral composition, as is very commonly observed in other countries. Thus, according to Professor Sedgwick, the main body of the Cornish granite is an aggregate of mica, quartz, and felspar; but the veins are sometimes without mica, being a granular aggregate of quartz and felspar."

[107] Daubeny, *Volcanos*, pp. 94–95: "Trachytic porphyry also appears to pass by imperceptible gradations into the next species, pearlstone, which is characterized by the vitreous aspect generally belonging to its component parts.... In its simplest form, this rock presents an assemblage of globules, varying from the size of a nut to that of a grain of sand, which have usually a pearly lustre, and scaly aspect.... In some varieties the globules are destitute of lustre, and exhibit at the same time sundry alterations in their size, structure, and mode of aggregation, till at length they entirely disappear, and the whole mass puts on a stony appearance, which retains none of the characters of pearlstone.... Various alternations occur between the glassy and stony varieties of the pearlstone, sometimes so frequent as to give a veined or ribboned appearance to the rock, at others curiously contorted as though they had been disturbed in the act of cooling."

[108] William Phillips, *An Elementary Introduction to the Knowledge of Mineralogy* (3rd ed.; London, 1823) contains no reference to pearlstone in Peru, but on p. 112 there is the statement that "At Tokay in Hungary, [pearlstone] is found enclosing round masses of black vitreous obsidian, and is intermixed with the debris of granite, gneiss, and porphyry, and alternating in beds with the latter."

[109] Daubeny, *Volcanos*, p. 180: "[The island of Ischia] is composed for the most part of a rock which seems to consist of very finely comminuted pumice, reagglutinated

so as to form a tuff. . . .Although the pumiceous conglomerate, as I shall venture to call this rock, is seen in every part of the island, yet at Monte Vico. . .we observe intermixed with it huge blocks of trachyte. . . ." In a footnote on this page, which Darwin heavily scored in his own copy of the work, Daubeny stated that other geologists had identified the predominate rock at Ischia as an "earthy variety of trachyte".

[110] Sir George Steuart Mackenzie, F.R.S. (1780–1848), mineralogist, as quoted in Daubeny, *Volcanos*, p. 221: "In many places [in Iceland], [Sir G. Mackenzie] says, an extensive stratum of volcanic matter has been heaved up into large bubbles or blisters, varying from a few feet to forty or fifty in diameter." The original reference is to George Steuart Mackenzie, *Travels in the Island of Iceland. . .1810* (Edinburgh 1811), pp. 389–390.

[111] As quoted in Daubeny, *Volcanos*, p. 313: "In Sumatra, Marsden has described four [volcanos] as existing, but the following are all the particulars known concerning them: Lava has been seen to flow from a considerable volcano near *Priamang*, but the only volcano this observer had an opportunity of visiting, opened on the side of a mountain about 20 miles inland of Bencoolen, one fourth way from the top, so far as he could judge. . . .He never observed any connexion between the state of the mountain and the earthquake, but it was stated to him, that a few years before his arrival it was remarked to send forth flame during an earthquake, which it does not usually do. The inhabitants are however alarmed, when these vents all remain tranquil for a considerable time together, as they find by experience, that they then become more liable to earthquakes." The original reference is to William Marsden, *The History of Sumatra* (3rd ed.; London, 1811), pp. 29–30.

[112] Alexandre Moreau de Jonnès (1778–1870), French economist and natural historian as cited in Daubeny, *Volcanos*, p. 334: "The process, by which these islands, according to Moreau de Jonnes, are in many instances formed, is sufficiently curious; first a submarine eruption raises from the bottom of the sea masses of volcanic products, which, as they do not rise above the surface of the water, but form a shoal a short way below its surface, serve as a foundation on which the Madreporites and other marine animals can commence their superstructure. Hence those beds of recent coralline limestone, seen covering the volcanic matter in many of the islands." The original reference in this case is to Alexander von Humboldt who had communicated directly with Moreau de Jonnès on the subject. See Humboldt, *Personal Narrative*, vol. 4, pp. 42–43; also M. Cortès and Alexandre Moreau de Jonnès, 'Mémoire sur la géologie des Antilles', *Journal de physique, de chimie, d'histoire naturelle et des arts*, vol. 70 (1810), pp. 130–131.

[113] Roussin, *Le Pilote du Brésil*, p. 47 states that on approaching the banks of Cape S. Roque: ". . .nous croyons avoir observé que le sable est d'autant plus rare et les graviers d'autant plus communs, que les sondes sont plus petites et plus voisines des bancs."

[114] Humphry Davy, 'On the corrosion of copper sheeting by sea water, and on methods of preventing this effect; and on their application to ships of war and other ships', *Philosophical Transactions of the Royal Society of London*, vol. 114 (1824), pp. 151–158. After describing his experiments Davy concluded on p. 158: that "small quantities of zinc, or which is much cheaper, of malleable, or cast iron, placed in contact with the copper sheeting of ships, which is all in electrical connection, will entirely prevent its corrosion. And as negative electricity cannot be supposed favourable to animal or vegetable life; and as it occasions the deposition of magnesia, a substance exceedingly noxious to land vegetables, upon the copper surface; and as it must assist in preserving its polish, there is considerable ground for hoping that the same application will keep the bottoms of ships clean, a circumstance of great importance both in trade and naval war."

[115] See note 59.

[116] The entries pertaining to Fig. 5 are written in brown ink.

[117] A bar and a dot over a number indicates that no bottom was found at that depth. All entries on this page are in brown ink, except for the page number.

[118] Thomas Sorrell (c. 1797–?), boatswain of the H.M.S. *Beagle*; personal communication. See Fitzroy, ed., *Narrative of the Surveying Voyages of His Majesty's Ships Adventure and Beagle*, vol. 2, p. 21. Also see *JR*, p. 282.

[119] This entry is written in light brown ink.

[120] Humboldt, *Personal Narrative*, vol. 4, p. 384: "We discover between Calabozo, Uritucu, and the *Mesa de Pavones*, wherever men have made excavations of some feet deep, the geological constitution of the Llanos. A formation of red sandstone [*Rothes todtes liegende*] (or ancient conglomerate) covers an extent of several thousand square leagues. We shall find it again hereafter in the vast plains of the Amazon, on the eastern boundary of the province of Jaën de Bracamoros. This prodigious extension of red sandstone, in the low grounds that stretch along the East of the Andes, is one of the most striking phenomena, with which the study of rocks in the equinoctial regions furnished me."

[121] Miers, *Travels in Chile and La Plata*, vol. 1, pp. 394–395: "All around Quintero [near Quillota]. . .the fishermen had employed themselves digging shells for lime-making from a stratum four or five feet thick, in the recesses of the rocks, at the height of fifteen feet above the usual level of the sea, it being evident that at no very distant period this spot must have been buried in the sea, and uplifted probably by convulsions similar to the one now described." Also p. 458: "The recent shelly deposites mixed with loam [at Quintero] I have traced to places three leagues from the coast, at a height of 500 feet above the level of the sea. . . ." See *GSA*, p. 35.

[122] Lyell, *Principles of Geology*, vol. 3, p. 371: "[According to M. Elie de Beaumont]...near Champoleon [in France], a granite composed of quartz, black mica, and rose-coloured felspar, is observed partly to overlie the secondary rocks, producing an alteration which extends for about thirty feet downwards, diminishing in the inferior beds which lie farthest from the granite....In the altered mass the argillaceous beds are hardened, the limestone is saccharoid, the grits quartzose, and in the midst of them is a thin layer of an imperfect granite. It is also an important circumstance, that near the point of contact both the granite and the secondary rocks become metalliferous, and contain nests and small veins of blende, galena, iron, and copper pyrites."

[123] Fitton, 'Geology' as quoted in note 47.

[124] Lesson and Garnot, *Voyage autour du monde...Zoologie*, vol. 1, part 1, p. 5: "Toutes les côtes de la Nouvelle-Galles du Sud [New South Wales] sont, en effet, entièrement composées d'un grès houiller à molécules peu adhérentes; et ce que nous appelons le premier plan des montagnes Bleues est également composé de ce grès, qui cesse entièrement au mont York. Là, une vallée profonde isole ce premier plan du second, qui est composé en entier de granite."

[125] Lesson and Garnot, *Voyage autour du monde... Zoologie*, vol. 1, part 1 [1826] and part 2 [1828]. The following citations pertain to the entire paragraph on p. 102 of the notebook:

On the formations of Payta see part 1, pp. 260–261: "Le lambeau de sol tertiaire se compose de couches ou bancs alternatifs, dont voici l'énumération, en commençant par la formation de phyllade qui le supporte. 1° *Roches talqueuses phylladiformes*, terrain primordial. 2° *Argiles plastiques*. — Sable argileux, schisteux, traversé par des veines entrecroisées de gypse fibreux...3° *Calcaire grossier*..." Rock cleavage is described as running from east to west on p. 260. On p. 262 Lesson uses the figure 200 feet in describing the change in sea level which would have caused such configurations of strata as seen at Payta.

With respect to volcanic formations on the north part of New Zealand, there is Lesson's remark in part 2, p. 410 that "De nombreux volcans, dont les traces des éruptions sont récentes, existent sur plusieurs points de ces îles [off the north shore of the North Island]...Aussi trouve-t-on communément des pierres ponces...." With respect to richness of plant genera in New Zealand see the quotation from Lesson in note 80.

On St Catherine's see part 1, p. 189: "Le granite forme entièrement la croûte minérale de l'île de Sainte-Catherine et du continent voisin...."

On the Falkland Islands see part 1, p. 198–199: "Les couches se composent de feuillets fendillés dans tous les sens, dont la direction, au lieu d'être horizontale, est presque verticale, et forme particulièrement sur le pourtour de la baie un angle de 45 degrés: ceux de la grande terre se dirigent à l'Est, et ceux des îlots aux pingoins à l'Ouest. . . . Cette phyllade supporte un grès schisteux. . . ." Also on p. 200 reference is made to the discussion by "Pernetty" of a "montagne des Ruines" which looked man-made, and on p. 201, to what Darwin later quoting directly from Pernety called a "stream of stones" and what Lesson referred to as "blocs énormes du même grès, entassés pêle-mêle. . ." See *JR*, p. 255 and Antoine Joseph Pernety, *Journal historique d'un voyage. . . aux îles Malouines* (Berlin, 1769), vol. 2, p. 526.

On the region around Concepcion see part 1, p. 231: "La couche la plus inférieure est formée par une sorte de phyllade noire, compacte et terne; celle qui est moyenne se compose d'un mica-schiste à feuillets très-brillants, dont la direction est de l'Ouest à l'Est." The presence of talcose slates at Concepcion is mentioned on p. 232.

126 Juan and Ulloa, *A Voyage to South America*, vol. 2, p. 97.

127 Juan and Ulloa, *A Voyage to South America*, vol. 2, p. 147: "These are the principal mines of Potosi, but there are several smaller crossing the mountain on all sides. The situation of the former of these mines is on the north side of the mountain, their direction being to the south, a little inclining to the west; and it is the opinion of the most intelligent miners in this country, that those which run in these directions are the richest."

128 Juan and Ulloa, *A Voyage to South America*, vol. 2, p. 252: "The country round the bay, particularly that between Talcaguana and Conception. . . is noted for . . . a stratum of shells of different kinds, two or three toises in thickness, and in some places even more, without any intermixture of earth, one large shell being joined together by smaller, and which also fill the cavities of the larger. . . . Quarries of the same kind of shells, are found on the tops of mountains in this country, fifty toises above the level of the sea." Also, p. 254: "All these species of shellfish are found at the bottom of the sea in four, six, ten and twelve fathom water. They are caught by drags; and. . . no shells, either the same, or that have any resemblance to them, are seen either on the shores continually washed by the sea, or on those tracks which have been overflowed by an extraordinary tide."

129 John Playfair, *Illustrations of the Huttonian Theory of the Earth* (Edinburgh, 1802), pp. 51–52: "Indeed, the interposition of a breccia between the primary and secondary strata, in which the fragments, whether round or angular, are always of the primary rock, is a fact so general, and the quantity of this breccia is often so great, that it leads to a conclusion more paradoxical than any of the preceding, but from which, nevertheless, it seems very difficult to with-hold assent. Round gravel, when in great abundance, agreeably to a remark already made, must necessarily be considered as a production peculiar to the beds of rivers, or the shores of continents, and as hardly ever formed at great depths under the surface of the sea. It should seem, then, that under the primary schistus, after attaining its erect position, had been raised up

to the surface, where this gravel was formed; and from thence had been let down again to the depths of the ocean, where the secondary strata were deposited on it. Such alternate elevations and depressions of the bottom of the sea, however extraordinary they may seem, will appear to make a part of the system of the mineral kingdom, from other phenomena hereafter to be described."

[130] The principle expressed in this passage, that the destruction of the earth's surface is required for its renovation, is consistent with the general content of the work of the great British geologist and member of the Royal Society of Edinburgh, James Hutton (1726–1797). However, as Darwin's cancellation would seem to indicate, the application of the principle failed in this instance, for Hutton, speaking providentially, had chosen rather to characterize volcanos as instruments designed "to prevent the unnecessary elevation of land, and the fatal effects of earthquakes", and his interpreter John Playfair, F.R.S. (1748–1819), while not quoting Hutton's words, did not challenge his conclusion. See James Hutton, *Theory of the Earth* (Edinburgh, 1795), vol. 1, p. 146, and Playfair, *Illustrations of the Huttonian Theory*, pp. 116–119. Later Charles Lyell (note 3) was more sanguine on the subject of the fatal effects of earthquakes. See his *Principles of Geology*, vol. 1, p. 479.

[131] Sir Richard Owen, F.R.S. (1804–1892), comparative anatomist and palaeontologist. In 1837 Owen was Assistant Conservator in the Hunterian Museum of the Royal College of Surgeons, and first Hunterian Professor of Comparative Anatomy and Physiology at the Royal College of Surgeons. In 1856 Owen left the Royal College of Surgeons for the British Museum, where he served as Superintendent of the Natural History Departments of the Museum and then later, as Superintendent of the new Natural History Museum in South Kensington. Owen's palaeontological work began in 1837 with his studies of Darwin's collection of South American fossil mammals. For Darwin's account of the opening of negotiations with Owen with respect to collections from the *Beagle* voyage see the letter from Darwin to J. S. Henslow, dated 3 October 1836 in Nora Barlow, ed., *Darwin and Henslow: The Growth of an Idea* (Berkeley and Los Angeles, 1967), pp. 118–119. Owen's completed work on Darwin's specimens is contained in Richard Owen, *The Zoology of the Voyage of H.M.S. Beagle ...1832–1836...Edited and Superintended by Charles Darwin. Part I: Fossil Mammalia.* 4 numbers. (London, 1838–1840).

[132] [Capt.] John Ross, *A Voyage of Discovery...for the Purpose of Exploring Baffin's Bay* (London, 1819), p. 178: "Soundings were obtained correctly in one thousand fathoms [at Possession Bay], consisting of soft mud, in which there were worms....The temperature of the water on the surface was 34 1/2° [F.], and at eighty fathoms 32°;...at two hundred and fifty fathoms [measurement taken aboard another ship],...29 1/2° [F.]." In Appendix No. III, p. lxxxv this information is summarized and the coordinates of Possession Bay given as 73° 39′ N., 77° 08′ W.

[133] These observations by John Herschel (note 40) on the subject of the crystallization of barium sulphate were probably communicated to Darwin by Charles Lyell (note 3). Herschel's letter of 20 February 1836 to Lyell, quoted in note 40, contains the following passage (Cannon, 'The Impact of Uniformitarianism', p. 310): "Cleavages of Rocks.—If Rocks have been heated to a point admitting a commencement of crystallization, ie to the point where particles can begin to move inter se—or at least on their own axes—some general cause must determine the position these particles will rest in on cooling—probably position will have some relation to the direction in which the heat escapes.—Now when all—or a majority of particles of the same nature have a general tendency to one position that must of course determine a cleavage plane.—Did you never notice how the infinitesimal crystals of fresh precipitated sulphate of Baryta [barium sulphate] & some other such bodies—arrange themselves alike in the fluid in which they float so as, when stirred all to glance with one light & give the appearance of *silky filaments*. Ask Faraday to shew you this phenomenon if you have not seen it—it is very pretty. What occurs in our expt, on a minute scale may occur in nature on a great one, as in granites, gneisses, mica slates &c—some sorts of soap in which insoluble margarates exist shew it beautifully [added: when mixed with water]." Lyell incorporated Herschel's observation into his next edition of the *Principles*. See *Principles of Geology* (5th ed.; London, 1837), vol. 4, pp. 358. Presumably Lyell showed Darwin Herschel's letter, or discussed its contents with him, sometime in late 1836 or early 1837. The 'Faraday' referred to in Herschel's letter is Michael Faraday, F.R.S. (1791–1867), the eminent natural philosopher and experimentalist.

[134] Erasmus Alvey Darwin (1804–1881). Charles' older brother who pursued the study of chemistry in his youth and early manhood.

[135] José de Acosta, *Histoire naturelle et moralle des Indes* (Paris, 1600), p. 125 refers to "des tremblemens de terre qui ont couru depuis Chillé, jusques à Quitto, qui sont plus de cinq cens lieues..." Acosta continued, "En la coste de Chillé (il ne me souvient quelle année) fut un tremblement de terre si terrible.... A peu de temps delà, qui fut l'an, de quatre vingts deux, vint le tremblement d'Arequipa, qui abbatit & ruina presque toute cette ville là. Du depuis en l'an quatre vingts six...aduint un autre tremblement en la cité des Roys [Lima]...." And on p. 125 verso: "En apres l'an enfuyuant, il y eut encor un autre tremblement de terre au Royaume & cité de Quitto, & semble que tous ces notables tremblemens de terre en ceste coste, ayent succedé les uns aux autres par ordre...."

[136] Joseph-Charles Bailly (1777–1844), mineralogist to the expedition, as quoted in François Péron, *Voyage de découvertes aux terres australes...1800–1804* (Paris, 1807), vol. 1, pp. 54–55. Following the passage quoted which Darwin copied correctly except for one misspelling ("d'lile" for "de l'île") and the loss of a few accent marks, the text continues (p. 55): "De ces observations, il résulte bien incontestablement que

toutes ont la même origine, qu'elles datent toutes de la même époque; que réunies jadis, elles n'ont pu être séparées depuis, que par quelque révolution violente et subite. Quelle peut avoir été cette dernière révolution?...Tous les fait se réunissent pour prouver que l'île toute entière ne formoit jadis qu'une énorme montagne brûlante; qu'épuisée, pour ainsi-dire, par ses éruptions, elle s'affaissa sur elle-même, engloutit dans ses abîmes la plus grande partie de sa propre masse, et que de cette voûte immense, il ne resta debout que les fondemens, dont les débris entr'ouverts sur différens points, forment les montagnes actuelles de l'île. Quelques pitons de forme conique, qui s'élèvant vers le centre du pays, notamment le Piton du centre, portent les caractères d'une origine postérieure à l'éboulement du cratère...." Also see *VI*, pp. 29–31.

[137] Bailly (note 136) as quoted in Péron, *Voyage de découvertes aux terres australes*, vol. 1, p. 295: "De hautes montagnes granitiques...dont les sommités étoient presque entièrement nues, forment toute la côte orientale de cette partie de la terre de Diémen...." Also see p. 304 for a description of more of the east coast of Van Diemen's Land [Tasmania].

[138] Henry Bolingbroke, *A Voyage to the Demerary* (London, 1807), p. 200 contains the passage Darwin quotes and pp. 200–201 the additional comment: "This constant shooting upwards of the land, which is so sensible in the West Indies, has been little heeded by European mineralogists."

[139] Webster, *Narrative of a Voyage to the Southern Atlantic Ocean*, vol. 1, p. 371: "Instances of earthquakes occuring in the island [St Helena] are on record. One took place in 1756, and in June 1780. On the 21st September 1817, one occurred, which it is said was particularly noticed by Napoleon, who thought that the Conqueror, 74, in which he had been, was blown up." The reference to antarctic vegetation pertains to Webster's discussion of the natural history of Cape Horn, Staten Island, and Deception Island in vol. 2, pp. 290–306.

[140] Darwin apparently searched Juan and Ulloa's *A Voyage to South America* for evidence connecting Indian habitation and climatic change, and could not find it. He was more successful in his reading of Antonio de Ulloa's *Noticias americanas* (2nd ed.; Madrid, 1792). He later quoted from that work (p. 302) in translation, presumably his own, to the effect that Indians of one arid region in the Andes had lost the art of making durable bricks from mud. This suggested to Darwin that the local climate had once been wetter, which fitted his notion that the South American continent had undergone elevation in geologically recent times. See *JR*, pp. 409–411.

[141] Edmond Temple, *Travels in Various Parts of Peru, Including a Year's Residence in Potosi* (London, 1830), vol. 2, p. 10: "In the course of this day's journey were to be seen, in well-chosen spots, many Indian villages and detached dwellings, for the most part in ruins. Up even to the very tops of the mountains, that line the

valleys through which I have passed, I observed many ancient ruins, attesting a former population where now all is desolate." For passages on a similar theme see pp. 4 and 5. Also consult *JR*, p. 412, where the quotation from Temple appears in slightly different form. From his comment it would appear that Charles' sister Caroline Darwin Wedgwood (1800–1888) gave him the reference to Temple.

[142] John W. Webster, *A Description of the Island of St. Michael* (Boston, 1821), p. 124: "There is scarcely a man on the island, who has not a dog, and many have half a dozen. It is a remarkable fact that, although these animals are so numerous, no instance of hydrophobia was ever known among them." See *JR*, p. 436.

[143] Sir Woodbine Parish, F.R.S. (1796–1882), personal communication. See *JR*, p. 156: "Sir Woodbine Parish informed me of another and very curious source of dispute [in the province of Buenos Ayres]; the ground being so long dry, such quantities of dust were blown about, that in this open country the landmarks become obliterated, and people could not tell the limits of their estates." Parish served as commissioner and consul general and then chargé d'affaires to Buenos Ayres from 1823–1832. Upon returning to London he became active in scientific societies. He was a long-time vice-president of the Royal Geographical Society and served on the Council of the Geological Society of London from 1834–1841, being sometime vice-president and during 1835–1836 one of the secretaries.

[144] Félix d'Azara, *Voyages dans l'Amérique Méridionale...1781–1801* (Paris, 1809), vol. 1, p. 374: "On voit un exemple aussi étonnant de cette fougue dans les années sèches, où l'eau est extrêmement rare au sud de Buenos-Ayres. En effet, ils partent comme fous, tous tant qu'ils sont, pour aller chercher quelque mare ou quelque lac: ils s'enfoncent dans la vase, et les premiers arrivés sont foulés et écrasés par ceux qui les suivent. Il m'est arrivé plus d'une fois de trouver plus de mille cadavres de chevaux sauvages morts de cette façon." See *JR*, p. 156.

[145] John Hunter, *An Historical Journal of the Transactions at Port Jackson and Norfolk Island...since the publication of Phillip's Voyage* (London, 1793), pp. 507, 508, 525, and 535 refer to the drought around Sydney in the first half of the year 1791. 'Phillip's Voyage' refers to the account of his travels written by Arthur Phillip (1738–1814), vice-admiral and first governor of New South Wales, published as *The Voyage of Governor Phillip to Botany Bay* (London, 1789).

[146] Charles Sturt, *Two Expeditions into the Interior of Southern Australia... 1828–1831* (London, 1833), vol. 1, p. 1: "The year 1826 was remarkable for the commencement of one of those fearful droughts to which we have reason to believe the climate at New South Wales is periodically subject. It continued during the two following years with unabated severity." And p. 2: "But, however severe for the colony the seasons had proved...it was borne in mind at this critical moment, that the wet and swampy state of the interior had alone prevented Mr. Oxley from

penetrating further into it, in 1818....As I had early taken a great interest in the geography of New South Wales, the Governor was pleased to appoint me to the command of this expedition." See also *JR*, p. 157.

[147] From this entry it would appear likely that it was Richard Owen (note 131) who referred Darwin to the article by Thomas Rackett, 'Observations on *Cancer salinus*', which is quoted enthusiastically in *JR*, p. 77: "In the Linnean [Society of London] Transactions, [1815], vol. xi, p. 205, a minute crustaceous animal is described, under the name of *Cancer salinus*. It is said to occur in countless numbers in the brine pans at Lymington; but only in those in which the fluid has attained, from evaporation, considerable strength; namely about a quarter of a pound of salt to a pint of water. This cancer is said, also, to inhabit the salt lakes of Siberia. Well may we affirm, that every part of the world is habitable!"

[148] Rev. John Stevens Henslow (1796–1861), Professor of Botany at Cambridge University and Darwin's 'Master in Natural History'. (Letter from Darwin to Henslow, January 1836, in Nora Barlow, ed., *Darwin and Henslow*, p. 114.) Henslow himself did not publish on the subject of springs, but he may have been the source for two references which Darwin quoted on the subject in the *JR*, p. 78. Both works cited discuss plant life at the location of the springs, a subject which would have interested Henslow. The references were to James Edward Alexander, 'Notice regarding the Salt Lake Inder, in Asiatic Russia', *Edinburgh New Philosophical Journal*, vol. 8 (1830), pp. 18–20; and Peter Simon Pallas, *Travels through the Southern Provinces of the Russian Empire...1793–1794* (London, 1802), vol. 1, pp. 129–134. The entry 'Springs. (Henslow)' is written in brown ink, the preceding entry on 'Mr Owen' in pencil.

[149] The two ostriches are the greater or common rhea, *Rhea americana*, found from north-eastern Brazil to the Rio Negro in central Argentina, and the lesser rhea or Darwin's rhea, *Pterocnemia pennata*, found in the Patagonian lowlands, where Darwin collected portions of a specimen, and in the high Andes of Peru, Bolivia, northern Chile, and northwestern Argentina. The lesser rhea became known as Darwin's rhea following its identification by the ornithologist John Gould, F.R.S. (1804–1881) at a meeting of the Zoological Society of London on 14 March 1837. Gould was then unaware that the species had already been described in 1834 by the French naturalist Alcide Dessalines d'Orbigny (1802–1857). For Gould's report on *Rhea darwinii* and comments by Darwin on the habits of the two species (but primarily the common rhea) and on their geographical distribution see the *Proceedings of the Zoological Society of London*, vol. 5 (1837), pp. 35–36. For further treatment see John Gould, *The Zoology of the Voyage of H.M.S. Beagle...1832–1836...Edited and Superintended by Charles Darwin. Part III: Birds.* 5 numbers. (London, 1838–1841), pp. 120–125 including plate. Also see *JR*, pp. 108–110.

Rhea americana, the bigger or common 'ostrich' referred to on pages 127 and 130.

Darwin's rhea, *Pterocnemia pennata*, the smaller 'ostrich' or 'Petisse' referred to on pages 127 and 130. Of this rhea Darwin wrote: 'This species... differs in many respects from the *Rhea Americana*. It is smaller, and the general tinge of the plumage is a light brown in place of grey; each feather being conspicuously tipped with white. The bill is considerably smaller, and especially less broad at its base; the culmen is less than half as wide, and becomes slightly broader towards the apex, whereas in the *R. Americana* it becomes slightly narrower; the extremity, however, of both the upper and lower mandible, is more tumid in the latter, than in the *R. Darwinii*.... The skin round and in front of the eyes is less bare in *R. Darwinii*; and small bristly feathers, directed forwards, reach over the nostrils. The feet and tarsi are nearly of the same size in the two species. In the *R. Darwinii*, short plumose feathers extend downwards in a point on the sides of the tarsus, for about half its length. The upper two-thirds of the tarsus, in front, is covered with reticulated scales in place of the broad transverse band-like scales of the *R. Americana*; and the scales of the lower third are not so large as in the latter. In the *R. Darwinii* the entire length of the back of the tarsus is covered with reticulated scales, which increase in size from the heel upwards: in the common *Rhea*, the scales on the hinder side of the tarsus are reticulated only on the heel, and about an inch above it; all the upper part consisting of transverse bands, similar to those in front.' Quoted from John Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds*. 5 numbers. (London, 1838–1841), pp. 123–124.

Rhea Darwinii [*Pterocnemia pennata*], Plate 47 from John Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds.* 5 numbers. (London, 1838–1841). Drawing by John Gould, lithograph by Elizabeth Coxen Gould.

[150] One of the sources which Darwin likely drew on for this passage was Webster, *Voyage to the Southern Atlantic*, vol. 2, pp. 281–302.

[151] *Zorrilla* is the Spanish word for skunk. The notes on species ranges of South American forms which Darwin suggested making in this entry are presumably those found in the Darwin MSS, Cambridge University Library, vol. 29 (i). The 'Birds' list is numbered fol. 41; the 'Animals' list appears between fols. 46–47. The *zorrilla* appears on the list for animals.

[152] The extinct llama is the *Macrauchenia patachonica* as described by Richard Owen (note 131). See Owen, *The Zoology of the Voyage of H.M.S. Beagle. Part I: Fossil Mammalia*, pp. 10–11, 35–56 and plates VI–XV. Darwin collected the fossil specimens in January 1834 at the port of San Julián, having "no idea at the time, to what kind of animal these remains belonged." (*JR*, p. 208.) Owen's earliest known comment on the specimens occurs in a letter to Charles Lyell dated 23 January 1837 where he described them as follows:

> RUMINANTIA
> Fam: *Camelidae*
> 2 cervical vertebrae, portions of femur, & fragments of a Gigantic Llama! as large as a Camel, but an *Auchenia* (from the plains of Patagonia)

For the citation from Owen see Leonard G. Wilson, *Charles Lyell: The Years to 1841* (New Haven and London, 1972), p. 437. Also see *JR*, pp. 208–209. Several of the fossilized bones which Darwin collected of *Macrauchenia patachonica* are presently on display in the Fossil Mammal Gallery of the British Museum (Natural History). A number of Darwin's fossil mammalia came to the British Museum (Natural History) during World War II after the specimens had suffered damage from bombs which fell on the museum of the Royal College of Surgeons, where the specimens had been stored since the time Owen first worked on them. Illustrations on pages 112–114.

[153] The 'Petisse' is the lesser rhea, or Darwin's rhea. (See note 149.) Darwin customarily referred to the two rheas in his field notes as 'Avestruz' and 'Avestruz Petise' from the Spanish *avestruz* (ostrich) and *avestruz petiso* (small ostrich).

Here and for the following notes (154, 156–159) I am indebted to Dr David Snow of the British Museum (Natural History) at Tring for supplying the present-day identifications of Darwin's specimens. Names follow or are consistent with the usage in Rodolphe Mayer De Schauensee, *The Species of Birds of South America and Their Distribution* (Narberth, Pennsylvania, 1966).

[154] *Fourmilier*, ('antbird') so named by the French naturalist George-Louis Leclerc, Comte de Buffon (1707–1788), for its falsely reported habit of living chiefly on ants (*fourmis*), is a general term for a member of the essentially tropical American family Formicariidae. Since Darwin did not collect extensively in tropical areas and does not seem to have used the term *Fourmilier* elsewhere in his notes, it is doubtful

Bones of the right forefoot and ankle-joint (astragalus) of Darwin's specimen of *Macrauchenia patachonica* from the palaeontological collections of the British Museum (Natural History).

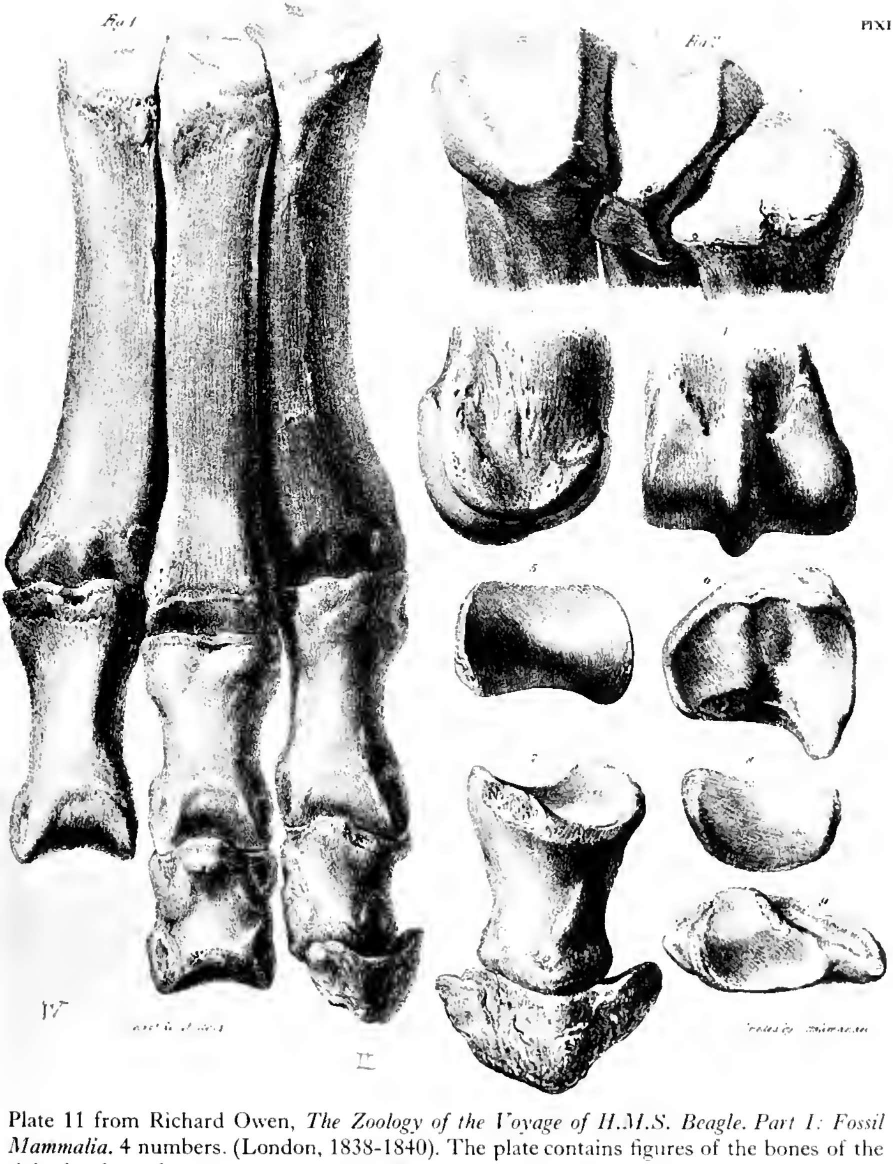
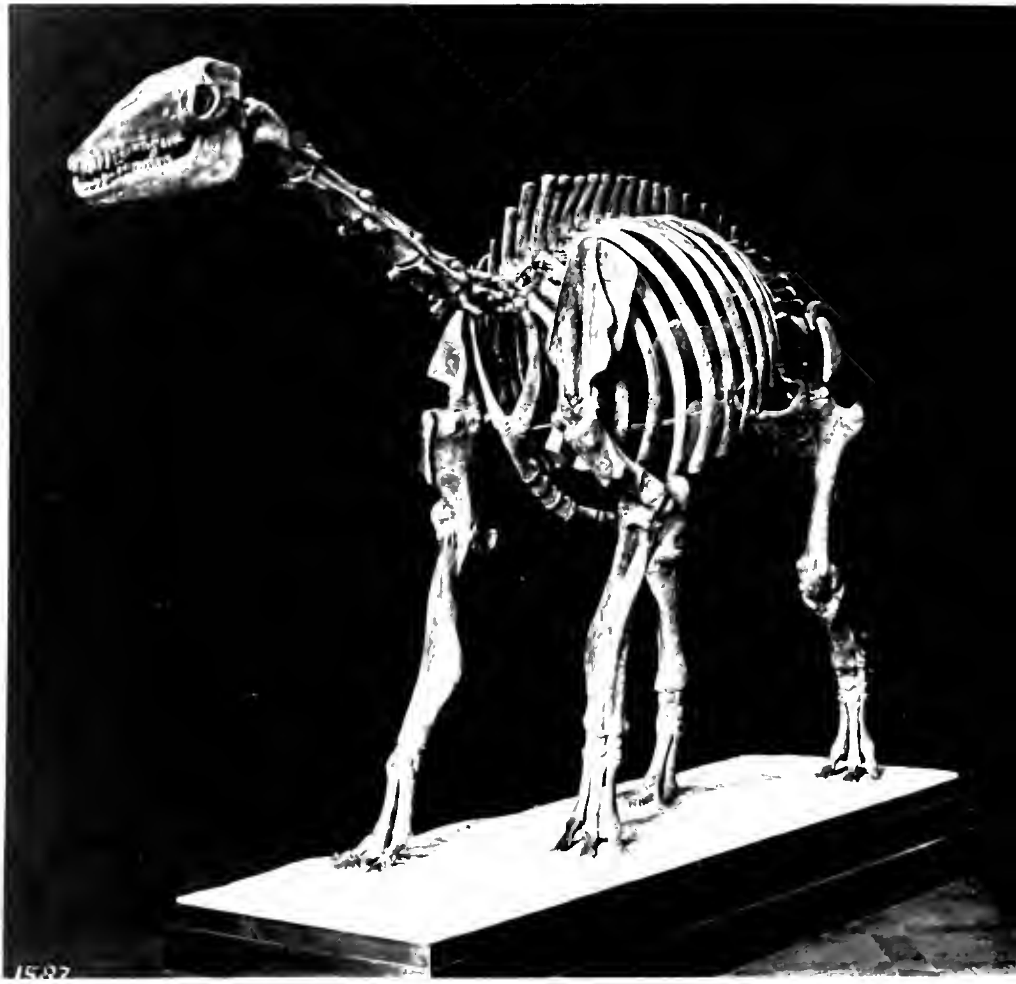


Plate 11 from Richard Owen, *The Zoology of the Voyage of H.M.S. Beagle. Part I: Fossil Mammalia.* 4 numbers. (London, 1838-1840). The plate contains figures of the bones of the right forefoot of Darwin's specimen of *Macrauchenia patachonica.* Drawing and lithograph by George Scharf.



A reconstruction of a specimen of the *Macrauchenia patachonica*, the 'extinct Llama' or 'extinct Guanaco' referred to on pages 129 and 130.

that it was the antbird, or at least primarily the antbirds, which he had in mind when he made this entry. More likely he was thinking of those birds which he described in his Ornithological Notes as *Myothera*, a term which was given as the equivalent of

Fourmilier in the '*Dict. classique*', the systemmatic work he had with him aboard ship. (See Jean Baptiste Bory de Saint-Vincent, ed., *Dictionnaire classique d'histoire naturelle* [Paris, 1825], vol. 7, pp. 22–25.) Under *Myothera* Darwin described a number of birds now assigned to the South American family Rhinocryptidae, a small family that appears to be closest to the Formicariidae, though its affinities are not certain. Chile is the centre of the present-day distribution of this family, in the sense that more genera occur there than in other countries. In general Darwin's recognition of specific differences and geographical ranges for this group was accurate and complete for the areas he visited. On Darwin's return to England the birds he had collected from this group were classified by John Gould (note 149) of the Zoological Society of London chiefly according to the taxonomy provided for the group by the German naturalist Friedrich Heinrich von Kittlitz (1799–1874) in 1830. For Darwin's discussion of the group, including Gould's classifications, see *JR*, pp. 329–330 and 351–353. For Darwin's listing of these specimens by number, all under the rubric *Myothera*, see Nora Barlow, ed., 'Darwin's Ornithological Notes', *Bulletin of the British Museum* (*Natural History*) Historical Series, vol. 2 (1963), pp. 201–278. Selected specimens which Darwin collected in Chile from this family, identified by their modern names, are listed as follows. Entries denoted with an asterisk indicate specimens collected by Darwin in the collections of the British Museum (Natural History) at Tring. The numbers given are those Darwin assigned to his specimens. From the genus *Pteroptochos* Darwin collected two species, the more southern *P. tarnii*, the Black-throated Huet-huet (specimen 2531*), and the more northern *P. megapodius*, the Moustached Turca (specimen 2172). [The Museum owns a specimen collected by Darwin of *P. megapodius* which no longer bears its original specimen number.] From the genus *Scelorchilus* Darwin collected three species, the more southern *S. rubecula*, the Chucao Tapaculo (specimen 2556*); the more northern *S. albicollis*, the White-throated Tapaculo (specimens 2173, 2174), and what was probably the northern desert subspecies *S.a. atacamae* (specimen 2825). Darwin also collected specimens of *Eugralla paradoxa*, the Ochre-flanked Tapaculo (specimen 2555*), whose range in Chile lies within that of *S. rubecula*. Further, he correctly identified the affinity of the 'black wren' of Tierra del Fuego (*Scytalopus fuscus* of Gould) with these other birds. This bird is now described as *S. magellanicus*, the Andean Tapaculo, and is assigned to the family Rhinocryptidae. In Chile it ranges from the Cape Horn Archipelago to Atacama. For general information on the family Rhinocryptidae, including drawings of various species and descriptions of their distinctive cries, see A. W. Johnson, *The Birds of Chile and Adjacent Areas of Argentina, Bolivia and Peru* (Buenos Aires, 1967), vol. 2, pp. 201–222. On these birds also see Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds*, pp. 70–74.

155 The 'extinct Guanaco' is identical to the 'extinct Llama'. See note 152.

156 The Chiloé creeper is *Aphrastura spinicauda*, the Thorn-tailed Rayadito (specimens 2129 and 2130). It is distributed from Coquimbo in Chile south to Tierra

del Fuego, and in Argentina from Neuquén and Rio Negro southwards. It also occurs on various off-lying islands including Chiloé. The Chiloé race is the distinctive subspecies *A. spinicauda fulva*, being buff-coloured instead of mainly white below. For further information on Darwin's specimens see 'Darwin's Ornithological Notes'; *JR*, p. 301; and Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds*, p. 81.

[157] *Furnarius*, the ovenbird, the genus which gives its name to the family Furnariidae. Found from southern Mexico to Patagonia the family shows the greatest measure of diversity in the southern part of its range. Darwin collected a number of species belonging to the family, paying particular attention to *Furnarius rufus*, the Rufous Hornero (specimen 1200) and *Geositta cunicularia*, the Common Miner (specimen 1222*). The asterisked specimen is part of the collections of the British Museum (Natural History) at Tring. The Museum also owns another Darwin specimen of the same species, unnumbered, and according to its label presented by Sir William Burnett (1779–1861, physician to William IV) and Robert Fitzroy (note 27). In the *Journal of Researches* Darwin referred to *Furnarius rufus* according to its common name as the 'Casara' or house-builder and to *Geositta cunicularia* as the 'Casarita' or little house-builder. As the similarity of the two local names suggests, the second bird is something like a smaller version of the first, though its plumage is more earth-brown and not so rufous. For further information on the birds see 'Darwin's Ornithological Notes'; *JR*, pp. 112–113, 353, and 477; and Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds*, pp. 64–65.

[158] Caracaras are large carrion-feeding birds belonging to the family Falconidae. They are very common in parts of South America, and Darwin collected a number of specimens. In his 'Ornithological Notes' Darwin mentions four species: *Polyborus plancus*, the Crested Caracara (p. 234), *Milvago chimango*, the Chimango Caracara (p. 234 top and p. 236; also see specimen 1204*), *Phalcoboenus australis*, the Striated Caracara (p. 236, specimen 1882), and *Phalcoboenus albogularis*, the White-throated Caracara (p. 238, specimen 2029). In his 'Ornithological Notes' Darwin also referred to the Galapagos hawk as a caracara (p. 238), though John Gould (note 149) later corrected him. The asterisked specimen of *M. chimango* is part of the collections at the British Museum (Natural History) at Tring. The Museum also has an unnumbered *Beagle* specimen of *M. chimango* which lacks its original label, as well as a specimen of *P. plancus* presented by William Burnett (note 157) and Robert Fitzroy (note 27) without data. For more on these birds see 'Darwin's Ornithological Notes', pp. 233–239; *JR*, pp. 63–69, 256, 461; John Gould, 'Observations on the Raptorial Birds in Mr. Darwin's Collection, with characters of the New Species', *Proceedings of the Zoological Society of London*, vol. 5 (1837), pp. 9–11; and Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds*, pp. 9–31.

[159] Calandria, *Mimus saturninus modulator*, the Chalk-browed Mockingbird which Darwin collected at Maldonado (specimen 1213). In this entry Darwin probably also

had in mind other mockingbirds he collected in South America and the Galápagos Islands. Continental forms included *Mimus patagonicus*, the Patagonian Mockingbird (specimens 1461 and 1620), and *Mimus thenca*, the Chilean Mockingbird (specimen 2169). The Galápagos forms included: *Nesomimus trifasciatus* (Gould, 1837) which Darwin collected on Charles Island (specimen 3306), *Nesomimus parvulus* (Gould, 1837) which Darwin collected at Albemarle Island (specimen 3349), and *Nesomimus melanotis* (Gould 1837) which Darwin collected at Chatham Island (specimen 3307). The British Museum (Natural History) at Tring owns these specimens which, however, no longer bear Darwin's original labels. Classification of the Galápagos forms is from Michael Harris, *A Field Guide to the Birds of Galapagos* (London, 1974), the most recent treatment of these birds. The only point bearing on Darwin's specimens where Harris's grouping of the birds differs from that of Gould is with respect to the mockingbird of James Island. Harris places the mockingbirds on James Island with those of Albemarle Island; Gould placed them with the group on Chatham Island. For further discussion of all six mockingbirds described in this note, including plates on the three Galápagos species, see Gould, *The Zoology of the Voyage of H.M.S. Beagle. Part III: Birds*, pp. 60–64. Also see 'Darwin's Ornithological Notes'; *JR*, pp. 62–63, 461; and Gould's report on the three Galápagos species in *Proceedings of the Zoological Society of London*, vol. 5 (1837), p. 27.

160 The 'C' of 'Crust' is written over an 'f'.

161 William J. Burchell (1782–1863), English naturalist; personal communication. Burchell's *Travels in the Interior of Southern Africa*, vol. 2, p. 207 is quoted on the subject of the large size of South African animals compared to animals from other continents in *JR*, p. 101.

162 William J. Burchell (note 161), personal communication. See *GSA*, p. 3: "Mr. Burchell informs me, that he collected at Santos (lat. 24° S.) oyster-shells, apparently recent, some miles from the shore, and quite above the tidal action." During his South American travels of 1825–1829 Burchell made extensive zoological and botanical collections but never published significantly on them in later life. In this paragraph Burchell's name is written in light brown ink above the line, which would indicate a later dating than other entries on the page.

163 Capt. Robert Fitzroy (note 27), personal communication. See also *JR*, pp. 266–267: "I have heard Captain FitzRoy remark, that on entering any of these channels [at Tierra del Fuego] from the outer coast, it is always necessary to look out directly for anchorage; for further inland the depth soon becomes extremely great."

164 Charles Lyell (note 3), personal communication. The reference is to Leopold von Buch, *Description physique des îles Canaries* (Paris, 1836), p. 428: "Ces émanations sulfureuses paraissent donner aux volcans de Java un caractère tout particulier qui n'appartient certainement pas avec le même degré d'intensité et de fréquence à la plupart des autres volcans de la surface du globe." See *GSA*, pp. 238–239.

[165] See Edward Kendal, 'Account of the Island of Deception, one of the New Shetland Isles. Extracted from the private Journal of Lieutenant Kendal, R.N., embarked on board his Majesty's sloop *Chanticleer*, Captain Forster, on a scientific voyage...', *Journal of the Royal Geographical Society*, vol. 1 (1832), p. 64: "Possession Cape is situated in 63° 46′ S., and 61° 45′ W. We procured specimens of its rock...." Also p. 63 where the land is described as being composed "of a collection of needle-like pinnacles of sienite." Capt. Henry Foster, F.R.S. (1796–1831) commanded the *Chanticleer* from 1828–1831, Darwin's misspelling of his name deriving from an identical misspelling in the title of the article cited here.

[166] Darwin's estimate of the dimensions of Deception Island is taken from the map facing p. 64 of Kendal, 'Account of the Island of Deception' (note 165).

[167] See Edward Kendal, 'Account of the Island of Deception' (note 165), p. 65: "There was nothing in the shape of vegetation except a small kind of lichen, whose efforts are almost ineffectual to maintain its existence amongst the scanty soil afforded by the penguins' dung." P. 66: "Having observed a mound on the hill immediately above this cove, and thinking that something of interest might be deposited there, I opened it; and found a rude coffin, the rotten state of which bespoke its having been long consigned to the earth, but the body had undergone scarcely any decomposition. The legs were doubled up, and it was dressed in the jacket and cap of a sailor, but neither they nor the countenance were similar to those of an Englishman." Also p. 66: "We took the hint of the freezing over of the cove, and effected our retreat.... We quitted it on the 8th of March...." See *JR*, p. 613.

[168] James Cook, *A Voyage towards the South Pole, and round the World...1772–1775* (London, 1777), vol. 2. There is, facing p. 177, a full page map of Christmas Sound with numerous soundings included. On p. 200 Cook commented of the entire south-western coast of Tierra del Fuego: "For to judge of the whole by the parts we have sounded, it is more than probable that there are soundings all along the coast, and for several leagues out to sea. Upon the whole, this is, by no means, the dangerous coast it has been represented."

[169] James Cook, *A Voyage to the Pacific Ocean. Undertaken...for Making Discoveries in the Northern Hemisphere...1776–1780* (London, 1784), vol. 1, pp. 78–79 records that at Kerguelen Land: "A prodigious quantity of seaweed grows all over it, which seemed to be the same sort of weed that Mr. Banks distinguished by the name of *fucus giganteus*. Some of this weed is of a most enormous length, though the stem is not much thicker than a man's thumb. I have mentioned, that on some of the shoals upon which it grows, we did not strike ground with a line of twenty-four fathoms. The depth of water, therefore, must have been greater. And as this weed does not grow in a perpendicular direction, but makes a very acute angle with the bottom, and much of it afterwards spreads many fathoms on the surface of the sea, I am well warranted to say, that some of it grows to the length of sixty fathoms and

upward." See *JR*, pp. 303–304, where Darwin quoted from this passage but erroneously credited it to the narrative of Cook's second rather than his third voyage. In Darwin's notebook entry the expression '$\underset{\cdot}{\underline{24}}$' would seem to be a variant of '$\overset{\cdot}{\overline{24}}$'. See note 25.

[170] Benjamin Bynoe (1804–1868), Assistant and later Acting Surgeon aboard H.M.S. *Beagle*; personal communication. From the use of the present tense in this entry it would seem that Darwin saw or corresponded with Bynoe after the voyage. If so, this would not be the first occasion on which Darwin discussed geological issues with Bynoe. See, for example, Darwin MSS, Cambridge University Library, vol. 34 (ii), fol. 182 for Darwin's notes on a conversation with Bynoe during the voyage on geological topics.

[171] Woodbine Parish (note 143), personal communication. Later published in Parish, *Buenos Ayres and the Provinces of the Rio de la Plata* (London, 1839), p. 242: "It is related that for many years after its foundation, the inhabitants [of Córdoba] were subjected to much inconvenience from the occasional overflowings of a lake in the neighbouring hills, until an earthquake swallowed up its waters, and drained it apparently forever."

[172] Sir Roderick Impey Murchison, F.R.S. (1792–1871), British geologist, fellow of the Geological Society of London, twice its president (1831–1833; 1841–1843) and in 1837 a vice-president; personal communication. In the 1830s Murchison was engaged in his great work on the stratigraphy of palaeozoic rocks, which culminated in his identification of the Silurian system, which he named and described. See Murchison, *The Silurian System* (London, 1839), chapter 18, pp. 216–222 on "Lower Silurian Rocks.—3rd Formation of 'Caradoc Sandstone'." Also p. 583, "There is . . . a phenomenon of the highest importance, connected with the distribution of organic remains in the older strata, which has not been adverted to; namely, that the same forms of crustaceans, mollusks and corals, are said to be found in rocks of the same age, not only in England, Norway, Russia, and various parts of Europe, but also in Southern Africa, and even at the Falkland Islands, the very antipodes of Britain. This fact accords, indeed, with what has been ascertained concerning the wide range of animal remains in deposits equivalent to our oolite and lias; for in the Himalaya Mountains, at Fernando Po, in the region north of the Cape of Good Hope, and in the Run of Cutch and other parts of Hindostan, fossils have been discovered, which, as far as the English naturalists who have seen them can determine, are undistinguishable from certain oolite and lias fossils of Europe." To this remark Murchison added in a footnote: "The fossils from the Falkland Islands were discovered by Mr. C. Darwin, and they appear to me to belong to the Lower Silurian Rocks." Also see *JR*, p. 253.

[173] Rev. William Daniel Conybeare, F.R.S. (1787–1857), English geologist, early member (1811) of the Geological Society of London; later dean of Llandaff. In his

'Report on the Progress, Actual State, and Ulterior Prospects of Geological Science' (*Report of the First and Second Meetings of the British Association for the Advancement of Science* [London, 1833], p. 396), Conybeare had expressed a high opinion of *Silliman's Journal* as a source for North American geology. This journal, formally entitled the *American Journal of Science and the Arts*, contained the following full-length articles on North American geology for the year 1835: (vol. 27) Julius T. Ducatel and John H. Alexander, 'Report on a projected Geological and Topographical Survey of the State of Maryland', pp. 1–38; A. B. Chapin, 'Junction of Trap and Sandstone, Wallingford, Conn.', pp. 104–112; Henry D. Rogers, 'On the Falls of Niagara and the reasonings of some authors respecting them', pp. 326–335; 'Notice of the Transactions of the Geological Society of Pennsylvania, Part I', pp. 347–355; Charles U. Shepard, 'On the Strontianite of Schoharie, (N.Y.) with a Notice of the Limestone Cavern in the same place', pp. 363–370; (vol. 28) John Ball, 'Geology, and physical features of the country west of the Rocky Mountains, &c.', pp. 1–16; T. A. Conrad, 'Observations on the Tertiary Strata of the Atlantic Coast', pp. 104–111, 280–282; John Gebhard, 'On the Geology and Mineralogy of Schoharie, N. Y.', pp. 172–177; Samuel George Morton, 'Notice of the fossil teeth of Fishes of the United States, the discovery of the Galt in Alabama, and a proposed division of the American Cretaceous Group', pp. 276–278; and Joseph G. Totten, 'Descriptions of some Shells, belonging to the Coast of New England', pp. 347–353. Briefer reports on aspects of North American geology appear under the heading of 'Miscellanies—Foreign and Domestic' in both volumes.

[174] Review of '*A Collection of Memoirs and Documents Relative to the History, Ancient and Modern, of the Provinces of the Rio de la Plata.—[Coleccion de obras, &c.]* by Pedro de Angelis', *Athenæum*, no. 496 (29 April 1837), p. 302: "La Cruz [Luis de la Cruz] volunteered to conduct the expedition [for the purpose of surveying a carriage road between Concepción and Buenos Aires] at his own expense, and being accompanied by some Chilian traders, well acquainted with the Pampas, and also by some caciques of the Pehuenche Indians, he started from the fort of Ballenar, near the volcano of Antuco, in the Andes, in the beginning of April—the autumn of that climate...The length of the road which he surveyed, and actually measured with the chain, was 172 Spanish leagues and a few yards [894.4 km (555 miles)]. The expense of rendering it practicable for carts was estimated by him at 46,000 pesos, the greater part of which sum was required for the passage through the mountains. In many places the large stones which covered the ground were to be cleared away; but the chief obstacles were the cracked streams of lava to be crossed in the Andes, and the numerous banks of rough scoriæ or ashes occurring in the plains as well as the mountains." Darwin misdated his reference to this review in the *Athenæum* by a year.

[175] Pedro de Angelis, *Coleccion de obras y documentos relativos a la historia antigua y moderna de las provincias del Rio de la Plata* (Buenos Aires, 1836–1837), 6

vols. Darwin's reference is to the first two volumes of this series which were published in 1836.

[176] Angelis, *Coleccion de obras* (note 175). Woodbine Parish (note 143) was certainly mentioned in this context because of his association with Buenos Ayres and the United Provinces of La Plata. Parish would have been a likely owner, and thus a possible lender, of Angelis's work.

[177] [W. D. Cooley], Review of *Coleccion de obras y documentos relativos a la historia antigua y moderna de las provincias del Rio de la Plata, ilustrados con notas y disertaciones* by Pedro de Angelis, *Edinburgh Review*, vol. 65 (1837), pp. 87–109. *The Wellesley Index to Victorian Periodicals, 1824–1900* is the source of the reviewer's name. The 'March 1835' notation in this entry is puzzling since the date is rather far removed from either the date of publication of Angelis's work or the date of the 'present Edinburgh'.

[178] Woodbine Parish (note 143), personal communication. The distance between Quilmes and Punta Indio is approximately 70 miles (112.63 km). The two points are found along the coastline south of Buenos Aires. In his book Parish discussed a larger area covered by beds of sea shells beginning at Santa Fé two hundred and forty miles northwest of Buenos Aires (*Buenos Ayres*, p. 168): "Travelling south from Santa Fé, along the shores of the Plata, which bounds these pampas on the east, we find, at distances varying from one to six leagues inland from the river, and from fifty to one hundred and fifty miles from the sea, large beds of marine shells, which the people of those parts quarry for lime. From these deposits I have myself specimens of *Voluta Colocynthis, Voluta Angulata, Buccinum Globulosum, Buccinum Nov. Spe., Oliva Patula; Cytheræa Flexuosa? Mactra? Venus Flexuosa, Ostrea*, &c." Also see Darwin, *GSA*, pp. 2–3 for lists of shells collected along the coastline near Buenos Aires by Parish and described by Alcide Dessalines d'Orbigny (note 149) and the conchologist and fellow of the Linnean Society of London, George Brettingham Sowerby (2nd) (1812–1884).

[179] James de Carle Sowerby (1787–1871), accomplished fossil conchologist, a fellow of the Zoological Society of London and the Linnean Society of London; personal communication. See *JR*, p. 253: "Mr. Murchison, who has had the kindness to look at my specimens [of fossil shells from the Falkland Islands], says that they have a close general resemblance to those belonging to the lower division of his Silurian system; and Mr. James Sowerby is of [the] opinion that some of the species are identical." For a complete description of one group of the shells see John Morris and Daniel Sharpe, 'Description of Eight Species of Brachiopodous Shells from the Palæozoic Rocks of the Falkland Islands, *Quarterly Journal of the Geological Society of London*, vol. 2 (1846), pp. 274–278: George Brettingham Sowerby (note 178) produced the two plates. The *Journal of the Society for the Bibliography of Natural*

History, vol. 6, pt. 6, 1974, is devoted to papers on the Sowerby family and includes: J. B. MacDonald, 'The Sowerby Collection at the British Museum (Natural History)' and R. J. Cleevely, 'A provisional bibliography of natural history works by the Sowerby family'.

[180] Charles Lyell (note 3), personal communication.

[181] James Bird, 'Observations on the Manners of the Inhabitants who occupy the Southern Coast of Arabia and Shores of the Red Sea; with Remarks on the Ancient and Modern Geography of that quarter, and the Route, through the Desert, from Kosir to Keneh', *Journal of the Royal Geographical Society of London*, vol. 4 (1834), pp. 192–206. The passage from which Darwin made the inference that the land in question had been elevated is the following (p. 202): "I visited old Kosír, six miles N.W. of the modern town. The town of old Kosír is situated on the north side of an inlet of the sea, which formerly extended westward into the land about a mile, but is now crossed by a bar of sand, that prevents the ingress of the water into the former channel. The ruins of the houses are chiefly found on the north side of the channel, which is still swampy in some parts of the bottom, where, in former times, the sea formed a kind of backwater to the point of land on which the town stood....The banks which bounded the former inlet, are formed of white calcareous tuffa and sand, as is also the whole of the shore of the Red Sea at this part. The sea appears to have gradually retired from the land, and left a considerable beach between its present limits and the base of the mountains westward."

[182] See Darwin, *VI*, pp. 120–121. Citing Leopold von Buch (note 56), among others, Darwin wrote: "Lavas are chiefly composed of three varieties of feldspar, varying in specific gravity from 2.4 to 2.74; of hornblende and augite, varying from 3.0 to 3.4; of olivine, varying from 3.3 to 3.4; and lastly, of oxides of iron, with specific gravities from 4.8 to 5.2. Hence crystals of feldspar, enveloped in a mass of liquefied, but not highly vesicular lava, would tend to rise to the upper parts; and crystals or granules of the other minerals, thus enveloped, would tend to sink... Trachyte, which consists chiefly of feldspar, with some hornblende and oxide of iron, has a specific gravity of about 2.45; whilst basalt composed chiefly of augite and feldspar, often with much iron and olivine, has a gravity of about 3.0. Accordingly we find, that where both trachytic and basaltic streams have proceeded from the same orifice, the trachytic streams have generally been first erupted, owing, as we must suppose, to the molten lava of this series having accumulated in the upper parts of the volcanic focus....As the later eruptions, however, from most volcanic mountains, burst through their basal parts, owing to the increased height and weight of the internal column of molten rock, we see why, in most cases, only the lower flanks of the central, trachytic masses, are enveloped by basaltic streams. The separation of the ingredients of a mass of lava would, perhaps, sometimes take place within the body of a volcanic mountain, if lofty and of great dimensions, instead of within the

underground focus; in which case, trachytic streams might be poured forth, almost contemporaneously, or at short recurrent intervals, from its summit, and basaltic streams from its base: this seems to have taken place at Teneriffe." To this last point Darwin added a footnote: "Consult von Buch's well-known and admirable *Description Physique* of this island [Teneriffe], which might serve as a model of descriptive geology." See von Buch, *Description physique des îles Canaries*, the entire section pp. 153–228.

[183] The 'Avestruz' was the local name for the rhea. See notes 149 and 153.

[184] 'Mr Brown' was obviously a guest with Darwin at the house of Woodbine Parish (note 143), and someone with first-hand knowledge of South American geography. Lacking a first name for Brown, and a good cross-reference, one can only speculate on his identity. He may have been William Brown (1777–1857), an admiral in the navy of Buenos Aires, a native of Ireland, and the only Brown mentioned in Nina L. Kay Shuttleworth, *A Life of Sir Woodbine Parish* (London, 1910). See also Michael G. Mulhall, *The English in South America* (Buenos Aires and London, 1878), p. 166 for information which places Brown in Ireland in 1836 and therefore plausibly in London in 1837.

[185] Woodbine Parish (note 143) referring to Anthony Zachariah Helms, *Travels from Buenos Ayres, by Potosi, to Lima* (2nd ed.; London, 1807); personal communication. Helms associated the granitic boulders he found around Potosí, Bolivia, which is situated in the Cordillera proper, with granite found in Tucumán, a province in northwestern Argentina. Parish considered Tucumán to lie in the upper parts of the Sierra de Córdoba, a low range of pampean mountains. (*Buenos Ayres*, p. 254) On the subject of the travelled boulders, see Helms, p. 45: "It in a particular manner excited my astonishment here, to find the highest snow-capt mountains within nine miles from Potosi, covered with a pretty thick stratum of granitic stones, rounded by the action of water. How could these masses of granite be deposited here, as there is a continual descent to Tucuman, where the granitic ridge ends, and from Tucuman to Potosi it consists of simple argillaceous shistus? Have they been rolled hither by a general deluge, or some later partial revolution of nature?" Darwin quoted from this passage in the *JR* (p. 290), and added, "He [Helms] supposes they [the boulders] must have come from Tucuman, which is several hundred miles distant: yet at p. 55 he says, at Iocalla (a few leagues only from Potosi), 'a mass of granite many miles in length, rises in huge weatherbeaten rocks:' the whole account is to me quite unintelligible." Unlike Darwin, Parish did not quarrel with Helms' account. See *Buenos Ayres*, p. 254.

[186] 'Signor Rozales' would also seem to have been a guest with Darwin at the house of Sir Woodbine Parish (note 143). Again, lacking a first name or a good cross-reference, one can only speculate as to his identity. From his last name and the nature of his remarks, one may presume that he was South American, likely Chilean. If he were sufficiently well known to be included in standard biographical dictionaries, he

was most likely related to Juan Enrique Rosales (d. 1825), a hero of Chile's struggle for independence. One member of that family who can definitely be placed in Europe in 1837 was Francisco Javier Rosales (d. 1875), Chilean chargé d'affaires to Paris from 1836–1853. Another member of the family probably in Europe at the time was Vicente Pérez Rosales (1807–1886), subsequently a well-known author and colonization agent for the Chilean government in Europe.

[187] Edward Turner, F.R.S. (1798–1837), the chemist, as quoted in Thomas Allan, 'On a Mass of Native Iron from the Desert of Atamaca [sic] in Peru', *Transactions of the Royal Society of Edinburgh*, vol. 11 (1831), p. 226: "Externally it [the specimen] has all the characters of meteoric iron. The metal in the specimen is tough, of a whiter colour than common iron, and is covered on most parts with a thin film of the oxide of iron. The interstices contain olivine." The proportions of iron, nickel and cobalt in the specimen are given as follows (p. 228):

Iron	93.4
Nickel	6.618
Cobalt	0.535
	100.553

Undoubtedly Darwin obtained this reference by way of Woodbine Parish. See Parish, *Buenos Ayres*, pp. 257–263 for a discussion of the specimen, which Parish had collected, and of Turner's conclusions. Parish doubted the meteoric origin of the specimen.

[188] For such a map see Alexander von Humboldt, *Atlas géographique et physique des régions equinoxiales du nouveau continent* (Paris [F. Schoell], 1814), plate 5 entitled "Esquisse hyposométrique des nœuds de montagnes et des ramifications de la Cordillère des Andes depuis le Cap de Horn jusqu'a l'Isthme de Panama..." The library of the Geological Society of London does not presently hold a copy of this atlas, although, according to the librarian, it once may have. It does hold a presentation copy of the first four volumes of an octavo edition of Humboldt's voyage published in Paris by Librairie grecque-latine-allemande. Volumes 1 and 2 are dated 1816; volumes 3 and 4, 1817. The title pages of these volumes refer to an accompanying atlas, but, from the evidence of library catalogues, it is questionable whether one was published specifically for this edition.

[189] Woodbine Parish (note 143), personal communication. Parish did not include this account in *Buenos Ayres*.

[190] Edmond Temple, *Travels in Various Parts of Peru, Including A Year's Residence in Potosi*, vol. 1, p. 116: "[January] 19th [1826], when about to rise with the sun, as was our custom, we suddenly felt ourselves shaken in our beds, and thought it

was occasioned by a dog or a pig, frequent visitors prowling about for the fragments of the last meal; we therefore all, at the same moment, looked under our beds, with the intention of chasing away the intruder." And, p. 146: "Did you feel the earthquake?—At what hour?—Where were you at the time?—What did you fancy?—What did you do?—These are questions I am putting to every body I chance to converse with, and I do not think I ever felt greater interest on any subject than in the various accounts I hear respecting this phenomenon." Temple's description of his route (p. 109) places him in the province of Santiago del Estero, just over the border of the province of Córdoba, at the time when the earthquake occurred. For the account of an earthquake in Córdoba causing the disappearance of a lake see note 171.

191 Arsène Isabelle, *Voyage à Buénos-Ayres et à Porta-Alègre. . .1830–1834* (Havre, 1835), pp. 454–455: "Au nord-est du *passo*, à distance de quatre à cinq lieues, est une montagne boisée, appelée *Serra do Butucarahy*, s'étendant un peu à sa base, à l'est et à l'ouest, formant comme un chaînon de monts élevés indépendans de la *Serra-Grande*, et d'ailleurs placé dans une direction parallèle à celle-ci. Vue de loin (on l'aperçoit du Jacuy), elle ne paraît être qu'un pic très élevé, mais en approchant on voit que le mamelon du centre se termine par une plate forme assez grande. Je suis porté à croire que cette montagne est volcanique, parce queles *moradores* du lieu m'ont assuré avoir entendu des détonations très fortes dans son intérieur; ils prétendent encore qu'il y a un lac à la cime, dont les eaux, en filtrant ou en débordant, produisent des éboulemens qui mettent à nu la roche qu'elle semble avoir pour noyau; aussi la partie supérieure est—elle devenue inaccessible à cause de sa dénudation. Après les grandes pluies d'orage, et pendant les gelées, l'eau se trouvant dans les fissures du rocher en détache des fragmens qui tombent avec fracas; sa grande hauteur, ou plutôt son isolement attire le tonnerre, ce qui fait que cette montagne est souvent foudroyée." The hill described is probably Coxilha which lies to the northeast of the Rio Botucaraí [30° 0′ S., 52° 46′ W.] in Brazil. It is not an active volcano, nor are there any in the area.

192 Jean Baptiste Joseph Boussingault, 'Sur les tremblemens de terre des Andes', *Bulletin de la Société géologique de France*, vol. 6 (1834–1835), pp. 54–56, as cited in Charles Lyell, *Principles of Geology* (4th ed.; London, 1835), vol. 2, p. 96: "In Quito, many important revolutions in the physical features of the country are said to have resulted, within the memory of man, from the earthquakes by which it has been convulsed. M. Boussingault declares his belief, that if a full register had been kept of all the convulsions experienced here and in other populous districts of the Andes, it would be found that the trembling of the earth had been incessant. The frequency of the movement, he thinks, is not due to volcanic explosions, but to the continual falling in of masses of rock which have been fractured and upheaved in a solid form at a comparatively recent epoch. According to the same author, the height of several mountains of the Andes has diminished in modern times." This passage also occurred in the 5th or (March) 1837 edition of the *Principles* (vol. 2, p. 44), where Darwin may

have encountered it first in print. Darwin did not own a personal copy of the 4th edition.

[193] George Steuart Mackenzie (note 110) as quoted in John Barrow, Jr., *A Visit to Iceland...1834* (London, 1835), p. 224: "This supposition [of lava blistering, see note 110] would appear to afford a better solution of the difficult problem of accounting for those blocks of lava that are perched on high ridges, than that given by Sir George Mackenzie, who imagines this lava to have flowed from the lower ground, and calls it the 'ascending lava.' He says—'It is caused by the formation of a crust on the coating of the surface, and a case or tube being thus produced, the lava runs in the same manner as water in a pipe.'" The quotation is from Mackenzie, *Travels in the Island of Iceland*, p. 108.

[194] Sir Henry Holland, F.R.S. (1788–1873), fashionable London physician, traveller, essayist, and a distant relative to Charles Darwin through Josiah Wedgwood the potter. Holland accompanied Sir George Steuart Mackenzie (note 110) to Iceland in 1810 and was the author of the 'Preliminary Dissertation on the History and Literature of Iceland' in Mackenzie, *Travels in the Island of Iceland*, pp. 1–70. Apparently Darwin intended to consult him on the subject of blistered lava. On this see Barrow, *A Visit to Iceland*, p. 223: "Dr. Holland, in his account of the Mineralogy of Iceland, seems to countenance the opinion of these masses having been thrown up on the very spot they occupy, observing there was one formation of lava which had every appearance of not having flowed. Speaking of these masses of lava, he says: — 'It was heaved up into large bubbles or blisters, some of which were round, and from a few feet to forty or fifty in diameter; others were long, some straight, and some waved. A great many of these bubbles had burst open, and displayed caverns of considerable depth.'" However, this description, which Barrow attributed to Holland, is rather to be found in Mackenzie's chapter entitled 'Mineralogy' in *Travels in the Island of Iceland*, p. 390. Barrow's error seems to have stemmed from a mistaken belief that Holland rather than Mackenzie wrote the chapter on mineralogy. See also *VI*, pp. 95–96, and 103.

[195] Barrow, *A Visit to Iceland*, pp. 276–277: "Here, then, we have the plain and undeniable evidence of subterranean or sub-marine fire, exerting its influence under the sea, almost in a direct line, to the extent of 16 1/2 degrees of latitude, or more than 1100 statute miles. If we are to suppose that one and the same efficient cause has been exerted in heaving up this extended line of igneous formations, from Fairhead to Jan Meyen, we may form some vague notion how deep-seated the fiery focus must be to impart its force, perhaps through numerous apertures, in a line of so great an extent, and nearly in the same direction. It may probably be considered the more remarkable, that no indication whatever is found of volcanic fire on the coast-line of Old Greenland, close to the westward of the last-mentioned island, and also to Iceland, nor on that of Norway on the opposite side, nor on that of Spitzbergen; on these places all is granite, porphyry, gneiss, mica-slate, clay-slate, lime, marble, and sandstone."

[196] 'Bosh' is written in the margin in pencil. Other entries on the page are in ink.

[197] Alexander von Humboldt, *Political Essay on the Kingdom of New Spain* (London, 1811), vol. 3, p. 113. Quoted correctly with minor variations in capitalization, punctuation, and the insertion of '&' for 'and'.

[198] Robert Brown, F.R.S. (1773–1858), pre-eminent British botanist of his day, from 1806 to 1822 librarian to and thereafter a fellow of the Linnean Society of London. In 1827 Brown arranged for the transfer of the botanical collection of Sir Joseph Banks, F.R.S. (1743–1820) to the British Museum, and from 1827 to his death Brown supervised the botanical collections of the Museum. Brown also assembled a valuable collection of fossil woods ('F.W.') which he bequeathed to the Museum.

[199] Darwin was referring here to the opinion of James Hutton (note 130) respecting the formation of fossil wood. In Hutton's view 'undulations' in silicified fossil wood would be traced to the action of exterior heat and pressure. See Playfair, *Illustrations of the Huttonian Theory of the Earth*, pp. 24–25: "...wherever they [fossils] bear marks of having been fluid, these marks are such as characterize the fluidity of fusion [caused by igneous consolidation], and distinguish it from that which is produced by solution in a menstruum.... Fossil-wood, penetrated by siliceous matter, is a substance well known to mineralogists; it is found in great abundance in various situations, and frequently in the heart of great bodies of rock. On examination, the siliceous matter is often observed to have penetrated the wood very unequally, so that the vegetable structure remains in some places entire; and in other places is lost in a homogeneous mass of agate or jasper. Where this happens, it may be remarked, that the line which separates these two parts is quite sharp and distinct, altogether different from what must have taken place, had the flinty matter been introduced into the body of the wood, by any fluid in which it was dissolved, as it would then have pervaded the whole, if not uniformly, yet with a regular gradation. In those specimens of fossil-wood that are partly penetrated by agate, and partly not penetrated at all, the same sharpness of termination may be remarked, and is an appearance highly characteristic of the fluidity produced by fusion."

[200] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 113. The original quotation begins, 'The true native iron,...' and varies slightly from Darwin's citation in punctuation and in the spelling out of the word 'and'.

[201] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, pp. 129–130: "The Mexican veins are to be found for the most part in *primitive* and *transition* rocks ...and rarely in the rocks of *secondary* formation...In the old continent *granite*, *gneiss* and *micaceous slate* (*glimmer-schiefer*) constitute the crest of high chains of mountains. But these rocks seldom appear outwardly on the ridge of the Cordilleras of America, particularly in the central part contained between the 18° and 22° of north latitude. Beds of amphibolic porphyry, greenstone, amygdaloid, basalt and

other trap formations of an enormous thickness cover the granite and conceal it from the geologist. The coast of Acapulco is formed of granite rock. Ascending towards the table land of Mexico we see the granite pierce through the porphyry for the last time between Zumpango and Sopilote. Farther to the east in the province of Oaxaca the granite and gneiss are visible in table lands of considerable extent traversed by veins of gold."

[202] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 131. The original sentence reads "The *porphyries*..."

[203] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, pp. 131–132: "They [the Mexican porphyries] are all characterized by the constant presence of amphibole and the absence of quartz, so common in the primitive porphyries of Europe, and especially in those which form beds in gneiss. The *common felspar* is rarely to be seen in the Mexican porphyries; and it belongs only to the most antient formations, those of Pachuca, Real del Monte and Moran, where the veins furnish twice as much silver as all Saxony. We frequently discover only *vitreous felspar* in the porphyries of Spanish America. The rock which is intersected by the rich gold vein of Villalpando near Guanaxuato is a porphyry of which the basis is somewhat a kin to *klingstein* (*phonolite*), and in which amphibole is extremely rare. Several of these parts of New Spain bear a great analogy to the problematical rocks of Hungary, designated by M. Born by the very vague denomination of *saxum metalliferum*. The veins of Zimapan which are the most instructive in respect to the theory of the stratification of minerals are intersected by porphyries of a *greenstone* base which appear to belong to trap rocks of new formation. These veins of Zimapan offer to oryctognostic collections a great variety of interesting minerals such as the fibrous zeolith, the stilbite, the grammalite, the pyenite, native sulphur, spar fluor, baryte suberiform asbestos, green grenats, carbonate and chromate of lead, orpiment, chrysoprase, and a new species of opal of the rarest beauty, which I made known in Europe, and which M. M. Karsten and Klaproth have described under the name of (*feuer-opal*)."

[204] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, pp. 133–134: "In proportion as the north of Mexico shall be examined by intelligent geologists, it will be perceived that the metallick wealth of Mexico does not exclusively belong to primitive earths and mountains of transition, but extend also to those of *secondary formation*. I know not whether the lead which is procured in the eastern parts of the intendancy of San Luis Potosi is found in veins or beds, but it appears certain, that the veins of silver of the real de Catorce, as well as those of the Doctor and Xaschi near Zimapan, traverse the *alpine lime-stone* (*alpenkalkstein*); and this rock reposes on a *poudingue* with silicious cement which may be considered as the most antient of secondary formations. The alpine lime-stone and the jura lime-stone (*jurakalkstein*) contain the celebrated silver mines of Tasco and Teuilotepec in the intendancy of Mexico; and it is in these calcareous rocks that the numerous veins which in this

country have been very early wrought, display the greatest wealth. . . . The result of this general view of the metalliferous depositories (erzführende lagerstätte) is that the cordilleras of Mexico contain veins in a great variety of rocks, and that those rocks which at present furnish almost the whole silver annually exported from Vera Cruz, are the *primitive slate*, the *grauwakke*, and the *alpine lime-stone*, intersected by the *principal veins* of Guanaxuato, Zacatecas and Catorce."

[205] Friedrich Hoffmann, *Geschichte der Geognosie* (Berlin, 1838), the section 'Dämpfe verändern die vulkanischen Gesteine', pp. 480–481. This entry is written in small handwriting in light brown ink, as are all other bracketed entries on page 165e.

[206] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 128: "How can he [the naturalist] draw general results from the observation of a multitude of small phenomena [regarding metalliferous deposits], modified by causes of a purely local nature, and appearing to be the effects of an action of chemical affinities, circumscribed to a very narrow space?"

[207] Eilhert Mitscherlich, 'On Artificial Crystals of Oxide of Iron', *Edinburgh Journal of Natural and Geographic Science*, vol. 2 (1830), p. 302: "So greatly do these [crystals of oxide of iron in a pottery furnace] resemble the crystals [of specular iron] from volcanoes, that the same theory of formation may be applied to both. The first are formed in a pottery furnace, in which the vessels, when baked, are glazed by means of common salt. The clay used consists principally of silica, alumina, and a little oxide of iron. The salt is volatilized, and water coming in contact with the surface of the vessels, new compounds are produced, the water is decomposed, muriatic acid is formed, and the soda produced unites with the silica to make the necessary glass. As to the oxide of iron, its history will be best understood by an experiment or two. If a mixture of salt, oxide of iron, and silica, be heated to redness in a tube, and water in vapour be passed over it, much muriatic acid is formed, but very little chloride of iron, and crystallized oxide of iron will be found in the mass: but if muriatic acid be brought in contact with ignited oxide of iron, water and chloride of iron are formed, and sublime; if the chloride of iron come in contact with more water, muriatic acid is first developed, then chloride of iron, and a residue of crystallized oxide of iron remains. The formation of chloride of iron by the action of muriatic acid upon oxide of iron appears, therefore, to depend upon the proportion of water present. M. Mitscherlich applies these experiments and principles in explanation of the manner in which volcanic crystallized oxide of iron is formed —all the conditions necessary, according to the above view, being present in those cases, where heretofore it had been supposed the oxide of iron, as such, had been actually sublimed."

[208] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 134, "Thus it is in a *primitive slate* (*ur-thon schiefer*) on which a clayey porphyry containing grenats reposes, that the wealth of *Potosi* in the kingdom of Buenos-Ayres is contained.

On the other hand, in Peru the mines of Gualgayoc or Chota and that of Yauricocha or Pasco which together yield annually double the quantity of all the German mines, are found in an *alpine lime-stone*. The more we study the geological constitution of the globe on a large scale the more we perceive that there is scarcely a rock which has not in certain countries been found eminently metalliferous. The wealth of the veins is for the most part totally independent of the nature of the beds which they intersect." And pp. 142–143: "The province of Quito, and the Eastern part of the kingdom of New Granada, from the 3° of South latitude, to the 7° of North latitude; the Isthmus of Panama, and the mountains of Guatimala, contain for a length of 600 leagues, vast extents of ground in which no vein has hitherto been wrought with any degree of success. It would not, however, be accurate to advance that these countries which have in a degree, been convulsed with volcanos are entirely destitute of gold and silver ore. Numerous metalliferous depositories may be concealed by the super-position of strata of basalt, amygdaloid, porphyry with *greenstone* base, and other rocks comprehended by geologists, under the general name of *trapp-formation*."

[209] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, pp. 152–153: "In Peru, the greatest part of the silver extracted from the bowels of the earth is furnished by the *pacos*, a sort of ores of an earthy appearance, which M. [Martin Heinrich] Klaproth was so good as to analyse at my request, and which consist of a mixture of almost imperceptible parcels of native silver, with the brown oxyde of iron. In Mexico on the other hand, the greatest quantity of silver annually brought into circulation, is derived from those *ores* which the Saxon miner calls by the name of *dürre erze* especially from *sulfuretted silver*, (or vitrous *glaserz*) from *arsenical grey-copper* (*fahlerz*) and *antimony*, (*grau* or *schwarzgiltigerz*) from *muriated silver*, (*hornerz*) from *prismatic black silver*, (*spödglaserz*), and from red silver (*rothgiltigez*). We do not name native silver among these ores, because it is not found in sufficient abundance to admit of any very considerable part of the total produce of the mines of New Spain being attributed to it." Also p. 154: "The muriated silver which is so seldom found in the veins of Europe, is very abundant in the mines of Catorce, Fresnillo, and the Cerro San Pedro, near the town of San Luis Potosi.... In the veins of Catorce, the muriated silver is accompanied with molybated lead, (*gelb-blei-erz*) and phosphated lead (*grünblei-erz*)." And p. 155: "The true mine of *white silver* (weissgiltig-erz) is very rare in Mexico. Its variety *greyish white*, very rich in lead, is to be found however in the intendancy of Sonora, in the veins of Cosala, where it is accompanied with argentiferous *galena*, red silver, brown blende, quartz and sulfated barytes. This last substance which is very uncommon among the *gangues* of Mexico, is to be also found at the Real del Doctor, near Baranca de las Tinajas, and at Sombrerete, particularly in the mine called Campechana. Spar-fluor has been only found hitherto in the veins of Lomo del Toro, near Zimapan, at Bolaños and Guadalcazar, near Catorce."

[210] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 156. Quoted exactly except for the abbreviation of 'and' to '&' and the deletion of a comma after 'silver'.

[211] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 157: "*Native Silver*, which is much less abundant in America, than is generally supposed, has been found in considerable masses, sometimes weighing more than 200 killogrammes [441 lbs], in the seams of Batopilas in New Biscay. These mines, which are not very briskly wrought at present, are among the most northern of New Spain. Nature exhibits the same minerals there, that are found in the vein of Kongsberg in Norway. Those of Batopilas contain filiform dendritic and silver, which intersects with that of carbonated lime."

[212] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, pp. 157–158: "Native silver is constantly accompanied by *glaserz* [sulfuretted silver] in the seams of Mexico, as well as in those of the mountains of Europe...From time to time small branches, or cylindrical filaments of native silver, are also discovered in the celebrated vein of Guanaxuato; but these masses have never been so considerable as those which were formerly drawn from the mine *del Encino* near Pachuca and Tasco, where native silver is sometimes contained in folia of selenite."

[213] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 158: "A great part of the silver annually produced in Europe, is derived from the *argentiferous sulfuretted lead* (*silberhaltiger bleiglanz*) which is sometimes found in the veins which intersect *primitive and transition mountains*, and sometimes on particular *beds* (erzflöze) in rocks of *secondary formation*. In the kingdom of New Spain, the greatest part of the veins contain very little argentiferous galena; but there are very few mines in which lead ore is a particular object of their operations."

[214] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 159: "A very considerable quantity of silver is produced from the smelting of the martial pyrites (*gemeine schwefelkiese*) of which New Spain sometimes exhibits varieties richer than the *glaserz* itself...It is a very common prejudice in Europe, that great masses of native silver are extremely common in Mexico and Peru...Also pp. 160–161: "It appears that at the formation of veins in every climate, the distribution of silver has been very unequal; sometimes concentrated in one point, and at other times disseminated in the *gangue*, and allied with other metals." And p. 162: "Although the New Continent, however, has not hitherto exhibited native silver in such considerable blocks as the Old, this metal is found more abundantly in a state of perfect purity in Peru and Mexico, than in any other quarter of the globe."

[215] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 176: "What is the nature of the *metalliferous depository*, which has furnished these immense riches, and which may be considered as the Potosi of the northern hemisphere? What is the

position of the rock which crosses the veins of Guanaxuato? These questions are of so great importance that I must here give a geological view of so remarkable a country. The most ancient rock known in the district of Guanaxuato, is the *clay slate* (*thon schiefer*)....It is of an ash-grey or greyish-black frequently intersected by an infinity of small quartz veins, which frequently pass into talk-state [sic] (*talk schiefer*) and into *schistous chlorite*." Also, pp. 177–178: "On digging the great pit (*tiro general*) of Valenciana, they discovered banks of *syenite* of *Hornblend slate* (*Hornblend schiefer*) and true serpentine, altering with one another, and forming *subordinate beds*, in the *clay slate*....These strata [of clay slate] are very regularly *directed* h. 8 to 9 of the miner's compass; they are inclined from 45 to 50 degrees to the south west....Two very different formations repose on the *clay slate*: the one of porphyry...and the other, of old *freestone* in the ravins, and table lands of small elevation." And pp. 179–180: "This porphyry...is generally of a greenish colour....The most recent [beds]... contain vitreous felspar, inchased in a mass, which sometimes passes into the petrosilex jadien, and sometimes into the pholonite [sic] or *klingstein* of Werner.... All the porphyries of the district of Guanaxuato possess this in common, that amphibole is almost as rare in them as quartz and mica."

[216] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, pp. 180–183: "This free-stone (*urfelsconglomerat*) is a brescia with clayey cement, mixed with oxide of iron, in which are imbedded *angulous* fragments of quartz, Lydian stone, syenite, porphyry, and splintery hornstone....This formation of old free-stone is the same with that which appears at the surface in the plains of the river Amazon, in South America....We must not confound the brescia which contains imbedded fragments of primitive and transition rock, with another freestone, which may be designated by the name of *felspar agglomeration*....This agglomeration...is composed of grains of quartz, small fragments of slate, and felspar chrystals, partly broken, and partly remaining untouched....Probably the destruction of porphyries has had the greatest influence on the formation of this *felspar* freestone. It contrasts with the freestone of the Old Continent, in which some chrystals of grenats and amphibole have been found, but never...felspar in any abundance. The most experienced mineralogist, after examining the position of the *lozero* [agglomeration] of Guanaxuato, would be tempted to take it at first view, for a porphyry with clayey base, or for a porphyritic brescia (*trümmer-porphyr*)....These formations of old *freestone* of Guanaxuato, serve as bases to other secondary beds, which in their *position*, that is to say in *the order of their superposition*, exhibit the greatest analogy with the secondary rocks of central Europe. In the plains of Temascatio...there is a compact limestone..."

[217] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 185: "The vein (*veta madre*) [of Guanaxuato] traverses both clay slate and porphyry. In both of these rocks, very considerable wealth has been found. Its mean direction is...[N. 52° W.] and is nearly the same with that of the *veta grande* of Zacatecas, and of the veins

of Tasco and Moran, which are all western veins (spathgänge). The inclination of the vein of Guanaxuato, is 45 or 48 degrees to the south west." Also pp. 186–187: "The *veta madre* of Guanaxuato, bears a good deal of resemblance to the celebrated vein of *Spital* of Schemnitz, in Hungary. The European miners who have had occasion to examine both these *depositories* of minerals, have been in doubt whether to consider them as true veins, or as *metalliferous beds* (*erzlager*)....If the *veta madre* was really a *bed*, we should not find *angular fragments* of its *roof* contained in its *mass*, as we generally observe on points where the *roof* is a *slate* charged with *carbone*, and the wall a talc slate. In a vein, the *roof* and the *wall* are deemed anterior to the formation of the *crevice*, and to the minerals which have successfully filled it; but a *bed* has undoubtedly pre-existed to the *strata* of the rock which compose its *roof*. [Hence] we may discover in a bed fragments of the *wall*, but never pieces detached from the *roof*."

218 Erasmus Darwin, *The Botanic Garden* (4th ed.; London, 1799), vol. 1, p. 18: "The air, like all other bad conductors of electricity, is known to be a bad conductor of heat...." Also see p. 11 on the subject of shooting stars and fireballs and pp. 249–258 for a discussion of meteors.

219 Woodbine Parish (note 143). See note 187 and see also Parish, 'Notice as to the supposed Identity of the large Mass of Meteoric Iron now in the British Museum, with the celebrated Otumpa Iron described by Rubin de Celis in the Philosophical Transactions for 1786', *Philosophical Transactions of the Royal Society of London*, vol. 124 (1834), pp. 53–54.

220 Ernst Florenz Friedrich Chladni, 'Supplément au catalogue des météores, à la suite desquels des pierres ou des masses de fer sont tombées', *Journal des mines*, vol. 26 (1809), pp. 79–80. Speaking of meteorites Chladni wrote (p. 80), "Il paraît qu'on doit aussi ranger parmi les masses dont il s'agit, celle d'un fer malléable, du poids de 97 myriagrammes, qu'un minéralogiste saxon, M. Sonnenschmidt, a trouvée dans la ville de Zacatecas, dans la Nouvelle-Espagne, où il était directeur des mines." Alexander von Humboldt (note 38) also reported the existence of this stone. See Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 2, p. 293.

221 Alcide Dessalines d'Orbigny, *Voyage dans l'Amérique méridionale...1826–1833*, vol. 5, part 1 (Paris and Strasbourg, 1847), pp. 140–144 and plate 10. Individual sections of this volume were published separately earlier. According to a typewritten list compiled in 1933 by Charles Davies Sherborn of the British Museum (Natural History), the section which includes pp. 140–144 was published in 1835 and plate 10 in 1834. The three species described by d'Orbigny were *Sagitta triptera*, *Sagitta exaptera*, and *Sagitta diptera*. In this entry Darwin was noting the similarity of one of his unidentified specimens to *Sagitta triptera*. The genus *Sagitta* or 'Flèche' had been established by Jean René Constantin Quoy and Paul Gaimard in their 'Observations zoologiques faites à bord de l'Astrolabe, en Mai 1826, dans le Détroit de Gilbraltar',

Annales des sciences naturelles, vol. 10 (1827), p. 232–233. Presumably Darwin's 'additional information' on the genus appeared in his later article, 'Observations on the Structure and Propagation of the genus *Sagitta*', *Annals and Magazine of Natural History*, vol. 8 (1844), pp. 1–6 with plate.

[222] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 189. Quoted exactly except for minor variations in punctuation, the abbreviation of 'and' to '&' and the lack of emphasis on foreign words by way of underlining.

[223] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 205: "The *veta grande*, or principal vein [at Zacatecas], has the same direction as the *veta madre* of Guanaxuato; the others are generally in a direction from east to west." And p. 207: "This wealth is displayed...not in the ravins, and where the veins run along the gentle slope of the mountains, but most frequently on the most elevated summits, on points where the surface appears to have been tumultuously torn, in the antient revolutions of the globe."

[224] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 210: "The greatest number of these veins [at Catorce] are *western* (*spathgänge*); and their inclination is from 25° to 30° towards the north east." P. 223: "...the vein of Moran ...inclined 84° to the north east..." P. 226: "The oldest rock which appears at the surface in this district of mines [at Tasco], is the primitive slate....Its direction is hor. 3–4; and its inclination 40° to the north-west...." Also p. 227: "The district of mines of Tasco...contains a great number of veins...all directed from the north-west to the south-east, hor. 7–9."

[225] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 215: "What relation exists between these last beds [of porphyry], which several distinguished mineralogists consider as volcanic productions, and the porphyries of Pachuca, Real del Monte, and Moran, in which nature has deposited enormous masses of sulfuretted silver and argentiferous pyrites? This problem which is one of the most difficult in geology, will only be resolved when a great number of zealous and intelligent travellers, shall have gone over the Mexican Cordilleras, and carefully studied the immense variety of porphyries which are destitute of quartz, and which abound both in hornblend and vitreous felspar."

[226] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 227: "These veins [in the mining districts of Tasco and the Real de Tehuilotepec], like those of Catorce, traverse both the limestone and the micaceous slate which serves for its base; and they exhibit the same metals in both rocks."

[227] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, p. 230: "This formation [of veins, one of four types existing at Tasco and Tehuilotepec] which is the richest of all, displays the remarkable phenomenon, that the minerals the most abundant in silver, form spheroidal balls, from ten to twelve centimetres in diameter...."

[228] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 3, pp. 347–348: "The mines of Huantajaya, surrounded with beds of rock salt are particularly celebrated on account of the great masses of native silver which they contain in a decomposed gangue; and they furnish annually between 70 and 80 thousand marcs of silver. The muriate of conchoidal silver, sulphuretted silver, galena with small grains, quartz, carbonate of lime, accompany the native silver." Also pp. 348–349: "[Antonio de] Ulloa after travelling over a great part of the Andes, affirms that silver is peculiar to the high table lands of the Cordilleras, called *Punas* or *Paramos*, and that gold on the other hand abounds in the lowest, and consequently warmest regions; but this learned traveller appears to have forgot that in Peru the richest provinces in gold are the *partidos* of Pataz and Huailas, which are on the ridge of the Cordilleras.... It [gold] has also been extracted from the right bank of the Rio de Micuipampa, between the Cerro de San Jose, and the plain called by the natives, *Choropampa* or *plain of shells*, on account of an enormous quantity of ostracites, cardium and other petrifications of sea shells contained in the formation of alpine limestone of Gualgayoc."

[229] Louis Antoine de Bougainville, *Voyage autour du monde...1766–1769*, (2nd ed.; Paris, 1772), vol. 1, p. 291: "Ces hommes bruts [the Fuegians] traitoient les chefs-d-œuvre de l'industrie humaine, comme ils traitent les loix de la nature & ses phénomènes." See *JR*, p. 242.

[230] Juan and Ulloa, *A Voyage to South America*, vol. 1, pp. 168–169: "On the coast [at Guayaquil]...is found that exquisite purple, so highly esteemed among the ancients; but the fish from which it was taken, having been either unknown or forgotten, many moderns have imagined the species to be extinct. This colour, however, is found in a species of shell-fish growing on rocks washed by the sea. They are something larger than a nut, and are replete with a juice, probably the blood, which, when expressed, is the true purple; for if a thread of cotton, or any thing of a similar kind, be dipt in this liquor, it becomes of a most vivid colour, which repeated washings are so far from obliterating, that they rather improve it; nor does it fade by wearing. ...Stuffs died with this purple are also highly valued. This precious juice is extracted by different methods. Some take the fish out of its shell, and laying it on the back of their hand, press it with a knife from the head to the tail, separating that part of the body into which the compression has forced the juice, and throw away the rest. In this manner they proceed till they have provided themselves with a sufficient quantity. Then they draw the threads through the liquor, which is the whole process. But the purple tinge does not immediately appear, the juice being at first of a milky colour; it then changes to green; and, lastly, into this celebrated purple. Others pursue a different method in extracting the colour; for they neither kill the fish, nor take it entirely out of its shell; but squeeze it so hard as to express a juice, with which they die the thread, and afterwards replace the fish on the rock whence it was taken."

[231] Juan and Ulloa, *A Voyage to South America*, vol. 1, p. 281: "As the pestilence, whose ravages among the human species in Europe, and other parts, are so dreadful,

is unknown both at Quito and throughout all America, so is also the madness in dogs. And though they have some idea of the pestilence, and call those diseases similar in their effects by that name, they are entirely ignorant of the canine madness; and express their astonishment when an European [sic] relates the melancholy effects of it."

[232] This entry is written in light brown ink.

[233] Humboldt, *Political Essay on the Kingdom of New Spain*, vol. 4, p. 58: "It is observed at Acapulco that the shakes take three different directions, sometimes coming from the west by the isthmus [which separates Acapulco from the Bay de la Langosta de la Abra de San Nicolas]...sometimes from the north west as if they were from the volcano de Colima, and sometimes coming from the south. The earthquakes which are felt in the direction of the south are attributed to submarine volcanoes; for they see here, what I often observed at night in the Callao of Lima, that the sea becomes suddenly agitated in a most alarming manner in calm and serene weather when not a breath of wind is blowing." This entry is written in light brown ink.

[234] Of the petrified trees he found on the Uspallata range Darwin wrote (*JR*, p. 406): "Mr. Robert Brown [note 198] has been kind enough to examine the wood: he says it is coniferous, and that it partakes of the character of the Araucarian tribe (to which the common South Chilian pine belongs), but with some curious points of affinity with the yew." Also see *GSA*, p. 202 for repetition of the same information. From Darwin's correspondence it is clear that Brown described the specimens of silicified wood sometime during the period from the end of March to mid-May 1837. On 28 March Darwin wrote to J. S. Henslow (note 148) telling of Brown's general interests in specimens from the *Beagle* voyage; on 10 April Darwin wrote to the English naturalist Leonard Jenyns [later Leonard Blomefield] (1800–1893): "Tell Henslow, I think my silicified wood has unflintified Mr. Brown's heart"; and on 18 May Darwin wrote to Henslow with Brown's identification of the specimens. For the Darwin–Henslow letters see Nora Barlow, ed., *Darwin and Henslow*, pp. 125, 127. For the letter to Jenyns see Francis Darwin, ed., *The Life and Letters of Charles Darwin* (3rd ed. rev.; London, 1888), vol. 1, p. 282.

[235] Jean André Deluc, *Geological Travels*. 3 vols. (London, 1810–1811).

[236] Francis Beaufort, *Karamania; or, A Brief Description of the South Coast of Asia-Minor and of the Remains of Antiquity, with Plans, Views, &c., Collected during a Survey of That Coast...in...1811–1812* (London, 1817).

[237] Ross, *A Voyage of Discovery...for the Purpose of Exploring Baffin's Bay*, Appendix No. 3, 'Table of Soundings obtained in Davis' Strait and Baffin's Bay'.

[238] William Scoresby, Jr., *An Account of the Arctic Regions, with a History and Description of the Northern Whale-fishery* (Edinburgh, 1820), vol. 1, pp. 184–194

entitled, 'Temperature, Depth, and Pressure of the Greenland Sea, with a Description of an Apparatus for bringing up Water from great Depths, and an Account of Experiments made with it'.

[239] Gilbert Farquhar Mathison, *Narrative of a Visit to Brazil, Chile, Peru, and the Sandwich Islands...1821–1822* (London, 1825).

[240] John Mawe, *Travels in the Gold and Diamond Districts of Brazil* (A new ed.; London, 1825). The first two editions of this work had been entitled *Travels in the Interior of Brazil.* This was, however, the edition which Darwin owned.

[241] Alessandro Malaspina (1754–1809), Spanish navigator of Italian birth. From 1789–1794 Malaspina led a major Spanish scientific expedition to circumnavigate the earth. However, on his return to Spain, Malaspina fell from favour, partly owing to court intrigue and partly to Malaspina's critical attitude towards Spain's treatment of her colonies. Malaspina was imprisoned and the full account of his work, which was to run to seven volumes, was never completed. His own narrative of the voyage was finally published in 1885 under the title *Viaje político-científico alrededor del mundo por las corbetas Descubierta y Atrevida...1789–1794* (Madrid, 1885). Earlier Malaspina's navigational work appeared in official Spanish charts, where it was much praised (see, for example, Parish, *Buenos Ayres*, pp. 96–98), although Malaspina was not credited for his contribution. A few of his observations were eventually published under his own name as 'Tablas de latitudes y longitudes de los principales puntos del Rio de la Plata', in Pedro de Angelis, *Coleccion de obras y documentos relativos a la historia antigua y moderna de las provincias del Rio de la Plata* (Buenos-Aires, 1837), vol. 6.

[242] Faddeĭ Faddeevich Bellinsgauzen, Двукратныя изысканія вь Южномь Ледовитомь Океанв...*1819–1821* [*Dvukratni͡a izyskanii͡a v I͡Uzhnom Ledovitom Okeane ...1819–1821*]. 2 vols. plus atlas. (St. Petersburg, 1831). The original work was published in a limited edition of 600 copies. For an English translation see Frank Debenham, ed., *The Voyage of Captain Bellingshausen to the Antarctic Seas 1819–1821*. 2 vols. (London, 1945).

[243] Otto von Kotzebue, *A Voyage of Discovery, into the South Sea and Beering's Straits...1815–1818*. 3 vols. (London, 1821).

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Index to persons named in the Red Notebook

Page references are to the original notebook

Subject index to the Red Notebook

Page references are to the original notebook

Geographical index to the Red Notebook

Page references are to the original notebook

Bulletin of the British Museum (Natural History)

The Earth Generated and Anatomized by William Hobbs

An early eighteenth century theory of the earth

Roy Porter (Editor)

Historical series Vol 8 26 March 1981

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Cromwell Road,
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England.

World List abbreviation: *Bull. Br. Mus. nat. Hist.* (hist. Ser.)

ISSN 0068–2306

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Historical series
Vol 8: 1–158 (Complete)
Issued 26 March 1981

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by William Hobbs

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Edited with an introduction by

Roy Porter

The Wellcome Institute for the History of Medicine
183 Euston Road, London NW1 2BP

Bulletin of The British Museum (Natural History)
Historical series Volume 8 (Complete)
London 1981

ISSN 0068 – 2306

Published by British Museum (Natural History)
Cromwell Road, London SW7 5BD

Bull. Br. Mus. nat. Hist. (hist. Ser.) 8: 1–158 (Complete)   Issued 26 March 1981

Printed in Great Britain by Spottiswoode Ballantyne Ltd., Colchester and London

Contents

Introduction

The discovery of new scientific manuscripts is always exciting: the discovery of a new scientific author even more so. Hence the appearance in 1973 of a new early eighteenth century theory of the Earth, *The earth generated and anatomized*, by an unknown writer, William Hobbs, was particularly significant, for many of the author's discussions of the problems of the terraqueous globe are sufficiently skilful in themselves to merit his theory being regarded as one of the more constructive attempts of its day to interpret the Earth. Hobbs's theory is also of significance in that it draws deeply upon long-established traditions of natural philosophical discourse, such as alchemy and organic theories of Nature, to offer a conscious challenge to the fashionable mechanical philosophy and the Newtonian world-picture. Furthermore, reading between its lines tells us much about the conditions under which amateurs, across provincial England, were beginning to develop a taste for scientific inquiry at the beginning of the eighteenth century. Scholars should hence be grateful to the British Museum (Natural History) for purchasing this important manuscript and undertaking to produce a printed version of it for the first time.

I am only too conscious of the imperfect and provisional state of much of the material in my commentary and references. To some degree it is because William Hobbs seems to have been a genuinely obscure and shadowy figure. Considerable research in a large number of archives over the last three years has failed to turn up more than a handful of references to him (I am still not even totally sure as to the identity of the author, given that there were at least two William Hobbs—father and son—living in Weymouth at the time the treatise was written!). I have thought it better to make the text available in print at an early date, in order that Hobbs's treatise could actually be read by a wider audience, rather than pause for perhaps many further years in the hope of tracking down additional biographical material for a definitive edition. I hope that the appearance of this edition in print will actually lead to the uncovering of more information about its absorbing author. In producing this edition I have built upon a preliminary paper which I delivered to a conference of the Society for the Bibliography of Natural History held in Spring, 1975, and which was published, as 'William Hobbs of Weymouth and his *The earth generated and anatomized* (?1715)' in the *Journal of the Society for the Bibliography of Natural History* 7 1976: 333–41; I have here corrected some errors in that account, dropped some hypotheses and verified others.

The kindness, patience and knowledge of innumerable people have been imposed upon in the course of my work on this manuscript—far more than I can mention here. I should like especially to thank the staff of the Department of Palaeontology at the British Museum (Natural History) for their unfailing helpfulness: Anthony P. Harvey in particular. The staffs of many libraries, record offices, museums and repositories have helped me track down materials and have answered numerous letters of inquiry. I should like particularly to mention the Dorset County Record Office, the Dorset Natural History and Archaeological Society, The Royal Society, The British Library (especially Dr C. Wright), The Custom House, Weymouth, and H.M. Customs and Excise.

Amongst the many individuals who have helped me and supplied me with information I should like to single out Miss M. Weinstock, Mr H. West and Mr V. Adams for their knowledge of Dorset; Dr H. Torrens for his unfailing geological help; Mr Peter Croft, Librarian of King's College, Cambridge for his advice on the calligraphy of the Manuscript; Dr S. Conway Morris and my wife, Sue Porter, for their great help in reconstructing Hobbs's diagrams; Miss M. Deacon for patiently instructing me in many aspects of the science of the sea; and Mr D. Bryden, Dr W. E. Knowles Middleton, Mr S. Schaffer, Dr J. Schuster, Professor P. Grierson, Dr K. Figlio, Professor A. R. Hall, Mr. A. Turner, Mr G. L'E. Turner, Dr C. Webster, Dr Roger French for helping me to hunt down references. Mr J. B. Morrell, Mr A. P. Harvey and Mr S. Schaffer kindly read earlier drafts of the 'Introduction' and offered helpful criticisms. Miss Fiona Mainstone undertook some search work, and Miss Katy Henkel admirably transcribed and typed the text. I must alone be responsible for the errors and gaps which still exist.

I should like to thank the following for permission to quote from materials in their possession: The British Library; The Royal Society of London; H.M. Customs and Excise; Dorset County Record Office; The Royal Greenwich Observatory.

Biographical

Very little is known about William Hobbs. He published nothing in his lifetime, and little independent record of him seems to have survived beyond his own unpublished natural philosophical writings. To some extent his life has to be reconstructed from these writings, though they contain little direct autobiographical information. The surname Hobbs was common, and late seventeenth and early eighteenth century local records in Wessex and the south-western counties reveal snippets of information about many William Hobbs's, it being impossible, at this stage, positively or negatively to identify some of such references with the author of *The earth generated and anatomized*.

It is not clear when or where Hobbs was born. In a letter sent to the Royal Society in 1709[1] he claimed to have been making natural observations for more than 30 years, which must surely put the year of his birth back before 1670, possibly considerably before then. There is no unequivocal clue as to his upbringing, education, or vocational training. It seems very unlikely that he was university educated, partly because he himself draws attention to his lack of skill in languages,[2] and partly for other reasons which will become apparent.

There were two excise officers with the name William Hobbs—they were father and son—working in the county of Dorset at the end of the seventeenth and the beginning of the eighteenth century.[3] It seems plausible to suggest that one of these—almost certainly the father—was the author of this treatise. An excise officer with an outdoor 'Ride', who would frequently be moved about the country by the Board of Excise, would have had excellent opportunity for gaining a knowledge of the structure of the countryside. Furthermore, a Dorset excise-man would have been expected to possess that kind of knowledge of the tides which the author proudly displays.

Both William Hobbs's, the excise men, were dismissed from the service—in January and April 1705 respectively—for dishonesty. One was subsequently reinstated, and posted to Devonshire.

My next—possibly appropriate—piece of independent biographical evidence dates from 1716, when the Weymouth and Melcombe Corporation Records note that a William Hobbs, 'Marriner', married one Rebecca Welstood, and soon found himself in trouble with his inlaws:[4]

> William Hobbs of this Borough and Towne Marriner maketh Oath that about a weeke after Easter last past he this depon^t intermarried with Rebecca Welstood of this Borough and Towne who was then possessed of a Messuage Burgage, or dwelling house in the [illegible] of Weymouth within this Borough and Towne called and known by the name of the Compass Alehouse and haveing so intermaried this depon^t and his wife lived in and enjoyed the said house And this depon^t saith that yesterday in the evening Edmund Welstood of this Borough and Towne Blacksmith Robert Saxton the elder of this Borough and Towne carrier John Williams of this Borough and Towne labourer and Anne Welstood of this Borough and Towne spinster ranne into the said House where this depon^t then were in possession and after calling this depon^t if he [illegible] severall names threatened to beate this depon^t if he did not go out of the said house and this depon^t saith that he went out accordingly and hath continued out of possession of the said house ever since and this depon^t saise that he is afraid of going into the said house fo feare of being beat out of the same haveing been threatened to be so used
>
> Jurat 10 of July 1716 William Hobbs

Of course, it is perfectly possible that the 'marriner' referred to is a third William Hobbs, who has no part of our story. If that is not so, however, it is more likely, I believe, that the Hobbs who fell foul of his new inlaws was Hobbs senior rather than junior, for Hobbs junior later seems to have had a wife named Hannah (see below). The outcome of the fracas of 1716 is unrecorded, but the bad feeling between Hobbs and the Welstood family evidently continued, for in 1722 we find in the Corporation Records:

> 3 April 1722 Ann Welstood, Singlewoman of this Town maketh Oath that On this present day Will^m Hobbs, Seaman, inhabiting in this Town came to the House of this Deponent and Endeavored to Enter it, but she haveing Lock'd the Doore he broke her Windows and Unhung the Casement and Shook her through ye Window Sev^ll times and swore he would kill her this Deponent, and then threw severall large Stones into the house at her and called her Whore & Bitch and other Scandalous names, w^th out haveing any provocation given

Jurat coram majore
3 Apll 1722

Ann Welstood

Wm Hobbs tenetur in
Thos Carter
Mary Hobbs

And then

10 July 1722
Mary Hobbs deposes she was assaulted by Anne Welstood
[Mary Hobbs being, I believe, William Hobbs, *pere*'s, daughter by a first marriage and thus William Hobbs, *fils*'s, sister.]

At about the same time there is a further record in the Weymouth Corporation Records of a William Hobbs being employed as a school-teacher.[5] It seems plausible to suggest that this is not the same querulous Hobbs who had been described as a mariner and seaman. In fact, we can be pretty sure that this Hobbs is the William Hobbs who left a will in 1743, and who was the brother of Mary Hobbs and the husband of Hannah Hobbs:

This is the last Will and Testament of me William
Hobbs late of Weymouth and Melcomb Regis in the
County of Dorset Schoolmaster, and now of Osmington,
made and published the fifth day of July in the year
of our Lord one thousand and seaven hundred fforty and
three And first I do make and ordain my Daughter
Ann Hobbs sole Executrix of this my last Will and
Testament, and my will is that she shall and do pay
unto my Sister Mary the wife of Nicholas ffar of
Chatham two Guineas and a half, In consideration of
her kindness to me when I was last there, All the
rest residue and remainder of my Goods & Chattles
Rights Creditts Sum and Sums of Money due and owing
unto me on any Account howsoever any personal Estate
whatsoever I do give devise and Bequeath unto my said
daughter Ann Hobbs IN TRUST nevertheless and to the
Intent and Purpose that she shall and do joyntly imploy
the same with her Mother, my wife Hannah Hobbs, in the
best and most frugal Manner they can for their joynt
Support and Maintainance during all such Time she
shall and do continue my widow and no longer. But
in case my said daughter shall and do happen to
decease before my said wife that then I will and
hereby give and devise all my said Goods and Chattles
and personal Estate, so bequested in manner aforesaid,
onto my said Wife, Hannah Hobbs, In Witness whereof

I the said William Hobbs have hereunto set my hand
and Seal the day and year above written.

Signed sealed published and declared
by the said Testator William Hobbs
as and for his last Will and Testament
in the presence of us who as witnesses — Wm Hobbs
hereunto have subscribed our Names in
the presence and at the request of the
said Testator
John Fooks
Joan Watts
Edward Fooks

Hannah Hobbs Executrix in trust was sworn the 19th day of
August before me, J. Preston—as also that the effects of
the deceased did not amount to Twenty Pounds—[6]

The late date of the death of this Hobbs—1743—probably indicates that it was the son and not the father. Further evidence is provided by the signature attached to the will, which is markedly different from the signatures on the letters to the Royal Society in 1709. Hence, tempting as it is to believe that the Hobbs who was the author of *The earth generated* would have made a suitable schoolmaster for Weymouth, and with his obvious familiarity with navigation, geometry and mathematics, it seems far more probable that it was his son who became Weymouth's schoolmaster, whereas the author perhaps made his living as a mariner, and then (presumably) as an inn-keeper. It would not be unusual, one imagines, for an ex-excise officer to marry an inn-keeper's widow.

So far as the evidence allows us to judge, Hobbs seems to have lived a life of almost continuous isolation from the learned and philosophical communities of his day. Apart from the brief contact with the Royal Society and a fleeting correspondence with Flamsteed at the Board of Longitude, he appears to have kept at a distance from London societies and scientists. I have found no evidence that he had any contact with any of the other virtuosi, country gentlemen, parsons, etc., who lived in Wessex and the south western counties and who pursued similar interests—men such as William Cole (d. 1701), John Strachey (1671–1743), John Aubrey (1626–1697), Joseph Glanvill (1636–1680) or John Beaumont (d. 1731). Similarly, beyond the treatise, and the shorter papers to the Royal Society on much the same subjects, Hobbs does not seem to have left record of pursuing any other intellectual interests.

Our first reference to Hobbs's scientific interests comes from two surviving letters of 1709 to the Royal Society, in which he gives his address as 'near the Bear Inn, Weymouth'. It would seem as if Hobbs submitted in person to the premises of the Society at Christmas 1708 a lengthy paper (now preserved by the Royal Society) with sections on the theory of motion, the tides, trade winds, etc., together with an accompanying letter, which he had apparently hoped to be allowed to read to a meeting of the Society. The letter[7] runs

Read 11 May 1709

Hono: S

Before we proceed to my Intentions its my indispensible duty to make an humble Acknowledgemt as well of my unworthyness to appear before, as of my unfittness to spake in the presence of soe Honbl soe Wise and soe Learned a Society; But that my Presumption may not be esteemed inexcusable, nor what I have to propose seem altogether needless, I begg leave to give your Hono: the Reasons that induced me hereunto. In order to which be pleased to know that for above 30 years I frequented my thought as well in Mathematicall knowledge As in Mechanicall Curiosities; But observing of Late such Vast improvements made in the former

[here ends the first page, at foot of which is written 'ordered to be registered']

I became less thoughtful thereof, and diverted my Contemplations to the search of natural Causes, whereupon those Books that came to my hands relating thereunto, I read with great delight, and as greatly Admired the Learning and Wisdome of the Authors; But having compared their Doctrine and Hypotheses with each other, And those again with the things that Appeared, I found Contradictions therein, That I could not obtain the least Satisfaction in what I sought after; And therefore I justly concluded, That the Truths of Nature were not as yet fully discovered.

And this I the rather supposed, because the verry Persons who writt such Admirable things in Mathematicall Sciences, And therein Exactly agreed with each other, were the same that soe much differed in their Apprehensions concerning the things of Nature; From which Considerations I presumed to lay aside as well what the other had proposed, and to try if I could hit on any other foundation that might better Answer the Ends designed; In order whereunto I took a compendious View of the process of Nature in generall, Wherein I found (as Yor Hono: well knows) That ye First Created Bring of which the Univr was made was Matter only.

2ly That this matter was by the Maker thereof Imprincipled with a Plastick power or faculty, to Forme it selfe into Naturall Bodys of Diverse Kindes and Species.

3ly That this Formation could not be Effected without a generall Motion in all its parts. For if Matter, or any part thereof, had been always devoid of Motion, it had perpetually remained such, And Consequently, noe naturall Body could have been formed Wherefore all naturall Bodys are Educed out of Matter by Motion.

4ly That altho' this Motion or plastic Faculty is originally promiscuously mingled with, and imprincipled in Matter as aforesaid; Yet the Matter of all such Bodyes (how promiscuously soever originally mingled) is nevertheless in its Forming, Tripartly Divided, or Discriminated; Namely into Active, Passive and Fixed parts.

5ly That the Active part (when formed) gives Motion to the passive part thereof, And the Fixed Contains, Setts bounds unto, and regulates the sd Motion, and also constitutes or modifies the Body soe produced.

6 That this Active part being thus Divided or Discriminated, is allways internally disposed of, or inclosed within the Body soe produced as afored, And not on its Superficies, or at a greater distance from it.

From these and other like self-evident Truths I grounded, or discovered my Hypothesis, By which I soon found That the Motion of the Fluid or passive part of the Earth, was not

Caused by the Motion, or pretended Influence of its Satellite, but in such manner as in the following Lines is Assigned. Nay it soe well Agreed with the Phenomena's of Nature, That if I saw but a Stone in the Street, (having any naturall Vain or Impression in it,) I could discover when, and how, it was produced or Impressed therein. Being by the same Doctrine also taught, That as there is a mutuall Harmony in the Powers, Proportions, & Affections, of Lines and Numbers in Mathematicall Knowledge, soe there is likewise as regular and mutuall an Agreement in the Powers Proportions and Affections, in the things of Nature; Which when fully discovered, and a true and Genuine Foundation Laid, I doubt not, nay am well assured, That the Doctrines, Corollaries and Consequences, Drawne from them will (from the Same naturall products and Phenomena's) be as evidently proved and demonstrated, and Errors as readily Detected, as by any of the Problems and Propositions in the Mathematicall Sciences whatsoever. And Consequently there will be as great concord and agreement amongst those that shall Treat thereof, as is now amongst those that treat of the former: For if such Regularity and perfection can be found in Art, which had its Originall from Humane Inventions and Institutions. How much more in Nature, whose Ordinances were Established, and whose footsteps were Imprinted, Long before those Learned Inventions, or humane Arts had their Being; And whose Laws are immutably the same, as having the Externall Existence for their Author: But if it has hitherto been otherwise, it's for want of a right Foundation And not from any deficiency in the Demonstrations that may be drawn from the Appearances or Evidences aforesaid.

Now by what hath been already delivered I have plainly intimated That the various opinions of those that treated of naturall causes, was what induced me to lay my Conceptions before yo[r] Hono[rs] in hopes at least that Something therein may tend to the Discovery of Such a true and Genuine Foundation as may produce such an Harmony amongst those that shall build thereon as is before proposed.

I would add a Word or two in particular concerning the following Lines, In which I have briefly treated of, And Assigned the Causes of the Various Motions in the Elements of Air & Water, i.e. of the Trade Winds, Monsoons And of the Flux, and Reflux of the Ocean.

In accounting for which (as has been already intimated) I have made some Angles with what severall of the Learned and Ingenuous [sic] of this Age have proposed. And altho' I am well Assured of the Truth and Certainty of what is therein Contained, Yet am nevertheless Soe unwilling to Give the least offence to those Worthy persons that have soe ingenuously [sic] treated of the same things Or to offer any thing to this Hon[ble] Society that may be judged needless of which they are fully Assured, the reall Causes are already Discovered: That I had rather Conceale what I have prepared and presume noe farther, than by a superfluous proceedure to be Guilty of offending in manner aforesaid. But on the other hand if your Hono[rs] Thinke that any of the Phenomena's in the Motions of either of the said Elements, or in the Fixed part of the Earth, are not as yet sufficiently accounted for, and shall please to Admitt of my Endeavours, I shall freely Offer to your Consideration what I have prepared. And tho' I am not accomplished with such Learning and capacity as may be necessary for its Verball Justification, Yet inasmuch as they are not Founded on Speculative Notions, nor Drawn from remote powers and Influences:

But from the Visible and Tangable Appearances of Nature and Evidenced and Illustrated in such Manner as this Royall Society Expects and Requires, I mean by Experimental Examples and Observations; I Assure myselfe they'll not only obteyn yo^{r} Hono^{rs} Approbation, But will be improved to a far Greater perfection by the Addition of more profound Discoveries, Than by mean Capacity can pretend unto. Which that it may is the hearty Desire of yo^{r} Hono^{rs} most humble Serv^{t}

W^{m} Hobbs

Hobbs's letter is followed by his paper, 'An essay concerning Motion', which was read to the Society at its meeting of 11th May 1709. The Royal Society's Journal Book runs[8]

> Papers of M^{r} Hobbs from Weymouth were Delivered by the President they related to the Structure of Mountains, Motions of Tides &c M^{r} Hunt was Ordered to take Care of the Modells and Stones and the Papers were Ordered to be Copied into the Books of the Society and he was Ordered to be thanked.

Presumably about this time Hobbs was sent the letter of thanks (of which no trace seems to remain) to which Hobbs refers in a later letter.

On 25th May William Derham (1657–1735) gave the Society an account of the paper Hobbs had sent. This paper survives in original and in copy in the Royal Society, but it is hardly worth transcribing in full here since it duplicates almost totally the ideas set forth in *The earth generated and anatomized* (though see later, p. 19 for an analysis of these ideas). Rather it is convenient to give Derham's account of it, since it is a reasonably accurate resumé, and embodies the judgment—prejudiced obviously, but not unintelligently—of the Society. Derham's report is headed 'An Account of the Papers Models and Figures which the Society Received from Mr Hobbs of Weymouth in Dorsetshire by the Reverend Mr Derham F.R.S.'[9]

> In pursuance of the Orders of this Most Famous Society I have with as much Care in my Opinion as they Deserve read over Mr Hobbs's Papers, in which I find him to have a Clear Head, and to be a Person of great Diligence and pretty good Judgment considering his Want of Learning, But his Philosophy is much inferior to his Observations of Matters of Fact, And therefore altho' I don't think him to be Numbered among the Eminent Philosophers and may have a meaner Opinion of his ἐργασίας than what he seems to have himself, yet I imagine he may be of good use to the Society, if they should have any Queries to be Answered or Notices to be taken in the Place where he lives. Particularly I think his Observations of the Tydes may well Deserve the Cognisance of the Society, he having Observed them strictly for two years, and no doubt will if desired proceed with Delight in farther Observing them if it be thought necessary.
>
> As to the particulars of his Papers a short account may Suffice Except where his Models and Figures may call for Some Enlargement.
>
> The Causes he assigns for Rain have nothing new or Remarkable except what is D^{r} Woodward's Centrall heat.
>
> The same for Winds. The generall Trade Winds he ascribes to the Diurnal motion of the Earth and heat of the Sun. He is of opinion that the Whirling about of the Terraqueous

Globe causes a Wake or Ditch in the Air between the Tropicks like that behind a Ship under Sail in the Waters, That the Hills and Highlands for the Divagations of the Trade-Winds near the African and the other Shores bordering on the Ocean.

For the Illustration of this he recommends to draw a piece of Wood thro' the Water, behind which you will not only see the Wake but you may observe also that just behind it the Water runs almost across it. So he says the Highlands next the Ocean whirling thro' the Air, the Wake in the Air next them is not (as 'tis at greater distance) Easterly & Westerly but toward the Northern & Southern points. And for the Monsoons he accounteth for them in this manner, He sayeth if instead of One you take two pieces of Wood, and brace them to stand at a distance from each other with a Wire bent so as to stand above them out of the Water, that there will be a Wake behind the hindermost but none between the two pieces of Wood, after the same Manner he imagineth it is where the Winds blow one half of the Year One Way, the other half the Contrary way (viz!) that the Wake in the Air between two Lands lying near One Another is taken off, as between Madagascar and Africa, between the Malacca, Sumatra, &c, which he thinks near enough even to Africa itself to cause this Quietness or Calm of the Wake of the Air. The force of the Trade Winds being thus taken off, he thinks then that the heat of the Sun takes place, and as he is either towards the N or S. Tropick, so he saith he drives the Vapours before him toward that Pole he is nearest unto, and then the Trade Wind Vapours come tumbling in thereupon, and make either an Easterly or Westerly Monsoon.

His Experiment and Notion I confess seemed to me Ingenious, and altho' I scarce think that the Rotation of the Earth has much to do in the Trade Winds, yet if his Notion be refined and considered upon it may be so far Serviceable as to give some good hints to Ingenious Persons about the Difficult Phænomena of the Monsoons, for which reason I have Enlarged on that head.

The last thing he Treats of, and thinks he has fully resolved, are the Tides, which he thinks can never be owing to the Influence of the Moon, or any Cælestiall Body, he knows nothing of the business of the gravitation of the planets to one another, and makes all Influence to be no other than the heat of Such Heavenly Body, and that the heat of the Moon or any Heavenly Body but the Sun cannot reach the Earth he endeavoureth to prove from the proportions & Distances which he gives of the Earth & Heavenly Bodies in his 3^{d} Scheme, In which Scheme he makes the Atmosphere and the heat of the Sun to be the Same, or at least that his Atmosphere Extends as far as his heat, as is represented in that Scheme by the Yellow Circular Shade about the Sun, and that the Moon hath no Concern in Agitating the Waters he thinks he has Demonstrated from this.

1st That no Influences can be conveyed from the Moon to the Earth but by some Medium or Atmosphere, and consequently the Atmosphere of those two Globes not Approaching each other as also they being both Earthy and Cold Bodies no Influence can be conveyed from one to the other.

2^{d} That the Motion of the Tides doth not Correspond with the Culminations of the Moon, which he supposes to be every Revolution only about 48′ different according to which Supposition he has drawn up his Table on the backside of Fig: 1. Whereas he findeth the daily Variation of Tydes to be at greatest Spring Tides but about 29′ & at the lowest Nepes 96′ and he Sayth he hath for two Years Observed the Variations of the Tydes in the Sea near the place where he lives, and he had very Ingeniously and handsomely Contrived, and put them into Fig 1st and 2d

Having thus as he thinks discarded the Moon from having to do in the Tydes he assignes what he takes to be the true Cause, and that is a kind of Respiration within the Earth owing to some Rarefactions therein, which he proves have been, and thinks therefore always are & will be in it as being as necessary for its Conservation as Animal Life and Motion is to the Conservation of Animall Bodies.

That Such Rarefactions have been in the Earth he proves thus, with Dr Woodward he supposes the Terraqueous Globe to have been once taken to pieces, as the fossile Shells &c import, but he denies this to have been at the Deluge, when this Mish:Mash had subsided into Various Strata according to the Rules of gravity and become hard, he thinks the Hills were then raised or pushed out by means of some Internall Rarefactions, These Strata & the manner of their being pushed out he hath handsomely (if I mistake not) represented in his Models (No) 1, 2, & 3, which I took but a Transcient View of at the Society, Having thus proved an Elevation in the Terraqueous Globe by means of Rarefaction he takes it for granted that it as necessarily Continues as breathing doth in an Animal, and that this happens at certain times near the Nepe Tides (like a sort of Respiration) and that one Agitation at Nepe Tides is Sufficient for all the following Agitations of the Waters which are only so many Returns of that Elevation of the Ocean.

To illustrate the matter he Instanseth in a long Wooden Tube or Trough with Water put therein which being lifted up at One End will Cast the Water to the Other, and being let down again the Water will return and Ebb and Flow backward & forward at first more & by Degrees less, and the proportion it doth thus in the Tides he hath represented at the Bottom of Fig: 2d & in a Small paper by itself in a straight line.

Another Illustration he gives us is by a large piece of Level ground of half an Acre or an Acre with a large Map of the Sea and Land drawn thereon the Seas to be represented hollow lower ground the Dry Land by rising up higher. An hollow deep pit being sunk in the Middle & covered with Leather & Water poured on the Leather if the Leather be lifted up in the Middle, 'twill Cast the Water out among the Seas and against the Dry Land and make such like Variations he thinks in the Ebbings & Flowing in this Map of the World as befalls in the Terraqueous Globe itself.

And lastly to further prove this Respiration of the Terraqueous Globe or to put it in his own Words: 'That there may be a Musculous part formed under the Ocean, where it may operate by its own principle or be agitated by some Internall Cause, or Rarefaction', *As his Words are p. 35*—I say to make good this he Instanceth in the Dilation and Contraction of the heart of an Eel for some time after 'tis cut out & but especially in the Elevation and Subsiding Motion observable in the Bell Fish which he hath sent a pattern of to the Society.

As to his Notions about the Motion of the Heart of Animals, & many other things, which I have passed by, I thought them not worth the Cognisance of the Society neither indeed should I have said so much of most of these as I have done but only to acquaint the Society with the Design & Meaning of his Models and Figures which are pretty enough to recommend them to the Desires of the Curious to be satisfied about them.

But reviewing his Papers there is One of his Figures I find I had like to have passed over, and that in his handsome Draught of the Isle of Portland, and his Remarks on it's Tydes. 1.st He Observes when the Tydes in the West Bay set Eastward that in the long Lake or Lagune (Setting in at the Narrow Passage B) they set to the Westward, and that 'tis full Sea at C, three hours later than at D tho only a Furlong distant. 2.d that in the Bay A, the Water ebbs & flows many times an hour or two before the proper Flood, which preliminary Tide they call the Gourder, this he applies to what is reported of the Tydes near Negropont. 3.d That at B, the Water oftentimes runs in briskly thro' the Inlet altho' it be Ebbing Water and Sunk a Foot or more in other places, all which things I think are easily Accounted for by an intent Inspection and Consideration of his Scheme.

Derham's account of Hobbs's papers drew some discussion. 'Doctor Woodward said that his Observations on the Strata of the Earth were Conformable to his Theory, and that he had given Mr Flamsteed his Observations on the Tides which differed from these given to the Society.

Mr Derham was desired to compare Doctor Woodward's or Mr Flamsteed's Observations on the Tydes Delivered from Mr Hobbs with those Delivered by him to the Society.'[10]

This then led to a further exchange at the meeting of 13th July when 'Dr Derham Delivered the Papers of Mr Hobbs Concerning the Tides and Earth, which were Ordered to be putt into the Repository after being Copied in the Books and returned from Mr Halley who was desired to peruse them and give his thoughts of them to the Society.'[11]

Halley apparently never did so, and no further mention is made of Hobbs in the records of the Society.

Hobbs meanwhile was clearly becoming anxious as to the verdict of the Society on his works, having had but a bare acknowledgement of receipt. Hence he wrote a few days later.[12]

near ye Bear Inn in Weymouth
July 16: 1709

Sir

I recd yor obliging Letter wherein you were pleased to give me An Account That the Papers &c: which I left with the Honble Sir Isaac Newton at Christmas last were by the Honble Society ordered to be Registered: for which I retourn my humble thanks. I should have been glad of a Line whether any part was approved or if not wherein Rejected. I will assure your Honours that 'twas neither Profit, applause nor emulation that enganged me thereunto But the irreconcilableness of what I saw in naturall things, to what I Read in those that have written thereof. And though my Pen be not sufficient to establish what I therein attempted yet perhaps Posterity may be by some Learned Author convinced that the Rocks were not Dissolved and the Shells immassed therein at the Deluge 2:ly That the Moon is not the Cause of the Flowing of the ocean, and 3:ly That the Diurnall Rotation of the Earth is the principall Cause of the Trade-Windes, Monsoons, &c Pardon me Sir for this Freedom tho' you should be one of those that approves of what has bee [sic] by some Hono:ble and Learned Authors written to maintain the Contrary. Sir I have seen soe many Thousand Tonns of Stone soe plentifully immassed with Shells, And made such observations of the generall Scituation of the Stratus or (rather) Bedds of Earth And kept soe long Account of the Flowing of the Ocean where noe river hindered That the above particulers are as plainly deducable from these observations at that the Sun is the fountain of Light &c: (or otherwise I should not have soe presumed.) And this I purposed to have evidenced by Experim^ts before yo^r Hono^r but was unhappyly prevented by your not meeting in the Hollidays.

I have herewith sent you 2 or 3 minnerall Impressions of which I have not seen any till lately. I have others in store and if Acceptible shall freely present them—Please to Hono^r me with a Line of the Receipt and if not too much trouble one line to the first above mentioned in which you will oblige.

Hono^rd S^ir Yo^r most humble
Servt
W^m Hobbs

I took the opportunity of a neighbour to carry it gratis

There Hobbs's contact with the Royal Society seems to end. There is no evidence that when his ideas were read out to the Society, they created any interest. Nor is there much sign that Hobbs thereafter tried to make further contact with the London intelligentsia during the rest of his life.

The next record of Hobbs is his treatise itself, *The earth generated and anatomized*. Of this, the preface 'To the Reader' is dated 1715 (though this date has almost been scratched out). It is very difficult to date the original composition of the treatise. Its Postscript leads one to believe that far the larger part of the treatise was conceived and in some form written several years before the Postscript. It is possible that Hobbs's failure to interest the Royal Society in his papers led him to decide to reorganize his materials into a lengthier, more coherent, independent, treatise. There is no clear indication whether Hobbs had any intention or ambition to publish the treatise, though it is written as if addressed to an audience (rather than being a series of self-addressed notes).

The treatise was composed in Weymouth. Hobbs had clearly been domiciled in Weymouth in the early years of the eighteenth century, since the treatise contains a register of the tides at Weymouth kept by him then over a period of three years, which may well indicate an ambition to compose a theory of the tides and of the Earth over a decade before he contacted the Royal Society.

William Hobbs in his local milieu

William Hobbs lived at a time before provincial England generated on any regular basis scientific communities and scientific societies. The period saw of course many provincial naturalists, but they were essentially *sui generis*.[13] None of the other naturalists operating at this time in the south western counties of England—men like John Strachey at Chew Magna, and William Cole at Bristol—lived sufficiently near for Hobbs to be part of their circle. Dorset in Hobbs's day does not seem to have supported any kinds of gatherings amongst men with scientific interest.[14]

Weymouth itself, being at the very southern tip of Dorset, was particularly isolated. It was over a hundred miles from Oxford and further from London. Having suffered under siege during the Civil War, Weymouth was a small, and probably decaying, sea-port at the turn of the eighteenth century. Its growth industry was smuggling, mainly from France via the Channel Isles. Weymouth did not even possess an endowed grammar school. It is hardly mentioned in the various books of travels which were produced early in the century.[15]

Weymouth's rise to some degree of importance as a town dates from the second half of the century, when it became popular as a seaside resort as a result of George III having chosen to use the town for sea-bathing.

If Hobbs received little human stimulus, however, from his Dorset milieu, he, like many a later geologist, must surely have been deeply stimulated by the opportunities offered—indeed the scenes thrust upon him—by the local natural scenery. Dorset contains a fine succession of strata from the Chalk of the Cretaceous down to the Lias of the Jurassic, particularly well exposed by the extensive cliff scenery around Lyme Regis on the coast. The Portland stone quarries doubtless helped to convince Hobbs not merely of the depth to which fossils were embedded in solid rock, but also of the fact that the Portland stone was largely composed of organic remains. The hills and cliff scenery of the county convinced Hobbs of the tilting of the strata in upland areas. Chesil Beach must have focused Hobbs's attention on the interface of sea and land, on accumulation of materials and denudation as a crucial process of Earth history. Hobbs was the first of a long line of geologists whose work was deeply inspired by the relief and structures of the county, and—later—by the extraordinary fossils to be found in the vicinity of Lyme Regis. Indeed, Osmond Fisher, who wrote extensively on Dorset geology, was born at Osmington, which is where Hobbs—probably *fils*—died.[16]

The intellectual milieu of Hobbs's *The earth generated and anatomized*

I shall not attempt here a detailed account of the state of the science—or sciences—of the Earth in Hobbs's time. Detailed references and bibliography on particular areas of this subject will be found in the notes appended to the main text. Rather, I should like to bring into focus certain aspects of the ambience of contemporary science, particularly as it impinged upon a scientific amateur such as Hobbs.

William Hobbs lived in a world in which the modern divisions of Nature and scientific inquiry into physics, astronomy, chemistry, biology, geology, etc., did not exist as such. Hobbs thus characteristically had no generic or specific terms for his science. He saw no conceptual oddity in writing—nor would any of his contemporaries have had difficulty in reading and assimilating—a tract which related together extensive local observations of the Earth with a geocosmic philosophy; which attempted to understand the structure of the Earth's crust in terms of celestial philosophy, and in context of a total philosophy of Nature. He saw the terrestial world as analogous to the animate, and indeed believed that all Nature was governed by laws of animation, organization and generation. In this respect, Hobb's work does not represent an antiquated rag-bag of quaint juxtapositions. Such a conjoint range of interests are the common ones of the age, and are utterly typical, for example, of the work of Halley.

Indeed Hobbs had a good grasp of the main contemporary problems within the philosophy of the geocosm. Amongst the chief debates to which he addressed himself were:

(a) The debate over the theory of the Earth, which had been joined in Britain in the works, above all, of Hooke (1635–1703), Burnet (1635–1715), Woodward (1665–1728), Whiston (1667–1752), Warren, Croft, Arbuthnot (1667–1735) and many others. The chief issues were whether the Earth had been created, or was eternal; how it had come to assume its present shape—its landforms, the divisions of land and sea, mountains and valleys; the questions of its age and its likely future. Furthermore there were problems of a more specific and technical kind, such as the nature and history of rivers and fossils, the origin of soil, and the question of an inner heat for the Earth. On most of these issues, Hobbs felt obliged to argue for a particular case, and to dismiss others. On some of them, however, *e.g.*, the questions of the origin and nature of fossils, Hobbs clearly had no doubts, and did not feel any need to spell out the criteria for choosing between different interpretations.

(*b*) The debate over the theory of the tides. This was not yet fully solved by the end of the seventeenth century. Hobbs was not out of date in still puzzling over the issue. The major seventeenth century theories had been those of Galileo (1564–1642), who attributed tides to the Earth's rotation; René Descartes (1596–1650), who saw them as a product of pressure set up by vortex action; and various theories specifically of lunar attraction. Some of these latter (as for example Childrey's (1623–1670)) were somewhat astrological, or magnetic; some, as Wallis's, were mainly concerned to establish the empirical regularities between the moon's phases and the tides; and some, as Newton's, emphasized the agency of gravitation. This clearly involved much larger natural philosophical issues with which Hobbs grappled, such as the problem of ether, and void space; and of the differential communicability of light, heat, fire, and power *via* media through the solar system.

As with most of his contemporaries, and especially the contemporary 'common scientist', Hobbs held a melange of views. Some of these could be called 'modern', and were destined to have a future. Hobbs was, for example, a 'modern' in his extensive commitment to factual observation, experiment and to the quantification of the tides. He was strongly hostile to 'verbal' science, and to mere book learning; he fiercely repudiated astrology and other supposed arts (taking a 'continental' view, as it were, in rejecting Newtonian gravitational attraction as 'astrological').

On the other hand, in the great seventeenth century debate on the order and composition of Nature, Hobbs's philosophy was obsolescent. The Renaissance had seen a great recrudescence of philosophies of active Nature; of alchemical and chemical philosophies; of the belief that Nature was living and organized. Such ideas were being thoroughly displaced in the second half of the seventeenth century both by the more orthodox forms of Cartesian mechanical philosophy, which emphasized that Nature was only matter in motion; and by the more complex Newtonian philosophy, which retained a far greater role for God's sustaining activity in Nature and for Providence, within a general philosophy of atomism and the downgrading of matter itself before law-governed forces. In this climate, Hobbs held to a philosophy which saw all Nature as alive; a philosophy with some affinities to that of the Cambridge Platonists, but one which owed far more to an alchemical vision of the potentialities of Matter for self-organization and generation. Hobbs had no concern for the providential dimensions of natural law; he had no interest in the ontological and epistemological problems of primary and secondary qualities. In a world increasingly of Newtonian forces and Lockean powers, Hobbs's philosophy was left behind.

Resumé of the argument of Hobbs's *The earth generated and anatomized*

On the thirty-first page of his MS (p. 59 of this edition) Hobbs states with full clarity the scientific problem which it was the aim of his treatise to solve. 'Our principal design', he writes, is 'only to finde out ye manner how, and when, the Shells, and other Marine productions, came to be immassed and mingled in the Rocks and Mountains' of the Earth. For, as Hobbs endeavours to show from the beginning of his work, there are certain natural phenomena, easily visible to the observer, whose very existence and situation are puzzling, and which need to be explained. These are the fact that dry land exists, above sea level; that this terrestrial matter is composed of rock which is predominantly found stratified; that these strata generally run parallel to each other and to the horizon, though, where the relief is undulating, the line of the strata is generally parallel to the dip of the land. Furthermore, Hobbs takes it to be a puzzle that this solid rock contains the remains of shell-creatures and of fish and other marine bodies embedded within it—and embedded deeply, not merely superficially; though scarcely any remains of land-dwelling creatures are found similarly immassed in the rock. How this came to be so Hobbs takes as the problem of his work. Furthermore, he states that, this being a work of *natural* philosophy, these problems must be solved *naturally*.

Hobbs first establishes that the present land contains marine materials. It is for him inconceivable and unnatural to suppose that the sea could somehow have become raised up all over the land, and thereby have deposited such materials (above all, fossils). Hence, it is evident that the present continents must once have formed the seabed. It is also clear that the silts, muds, clays and other materials which now constitute rocks must have been plastic, flexible, and soft while on the seabed; otherwise shells and other organic remains could not have been introduced into them—for it is evident that such organic remains were introduced while on the seabed. (Hobbs offers a variety of arguments, when tying up loose ends towards the end of his treatise, to demonstrate that there is no way in Nature whereby the Noachian Deluge could have infiltrated organic remains into solid rock.)

Hence, Hobbs notes, the problem is to discover the mechanism whereby seabed became land surface. This process, he avers, must have taken place in two separate stages, as the visible evidence proves. Firstly, dry land must have appeared while its solid materials were still flexible, thus explaining the generally horizontal lie of the strata. But hills and mountains can only have been raised above the general level of the land after the continents had hardened: for they show evidence of fracture, and fluid land materials would not have held their place. In short, strata are not the product of a Deluge, or of precipitation, but of *elevation*: elevation in two stages.

The natural philosophical viewpoint from which to understand this process of the elevation of strata is through a general philosophy of Generation. The generation of the Earth is merely one example of generation at work throughout Nature; and one instance of the animated character of all bodies. Hobbs sets out a number of Postulates which explain his philosophy of generation. All bodies are presupposed to move from an original condition of chaos and undifferentiation, into a state of being organized, differentiated, animated, and vital within a system. All animated bodies need, and have, Life, Heat and Motion. But they also need as well as these Active Parts, Fixed Parts and Passive Parts. In the case of the Earth these are, respectively, its Heart, its Land Masses, and its Waters.

Thus to solve the problem of the strata and of fossils we must understand the process of the generation of the Earth. The Earth began from a chaotic condition. Gradually differentiation of its original materials took place, as in the development of different parts of the substance of an egg and finally the chick. First to develop were an internal pulsating faculty, or heart; and watery fluids which covered the surface. The pulsation of the Earth's heart agitated the waters and gave rise to tides (tides thereby being empirical evidence of the existence of an internal heart to the Earth).

Hobbs here interposes two notes of warning. Firstly, though the Earth is thus generated, organized and animated, its organic parts cannot be read off mechanically by a macrocosm microcosm comparison with other animals. The Earth is a very special animated whole with its own unique organic functions. Secondly, Hobbs seeks at considerable length to demonstrate the falseness of all other theories of the origin and cause of the tides—the notion that the rotation of the Earth, or the influence of the Moon (whether magnetical, astrological or atmospheric-gravitational) produces the tides. All such theories of lunar influence are empirically false (*i.e.*, they do not square with the periods of the tides). They are also physically erroneous. Lastly, they are ontologically absurd, for the tides must be organically and necessarily related to the economy of the Earth, not an accident of a mere satellite. Indeed, the rotation of the Moon is itself a product of the rotation of the Earth which is a product of the action of the tides, which is in turn a manifestation of the animated pulse of the Earth.

The pulse of the tides was (and still is) from the Poles towards the Equator. Gradually, as the tides drove water across the pristine Earth, some areas of higher, and some of lower, seabed formed, with *stratum super stratum* of loose sedimentary material being heaped up in horizontal layers. Gradually, some of these strata appeared above the level of the lowest neap tides; and then eventually above the level of the highest spring tides. Thus land appeared.

This land gradually hardened as a result of the action of the internal heat of the Earth. As irregular continents of dry land formed, the tides begin to fall into disequilibrium, causing the Earth for the first time to begin to rotate on its axis. Thus time, as man knows it, began. In stagnant pools which abounded on the nearly flat surfaces of the land, terrestrial creatures spontaneously generated (thus explaining why no land creatures are to be found deeply embedded within the rocks). In due course, the internal heat of the Earth raised up some parts of the land into hills and mountains, causing disturbance of the strata. The humid, fertile condition of the Earth, favourable to spontaneous generation, now gave way to a brisk circulation of waters on the land surface, with the development of systems of rivers, fed by rain. The spontaneous generation of large creatures ended—now, only minute bugs generate in that manner. Thus, the Earth is completely generated, and in a state of perfect preservation.

Hence, concludes Hobbs, by adopting a philosophy of generation, we can understand the main puzzling terrestrial phenomena, *viz:*

(*a*) that land surfaces are the product of tidal action;
(*b*) that tides created the rotation of the Earth;
(*c*) that hills and mountains were raised up by the internal heat of the earth;
(*d*) that the internal heat of the earth, together with the fertility of the original chaotic materials, brought forth and continue to sustain life;

(*e*) that only *marine* organic remains are found fossilized in rocks;
(*f*) that most rocks are horizontally bedded;
(*g*) whereas in the vicinity of mountains and hills the strata are not horizontal but rather broken and ruptured in line with the line of the hills.

We also understand through this philosophy of generation that the Earth is not eternal, but rather had a beginning, and hence a Creator who is to be praised and worshipped.

To this treatise Hobbs then adds a Postscript, proving from empirical materials that the impulse of the tides is from the two poles of the Earth, thus reinforcing his argument that the Earth has a heart, or pulsing faculty, situated at both these poles.

William Hobbs: other scientific writings

Apart from *The earth generated and anatomized*, the only extended scientific paper by Hobbs known to the present editor is 'An Essay concerning Motion'. This Hobbs appended to his first letter to the Royal Society, read 11th May 1709, and it survives in the original (Royal Society MS Ex. 1. 13) and in copy (Royal Society Letter Book Supplement, G–H, copy, pp. 357–406). It is the paper summarized and criticized by William Derham on 25th May 1709 (see earlier). Practically all the major arguments and themes developed in the 'Essay' are also present in *The earth generated*: a discussion of winds, of tides (and of the impossibility of the Moon being their cause), and a demonstration that the cause of the tides was an internal pulsation of the Earth. For this reason it will not be necessary to discuss the 'Essay' at length here. The 'Essay' contains a few examples and experiments which do not appear in *The earth generated*. Conversely, very little of the lengthy discussion of the philosophy of generation, within an alchemical context, which is such a prominent feature of *The earth generated*, finds a place in the 'Essay'.

The most important distinction, however, between the two works is their focus of organization. The 'Essay' centres on a discussion of the various types of motion found in Nature. *The earth generated* is expressly concerned with an explication of the various phenomena of the globe in terms of its own unique history. To what extent this shift in focus represents a real change in interests, or simply the reorganization of ideas onto a different plane of coherence, is not clear.

The 'Essay concerning Motion' begins with a threefold distinction of Motion, into artificial, natural and accidental. It establishes that all motion is produced 'either by Rarifaction and Condensation, Sublimation & Precipitation, Dilation and Contraction, or by Causes derived therefrom or depending thereupon'. Artificial and accidental motion are quickly dismissed as falling outside his present concerns. Natural motion is then taken and divided into (*a*) intrinsick (*b*) internal and (*c*) local. Intrinsick motion is taken to be the motion of the Chaos 'during the time of its Incubation' before matter was divided up into three parts, active, passive and fixed. Internal motion is the motion of the parts of an organized and living body. Local motion is the movement of bodies from place to place in the universe.

Hobbs then addresses himself to the problem of explaining various particular sorts of motions associated with the terraqueous globe. Rain is briefly dealt with first. It is shown to be a motion consequent upon the formation of clouds, which in turn depends upon the action of heat in sublimating the 'watery humidity' of the atmosphere. When clouds achieve sufficient 'magnitude and Ponderosity', they 'begin to precipitate towards the Earth'. Then Hobbs examines winds. He is interested in the question of why winds exist at all. He recognizes that heat (particularly the heat of the Sun) creates a motion in the atmosphere—with the sublimation of the watery content of the atmosphere, the formation of clouds, and their precipitation as rain. But such heat on its own would produce merely vertical movements of the air, up and down, not winds blowing across the globe.

In part, he concludes, winds are created by the inequalities of land and sea, which cause certain parts of the Earth's surface and atmosphere to be hotter and cooler, rarer and denser, than others, leading to movements tending to equalize heat and pressure. But chiefly winds are the product of the Earth's motion, both diurnal and annual. Hobbs assumes that the atmosphere drags and is perturbed as the Earth rotates on its axis. He believes that the Earth's rotation accounts nicely for the fact that the fiercest winds, such as Monsoons and Tornados, and the most constant, regular winds, the Trade Winds, are found towards the tropical, rather than the polar or temperate, regions of the globe.

For in the equatorial regions, the Earth is spinning with greatest velocity on its axis. Towards the poles the Earth's motion is far less; hence, winds are much weaker. Similarly, the direction of Trade Winds (towards the Equator, and westerly) is explained by the easterly rotation of the Earth. In his discussion of winds, Hobbs makes extensive use of Halley's views and of his map of the Trade Winds published in the 1705 edition of his *Miscellanea curiosa*.

Hobbs then proceeds to discuss tides. His argument covers essentially the same ground as in *The earth generated*, but is actually expressed with greater clarity and economy. He sets out his basic premise thus:

> In the first place, then, I shall lay down this Proposition; namely, That the Waters of the Great Ocean are by some internal Force or Rarification within the Cavity of the Earth, in some certain part thereof lifted up or exsusitated above its Equilibrium, or equal distance from its Center, & y^t it being so rais'd, does from thence naturally devolve towards the Shore, whereunto being come, the Waters are there made higher than where they were first lifted up; and therefore they as naturally return to the place from whence they first came, which thereby does again become the highest part of the Ocean; on which it again devolveth as before. And in this same manner with the first Elevation, it Ebbs and Flows for fifteen Days successively, at which time by receiving another Elevation, it Ebbs and Flows again in the same manner as afores^d.

In order to substantiate this view, Hobbs undertakes to prove three further postulates:

> First, That there was, and
> Secondly, That there is, such an internal Force within the said Cavity or Bowels of the Earth.

His proof of this is largely from the existence of mountains. The only Power in Nature which could have created mountains is an elevating heat-force located somewhere beneath the Earth's crust. Such a force, which once existed, presumably still exists to convey impulse, or wave motion, to the tides; for, argues Hobbs, by the analogy of Nature those powers which assist in the *formation* of organic beings continue to ensure their *sustenation*.

Despite popular opinion, Hobbs avers, tides cannot be caused by lunar, stellar, or solar attraction (any more, indeed, than mountains could have been raised by such supposed forces). Hobbs maintains the point in two ways. Firstly, he asserts that force can only be communicated by contact action in a sufficient medium. But no adequate medium exists between the Earth and the Moon. Secondly, he asserts (referring to his table of the tides kept at Weymouth) that whereas the theory of the lunar causation of the tides requires that the retardation of the time of the tides should keep pace arithmetically with the retardation of the Moon, in fact the retardation of the times of tides obeys a law of its own, which is not at all synchronized with lunar times.

Hobb's third postulate is that

> the Ebbing and Flowing of the Ocean is exactly conformed or assimilated to Water put in motion by being so lifted up, & agitated as aforesaid.

He seeks to demonstrate this by setting up two experiments. One is the experiment with the pit in an orchard covered by a leather tarpaulin, described above in the account by Derham (see above, p. 14). The other is the experiment with the double-ended chute (designed to show how the height of waters originally raised at one end of the chute, and then allowed to pass from side to side, diminishes very gradually), which appears in *The earth generated*.

Hobbs lastly attempts to explain anomalous tide phenomena, such as the fact, demonstrated by Halley, that tides flowed only once every 25 hours in the gulf of Tonquin. He accounts for these by arguing that in enclosed areas (such as the lagoon behind Portland created by Chesil Bank) the frequency of tides is totally distorted by the accidents of the coastline.

The other scientific contact which Hobbs is known to have had is with John Woodward and John Flamsteed (1646–1719) concerning his register of tides kept at Weymouth. It is not clear how Hobbs made contact with either, nor when he did. There are two pieces of surviving evidence. One is a three page note in Hobbs's hand, headed 'A True Register of y^{e} Time when Full Sea at Weymouth an^{o} Do^{mini} 1700 by W^{m} Hobbs communicated by D^{r} Woodward' which is now in the Flamsteed Papers at the Royal Greenwich Observatory (vol. 41, f. 129^{v}–130^{r}). The first two pages of this record Hobbs's observations of the times of the tides from April 1700 to October 1700. With a few exceptions—which I assume are slips of the pen—the data correspond to those in *The earth generated and anatomized*. The third sheet analyses the retardation of the times of the tides, and concludes 'By these diurnal Observations it appeareth that the mean Dayly difference of y^{e} Coming of y^{e} Tydes 2 or 3 days after y^{e} New and Full Moon is but 27 or 28 Min. But 2 or 3 days after y^{e} Full and last Quarter is [sic] 90 or 91 Min Difference W^{m}. H'.

The other is also in the Flamsteed Papers (Royal Greenwich Observatory, vol. 69, fol. 259^{v}–260^{r}). It is headed 'M^{r} Hobbs of Weymouth's Tables of the Tides observed by him there'. It is in the hand of Flamsteed's assistant, Thomas Faber (*alias* Smith). It consists of three geometrical diagrams graphically representing Hobbs's claim that his register showed that the time of high tide retarded by a logarithmic rather than an arithmetical law. The diagrams are headed:

'This scheme drawn from above two years observations shews how the flowing of the Ocean dos dayly increase and decrease from one Spring tide to another.'

'This scheme shews how the Tides should Flow if Governed by the Moon, which is contrary to Observation, as by the next Scheme appeareth'. 'This Scheme drawn from above two years Observation sheweth that the dayly difference in the Flowing of the Tides is in a Logarithmicall, & not in an equall progressive Difference, as hath been in the past accounted.'

The only surviving indication of relations between Hobbs, Woodward and Flamsteed is a note in the Journal Book of the Royal Society which reads: 'Doctor Woodward said that his Observations on the Strata of the Earth were Conformable to his Theory, and that he had given M[r] Flamsteed his Observations on the Tides which differed from these given to the Society' (vol. X, 1702–14, May 25, 1709).

William Hobbs: an assessment

(a) Hobbs's general vision of nature

It is difficult—and perhaps unnecessary—to try and pin down the exact sources or tendencies of Hobbs's fundamental vision of Nature. Its distinguishing feature is to see Nature as organic through and through. Hobbs places special emphasis upon Nature's vitality, its 'Vivifying, or self forming Quality', its 'plastick Qualification'. 'Nature is never idle', he writes. The power to generate is one of Nature's 'essential properties'. This general insistence on the essential quality of life possessed by Nature distances Hobbs utterly from the tendency of contemporary mechanical philosophy in England. It is also apparent in his stance over particular issues, such as his defence of Nature's capacity for spontaneous generation, and his hostility to the preformation theories which fitted in so well with the mechanical philosophy.

Hobbs's natural philosophy allowed no sharp distinctions between animate and inanimate. Yet his view of the activity and agency of Nature was hardly mystical, Hermetic, or built on the basis of a magical, or primarily symbolic philosophy—despite occasional mention of the mysteries and the symbolical characters of Nature. Hobbs was deeply hostile to 'vulgar' manifestations of mystical and magical views, such as astrology, or belief in fairy rings, just as he was hostile to introducing supernatural explanations into natural philosophy.

Rather, Hobbs was committed to what is essentially a chemical, or alchemical—the distinction is not material—view of the cosmos. His main concern was to see Nature in terms of such substances as Salt, Sulphur and Mercury, fermenting liquors, and menstrua. He was interested in states such as Heat, Motion, Fire. He perceived throughout Nature processes such as fermentation, germination, generation, incubation, concoction, separation, putrefaction, calcination, digestion, incorporation, vivification, and solidification.

In these respects, Hobbs's theory of the Earth addresses itself to quite different problems from the majority of the theories of the Earth of the late seventeenth and early eighteenth centuries. Hobbs for example did not at all share the common fear that a philosophy of Nature seen as active was the thin end of a wedge of full-scale hylarchism and hylozoism, which would lead to eternalism and atheism. Hobbs did not share the Newtonians' overriding desire to demonstrate the existence both of universal Law and Providence throughout Nature.

In many respects, Hobbs's theory was simply old-fashioned. In many others, it was desperately ignorant, wrong, ill-informed, naive, and muddled in its views. For example, his arguments that the rotation of the Earth is the cause of the orbit of the Moon seem directly to contradict his claim—which he advances while when disproving lunar theories of the tides—that power and motion cannot effectively be communicated between the two bodies for lack of an adequate medium. It is not clear to what extent he was ignorant of many of the developments of contemporary astro-physics, or to what extent he merely ignored them. Thus, he did not explicitly discuss the Newtonian theory of the nature of the motion of the tides.

But we must not be hastily dismissive of the provincial's natural philosophy. For in many ways it was, in fact, highly appropriate as a tool for understanding the nature of the Earth, viewed as a system, as a complex economy, in which each aspect had its functions and structures, its part to play in the complex maintenance of the whole. Hobbs's was a philosophy excellently fitted for coming to grips with the phenomena of gradual change on the Earth's surface; highly appropriate for understanding the actions of the tides, the importance of central heat, of elevation, of denudation, of stratification—many of which phenomena Cartesian mechanical philosophy, or a Newtonian emphasis on particles and gravitation, were ill-suited to explain.

Indeed, it is important to point out that several of the theories which were to shape the development of geology in the eighteenth century shared many of Hobbs's own concerns and patterns of explanation. French writers such as de Maillet (1656–1738), le Cat, Boullanger (1722–1759) and Buffon (1707–1788) all, like Hobbs, stressed the importance of the tides as an agent in the formation of land masses. Like him they thereby naturalistically explained fossils and the elevation of land. As did G. H. Toulmin, in his *Antiquity and duration of the world* (1780) and Lamarck (1744–1829) in his *Hydrogéologie* (1802), Hobbs insisted on the synergistic unity in Nature of the organic and inorganic, with the organic having ontological priority. Like Buffon and Lamarck, Hobbs supported belief in spontaneous generation as a way of showing how the forms of life at any time were dependent upon the conditions obtaining on the earth.

It is easy to scoff at Hobbs's insistence that the Earth was an animal, and to dismiss his thinking for being crudely animistic. But it is important to remember that Hobbs himself reminds the reader that he does not thereby mean (unlike, say, Thomas Robinson) that the earth actually has ears, eyes, a mouth, hair, etc., but rather that the Earth is an organized system, in which functions correspond to structures, and which is essentially self-maintaining. When James Hutton (1726–1797) wrote in 1788 that the Earth was more than a machine—it was an organism as well—he was expressing, though in a rather more metaphorical form, essentially the same idea as Hobbs's.

(b) Hobbs, religion, and the aims of his treatise

Hobbs more than once affirmed that he was writing a tract of natural philosophy, to solve specific natural problems. This fact has two important correlates.

Firstly, Hobbs was throughout concerned with what was rationally and naturally possible in Nature. He termed himself on his title page 'a Lover of Truths drawn from Nature and Reason'. He did not of course absolutely exclude the possibility of miraculous, divine intervention. But he announced his hostility to invoking divine miracle (such as the Deluge) as a blanket *explicandum* of events which could be explained by natural causes. By implication and association, Hobbs linked the Deluge with the credence given by the 'vulgar' to such phenomena as fairies, and with Popish superstition. When Hobbs cites the Bible, it is to conform that God works by gradual, natural causation (*e.g.*, through the process of generation).

Secondly, Hobbs's treatise has no pretensions to be a total, man-centred cosmogony and cosmology, justifying the ways of God to man, as were, for example, the treatises of Burnet, Whiston, Ray (1627–1705), Woodward and other contemporaries. Throughout the work, Man is never mentioned in a context of design and teleology. Hobbs barely touches upon God's purposes in Creation. Moses, he asserts, did not seek in the Book of Genesis to offer a comprehensive natural philosophy of Creation. The aim of the Bible in respect of the natural world was merely to demonstrate that the Earth was not eternal; that it was God's Creation.

Nevertheless, Hobbs's world-view is Christian, and he seeks to show that the first chapters of Genesis (and also other Books of the Bible, such as Psalms and Job) do contain, when properly interpreted, natural truths. Yet his theory is in no sense merely an *explication de texte*. Far from it. For Hobbs declines to take a literal view of the Genesis cosmopoeia. He is insistent that the various processes of creation which are described in the first chapter of Genesis did not occur in six days, as the term 'day' is at present understood. They were rather gradual processes and must have taken a great deal longer. Furthermore, Hobbs offers a daringly unconventional interpretation of the first chapter of Genesis in which the six days of Creation do not even stand for six successive periods, but rather six synchronic aspects of Creation, all occurring essentially simultaneously, or at least being not significantly differentiated by succession. The difficulty of interpreting the six days as successive stages is that they show the differentiation of land and sea occurring *before* the creation of life. This seemed to exclude the most direct and simplest explanation of the entombment of fossils (taken as organic remains) in the strata, namely that the seas had been teeming with fish and shell creatures before the continents had come into existence. By asserting that the 'days' of creation were merely metaphors for different aspects of the creation process, Hobbs could employ this easy and natural solution to an old problem.

(c) Hobbs as a theorist of the Earth

The quality of Hobbs's insights into the structure and history of the Earth varies almost exactly in inverse ratio to the magnitude of the problem he was tackling. When he is discussing large geophysical and astronomical problems such as the rotation of the Earth on its axis, or the source of the tides, his own provincial ignorance of recent work, and gaucheness at handling complicated—and often mathematical—notions, and his inability to grasp objections to his own views, stand out most noticeably. When dealing with large issues he regularly oversimplifies and begs questions. (Though this is not to deny that he has some sharp and pertinent criticisms to offer of other contemporary theorists of the Earth such as Burnet and Woodward.)

Furthermore, even when dealing with more immediate, concrete realities such as the strata, rocks, fossils, and the like, Hobbs is sometimes hindered by being ignorant of published work publicly available. For instance, he too readily assumes that all rocks are to be found stratified, or that the remains of *terrestrial* creatures are not to be found in a properly fossilized condition. And he is apt to ignore or oversimplify issues which greater naturalists—such as John Ray—had contemplated for years. He could, for instance, simply assume without argument that fossils were organic remains; or dismiss peremptorily all other theories of the origin of rivers than that they took their origin from rainwater—both issues being ones which had genuinely taxed scientific minds in his own time. One has the impression of a mind unused and impervious to criticism, creating a system which was suspiciously self-confirming, because it had never had to think probabilistically about problematic evidence.

Likewise, it is *prima facie* strange that Hobbs makes no explicit use of natural history data potentially available to him in the form of articles in the *Philosophical Transactions of the Royal Society*, and the natural histories of Plot (1640–1696), Lhwyd (1660–1709), Leigh (1662–1701), Ray etc. It is not clear in most cases whether he read such authors or not or whether he believed his own methodology of strict observation and induction required him to desist from making use of the observations of others.

All in all, these habits lent to Hobbs's theory a rather assertive and one-dimensional character. He set out his beliefs in the form of postulata. He rarely supported geological references with detailed local evidence. His diagrams (sadly lost) must have been abstract and idealized. He made no attempt to meet hostile criticism or to deal with anomalous cases.

Yet, where Hobbs had observed for himself, he appears both as a sharp observer, and as an intelligent interpreter of the significance of phenomena he had seen. He claimed to have viewed strata in half the counties of England, though he mentioned by name only Dorset, Devon and Cornwall, and was vague about particular geographical locations. He was probably exceptional rather than typical in his generation in being a naturalist who was both highly familiar with the structure, distribution and composition of rocks in a particular locality, and also concerned to generalize that knowledge into a theory of the Earth, whose universal validity would explain local phenomena.

Hobbs's geological intelligence is apparent in the following areas: firstly, for Hobbs, the key fact, and the key explicandum, about the terrestial parts of the globe is that they are stratified. The fact of stratification, and the need to explain it, is the hub around which all other aspects of his ideas about the Earth revolve. This is itself highly interesting, since observation and analysis of the *strata* comprised only a rather minor part of contemporary theories of the Earth and of local natural histories. In this prespect, Hobbs's interest in the strata is more typical of geology two or three generations later, rather than of his own time.

Hobbs's way of handling the strata is also distinctive. Unlike a theorist such as Woodward, he was not concerned to show that the strata are universally found in the same situation. Unlike natural historians like Plot, Leigh, and Morton, he does not concern himself with compiling lists of the order of the strata in particular geographical locations, naming the particular rocks. He has none of the ambition of later geologists like William Smith (1769–1839) to establish the general order of the strata, and to trace it across the British Isles.

Rather, Hobbs's concerns were twofold. Firstly, to establish the range of typical characteristic *positions* of strata. That is to say, under what circumstances they were to be found parallel to the horizon, or parallel to the line of the countryside, or in no apparent order at all; or where they were broken etc. And then secondly to establish—to deduce, in a way which reminds one of the thought of Hutton—what this necessarily demonstrated about the agency which had created the strata in the first place, and brought them to their current positions.

In other words, he was concerned with forces, pressures of a 'tectonic' nature. Thus for Hobbs, in a way not at all characteristic of contemporary geology, strata were the key to Earth history (*cf.* for example, his highly acute remarks on the significance of the phenomenon of stratification as such as a clue to Earth history).

Almost alone in his generation, Hobbs grasped clearly that the very fact that strata existed (*i.e.*, that rocks were found bedded, and that they contained the remains of organic creatures) demonstrated beyond dispute a marine origin for them. And the fact that the normal condition of strata was to lie horizontally demonstrated that natural, gradual, and relatively calm processes had placed them there—not Burnet's crustal collapse, or a Deluge, or Hooke's massive earthquake and volcanic movements. Similarly, the angle at which the strata of hills ranged to the horizon demonstrated the reality of subsequent upthrust from below. Hobbs's tidal origin theory of the strata is similar to those of many French naturalists of the period and the later eighteenth century such as de Maillet, Le Cat and Buffon, all of whom attributed stratification to the action of the tides. Of course, unlike those naturalists, Hobbs had no desire to advance such a theory in order to attack Genesis. But it is nevertheless true that Hobbs's theory of the formation of strata was possible only *because* he had taken such a liberal reading of Genesis, and because he was so committed to the constancy of Nature and to natural causation. He would hear nothing of any cataclysmic theory of the origins of fossils.

Clearly Hobbs also advances his theory of the gradual formation of stratified land by the sea precisely because this is the phenomenon which he had been actually observing gradually occurring on the Dorset coasts—above all in the vicinity of Chesil Bank—for many years of his life. Hobbs shows, in his theory of the formation of strata, a closer integration of extensive personal observation—above all of current processes—with theorizing than is characteristic of more famous theorists of the Earth of his age—men such as Burnet, Whiston, and, perhaps, Woodward. The power of Hobbs as a geological theorist lies in the fact that he lived on the coast. The relations between land and sea, water and matter, are crucial to all good theories of the Earth.

The other related feature of Hobbs's analysis of the Earth which was important and pioneering was his construction of a number of sections of the strata (though clearly it is difficult to write about them, they being now missing). Not only were they the first and most extensive series of sections accompanying a late seventeenth century or early eighteenth century theory; but in type they seem to have been of a kind not commonly found again till the nineteenth century. For they were not sections of particular locations, as one finds in Strachey and Whitehurst (1713–1788), but rather generalized ideal types, highly stylized and conceptualized, illustrative of typical situations (possibly a little like the block diagrams of faults which Farey inserted in his *General view of the agriculture and minerals of Derbyshire*). They embodied and illustrated a theory of how the strata had been formed. Such a graphic technique was not absolutely new—Steno's diagrams[17] are of very much the same kind (though Hobbs seems to owe nothing to Steno). But it is for that reason of no less interest as a sign of how a man of some intellect and much observation had been able—possessed as Derham said, of 'a clear head'—to conceptualize the typical and exceptional in terms of a significant history.

To place greatest stress on Hobbs's analysis of the strata while relatively neglecting his theory of the pulsation of the tides due to the inner heart of the earth or his astronomy, is not simply to select for attention and praise the most 'progressive' parts of his work; nor is it to fall victim to modern disciplinary boundaries which would separate Hobbs's 'geology' from his 'astronomy', his 'oceanography' and so forth. It is rather to point out that on Hobbs's own statement of his intentions, the problem of the strata and of the fossils they contained was his chief concern. After all, his own title page announces: *The Earth generated and anatomized,* *wherein is shewn what the Chaos was; how and when the Oyster-shells, cockle-shells and all other Marine productions were brought upon, and incorporated in the rocks and mountains of the Earth.*

For this, his natural philosophy of generation was to be invoked as a general framework within which his specific mechanisms for explaining strata made sense, and his discussion of the tides was a necessary digression. Moreover, when he came to reorganize the paper he had submitted to the Royal Society into his treatise, further reflection clearly caused him to decide to place the problem of the strata, and the formation of the present condition of the Earth—problems which had been relatively unimportant in his Royal Society paper—to the forefront, as the organizing principle which was the intellectual thread running through all his work. And, further, it was within his discussion of formation of the Earth that Hobbs, confessedly an unlettered man, could speak from most experience and with greatest interest.

Hobbs was swimming against the tide in his day (as the quick dismissal of this theories by the Royal Society clearly shows). He was putting forward a philosophy of an active, living Nature at a time when Newtonianism was stressing *God's* activity, and the passivity of Matter itself. He was offering a liberal view of the Biblical creation at a time which piety required more orthodox readings. He was seeing Nature in terms of process, through alchemical philosophies, at a time when the mechanical philosophy was replacing the chemical philosophy. It is not surprising that Hobbs's paper was virtually neglected by the Royal Society. Had *The earth generated and anatomized* been published it would probably have received rather less attention than, say, John Hutchinson's (1674–1737) anti-Newtonian *Moses's Principia*.

Yet there is much in his natural philosophy which is an indispensable background for his observations and technical mechanisms, and much in his specific notions which back up his philosophy. Not until new natural philosophies came into vogue associated with men such as Hutton, which were not precisely like Hobbs's, but which carried many of the same burdens—the stress upon the activity, and organization of the Earth, upon its being transformed gradually and continuously, the demotion of Biblical literalism and of miraculous agency—could the study of the Earth actually rediscover many of the important foci of Hobbs's interest.

The manuscript of *The earth generated and anatomized*, with some notes on editorial practice

The manuscript of Hobbs's treatise from which I have worked appears to be the only one in existence. It has never before been printed. It was purchased by the British Museum (Natural History) from Messrs Dawson's of Pall Mall who had advertised it for sale in their catalogue no. 240 (1973). The history of the manuscript is obscure. Certainly the William Hobbs will of 1743 (p. 8), which I take to be the will of the son of the author, makes no mention of any scientific papers. Written on the vellum cover of the manuscript are the words 'Hobbs Animadversiens' which suggest that at some stage it fell into French hands. On the first sheet of the manuscript are the words:

J. Bailey
August 1825
I bought this MS. in the borough of Southwark.
Shortly after I had made the purchase, mention was made of it, the Title quoted partially, &c. in the Times newspaper.

J.B.

The manuscript is a folio of seventy-five sheets, bound in contemporary limp vellum. It measures 33 cm × 21½ cm. The text comprises three main sections:

(*a*) To The Reader (unpaginated)
(*b*) The main body of the text (pagmated 1–54, recto only)
(*c*) Postscript (paginated 1–18 recto and verso).

It seems to have been written in two hands. The first two thirds or so of the main treatise is in a neat, polished, mature hand, and considerable care was obviously taken in the production of the manuscript. Many passages of the rest of the treatise and the Postscript are also in this hand. This hand can be identified with confidence as that of the William Hobbs who wrote and signed the two letters to the Royal Society in 1709 (though these two letters were penned less formally). It is perhaps not surprising that Hobbs, a sometime excise officer, could write a handsome hand.

The rest of the treatise and the Postscript are in a different hand, which appears less mature, less confident, less fluent and less regular. It would seem as though Hobbs obtained the help of a second hand in aiding him to complete the copying out of the manuscript—possibly a member of his family (this second hand may well be that of a juvenile). This might indicate that Hobbs showed a certain impatience during the later stages to complete the work. In many places the two hands succeed each other every few paragraphs. Errors in the second hand are often corrected by Hobbs's original hand.

Hobbs signed his manuscript, at the end of the section 'To The Reader'. His name has been scratched out and almost obliterated. The signature—so far as it still appears—seems to be in the same hand as the earlier part of the treatise, and rather different in style from the signatures as appear on Hobbs's letters to the Royal Society. It is not clear whether Hobbs himself scratched out his name, or whether that was done subsequently, or, indeed, why this was done.

At no other place in the manuscript did Hobbs sign his name. The title page refers to the author as 'W.H.'. Identifying books by initials was, of course, common practice in Hobbs's day. It is not clear why Hobbs chose to appear simply as W.H. It is conceivable that he did it to avoid all connexion with Thomas Hobbes. It is rather more likely that, as an unknown author, he might expect more notice to be taken of his tract if it were virtually anonymous than if known to be by an author who had no other work in print. This assumes that Hobbs intended his treatise to be printed, or at least circulated.

The manuscript bears one date: 'July 1715'. This is at the end of the section 'To The Reader'. The numerals '15' have been scratched out. Since we have no rough drafts of the treatise it is difficult to base a reconstruction of the chronology of the composition and penning of the treatise upon more than plausible guesswork. Hobbs had presumably been making observations and having ideas about the structure of the Earth from the late 1670s, since he wrote in his letters to the Royal Society that his experience in these matters was of more than thirty years.

It seems to me most probable that Hobbs first set out the major ideas of his treatise soon after he completed his register of the tides, *i.e.*, from about 1704 onwards (assuming that he was dismissed from the excise service at about this time, this might have given him the requisite leisure). Presumably, as he himself claimed, he had kept his tide record in order to confirm a hypothesis about the independence of the tides from the Moon; and having demonstrated that, he would wish to write up such an interpretation. He then seems to have taken no further steps, until he made contact with the Royal Society in 1709, sending them two letters (at least), the first of which spelt out his arguments about Motion and the Moon, and including his 'An essay concerning Motion', which set out many of the ideas (*e.g.*, about trade winds) to be found in *The earth generated*.

Why Hobbs decided, after his 'snub' from the Royal Society, to write up his ideas into the form in which they at present stand, is unclear. It may have happened exactly as Hobbs himself states in his 'Postscript', which I assume was penned with the rest of the treatise in 1715. At the beginning of the 'Postscript' Hobbs wrote: ''Tis almost ten years Since I composed what is generally contained in the foregoing Treatise', indicating perhaps that that was written about 1706, and that he had put the work aside because he had despaired of being able to demonstrate the global movements and times of the tides. However, as he went on to say, he had recently come across a work, the *Lightning column*, which solved such problems for him, and opened the way forward. Having read the *Lightning column*, Hobbs presumably felt in a position to expound his chief ideas in the body of his treatise, confirming them from deductions from the global pattern of the tides in the 'Postscript'.

Comparison between the papers Hobbs sent to the Royal Society in 1709 and *The earth generated* suggests a considerable amount of reworking in the interim. Certain areas of Hobbs's thought appear much more strongly in the later treatise (*e.g.*, his alchemical ideas), and what had been separate and isolated sectors of his theories (*e.g.*, his interpretations of Monsoon winds) had by 1715 been worked into a comprehensive philosophy of the globe. One assumes that had the manuscript of *The earth generated* been in existence, in a reasonably complete condition, in 1709, he would have sent that to the Royal Society.

A Note on editorial practice

In rendering Hobbs's manuscript into print, I have tried to strike a compromise between two desiderata: (*a*) the aim of providing an exact transcript of the manuscript, (*b*) the aim of presenting an easily read version. To the first end, I have retained the spelling, capitalization and punctuation of the manuscript. I have also indicated deletions, alterations and other emendations in the manuscript, where these might have some intellectual significance, rather than being mere slips of the pen. I have tried to do this inconspicuously, distracting the eye as little as possible from the flow of the line. At the same time I have chosen not to try to reproduce every idiosyncracy of the manuscript, since that would have been to hinder general readability. Any reader wishing to hunt among such idiosyncracies for further clues in the appearance of the manuscript may consult it on the permission of the Librarian, in the Palaeontology Library, of the British Museum (Natural History). On a number of occasions, Hobbs deleted a word or phrase and substituted one nearly identical. I have chosen not to burden the present text with these variants, since in my judgment the variations are of no intellectual significance, and I have simply transcribed Hobbs's final intention.

Hobbs had a highly elaborate practice of representing relative degrees of emphasis for different words and phrases by the use of distinctive sizes and thicknesses of script and different degrees of italic and gothic script. In a rather simplified manner I have tried to retain Hobbs's emphases, largely by the use of bold type. I have used square brackets for the occasional [sic] and to mark the page numbers of the original manuscript. All other uses of square and round brackets are Hobbs's.

An impressive feature of Hobbs's original manuscript must have been the diagrams—some twelve in all, probably contained on about five or six sheets. Of these only one sheet survives, containing four diagrams (nos 9, 10, 11, 12). These have been reproduced here. For the convenience of the reader I have attempted to reconstruct the remaining diagrams. I wish to thank Dr S. Conway Morris for his great help in this task.

Hobbs's scientific drawings were clearly prized in his day. He had sent similar drawings and models to the Royal Society in 1709, including a map of the Isle of Portland. William Derham remarked on their quality. At least some of these survived through to the mid-eighteenth century, for notice of them appears in manuscript catalogues of the collections possessed by the Royal Society ('An inventory of the subjects of natural history in the Repository of the Royal Society, Nov. 21, 1763' contains a reference to 'Representations of the Earth's Strata: 4 pieces, and also of the Bell fish in a box' which are clearly Hobbs's). When or how they were finally lost is not known.

Notes

1 Original in Royal Society Archives, MS Ex 1. 13; copy in Letter Book Supplement, G–H, copy, pp. 357–406.

2 At the end of his 'An Essay concerning Motion', *op. cit.* (note 1).

3 The following section is based chiefly on the surviving minutes of the Excise Board, preserved at the library of the Custom House in London, and to a small extent on the minutes and correspondence of the Customs Board, also preserved there. Since these records date only from the 1690s, it has been impossible to trace the origins of Hobbs's connexions with the excise authorities. It appears from these that William Hobbs, Sr, was already excise officer at Weymouth in 1698, when, for a short period of time, his son substituted for him while he was sick. The younger Hobbs was posted frequently to new 'Rides' in such places at Taunton and Worcester, moving it seems to Hindon in Dorset probably in 1703. Meanwhile his father continued as officer at Weymouth, becoming officer at Bridport in November 1704. In January 1704/5 Hobbs, Jr, was dismissed for dishonest returns. The same fate befell his father in April 1705. In August 1705 one of the Hobbs's—I presume the younger—was reinstated to a Devon collection. He served other Devon collections in the next few years. The last mention of him I have found in the minutes is in 1707. The other Hobbs does not figure in the minutes at all after his dismissal. I am grateful to H.M. Customs and Excise for permission to use and quote from their archives, and in particular to Mr F. R. Blanchard for his courteous help in explaining the archives, and the structure of the excise service to me. See also E. Carson, *The ancient and rightful customs* (London, 1972).

Prima facie there might seem to be some connection between William Hobbs of Weymouth, author of *The earth generated and anatomized*, and the man of the very same name who in 1714 published a tract, *A new discovery for finding the longitude*, printed for the author who was found at the sign of the Porter in Baising Hall Street, London. Apart from their almost exact contemporaneity, both works show interest in broadly similar problems—of navigation at sea and its difficulties. But it is almost certain that these William Hobbs's are in fact different men. The author of the longitude tract was a clockmaker (quite probably the man of that name apprenticed in 1672 in London). There is no intellectual cross-referencing between the two works. The London Hobbs was chiefly interested in solving the longitude problem through fancy pieces of clock work; the Weymouth Hobbs was deeply interested in the much more philosophical problems of the figure and motion of the earth.

4 Weymouth and Melcombe Regis Corporation Records, 1699–1724, no. 259, 185 verso.

5 The Weymouth and Melcombe Regis Corporation Records (Item S 259 Minute Book, 1699–1724, p. 2366, 8th March 1722/23) mention a Mr William Hobbs as a school master. Dr Hugh Torrens has kindly drawn my attention to the fact that Joshua Childrey was in contact in 1669 with a 'friend' from Weymouth who taught 'mariner's art' and was interested in tides. See A. R. Hall and M. B. Hall, *The correspondence of Henry Oldenburg* (Madison, 1969, **6**: 109). It is *just* conceivable that this was the elder Hobbs, but there is no need to suppose this, since the teaching of mariner's art must have been an important and integral part of the economy of a town such as Weymouth. In 1753 a school was set up for training boys who would go to sea; see M. Weinstock *Old Dorset* (Newton Abbot, 1967).

6 The will is at the Dorset County Record Office, Dorset Archdeaconry Records, DA/W1743/32.

7 *Op. cit.* (note 1).

8 Royal Society Journal Book, X 1702–14, p. 215.

9 Royal Society Register Book, IX, pp. 268–73.

10 Royal Society Journal Book, X, 1702–14, 25th May, 1709. I assume that on both occasions 'his' in Woodward's sentence refer to Hobbs not to Woodward.

11 Royal Society Journal Book, X, 1702–14, 13th July 1709.

12 This letter is Sloane Mss, 4042, f. 13, in the Department of Manuscripts, British Library. There is a copy in the Royal Society archives, LBC 14 276. The Bear Inn was in St Mary's Street.

13 A similar provincial, contemporary with Hobbs, was Convers Purshall, a country physician (? at Bromsgrove), who wrote *An essay at the mechanism of the macrocosm* (London, 1705). Purshall complained of his isolation from learned society. His book shows a mixture, similar to Hobbs's, of rather acute criticism of fashionable mechanical and Newtonian philosophy, with some extremely eccentric and old-fashioned views (*e.g.*, an apparent denial of Copernicanism). Like Hobbs, Purshall believed that the pressure of the aether accounted for all heavenly motions, but there the similarity ends.

14 See D. E. Allen, *The naturalist in Britain* (London, 1976), for an account of the social development of the natural history sciences in Britain.

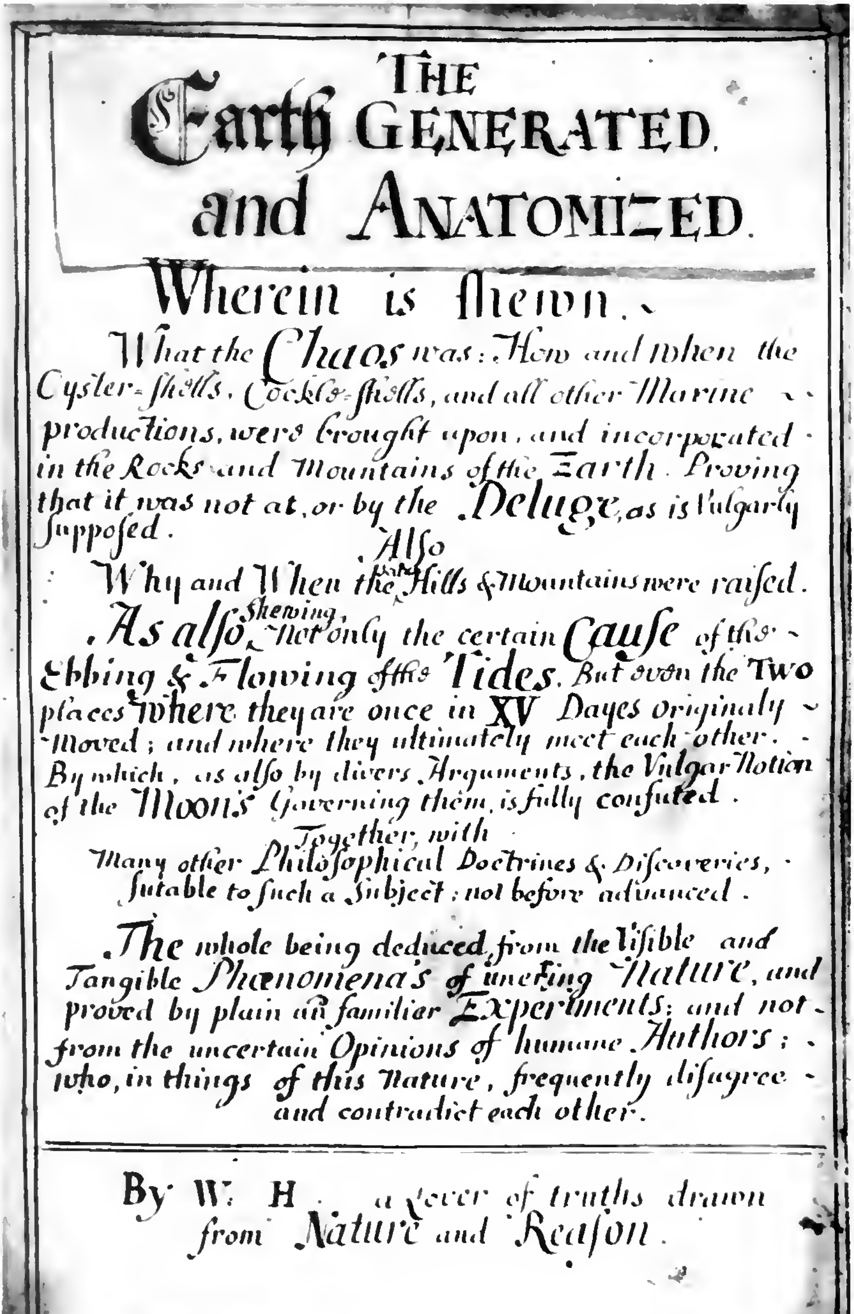
15 This account is derived from sources such as J. Coker, *A survey of Dorsetshire, containing the antiquities and natural history of that county* (London, 1732); John Hutchins, *The history and antiquities of the county of Dorset* (2 vols, London, 1774); H. J. Moule, *Old Dorset* (London, 1893); T. Perkins and H. Pentin, *Memorials of old Dorset* (London, 1907); and G. A. Ellis, *The history and antiquities of the borough and town of Weymouth and Melcombe Regis* (Weymouth, 1829). For a rich guide to the literature on Dorset see R. Douch, *A handbook of local history: Dorset* (University of Bristol, Bristol, 1952, revised and corrected ed., 1962).

16 For a good bibliography of books and articles on Dorset geology see G. M. Davies, *The Dorset coast, a geological guide* (London, 1935: 113–22).

17 M. J. S. Rudwick, 'The emergence of a visual language for geological science', *History of science* **14** 1976: 149–95.

The earth generated and anatomized:

Text



THE
Earth GENERATED
and ANATOMIZED.

Wherein is shewn.

What the Chaos was: How and when the Oyster-shells, Cockle-shells, and all other Marine productions, were brought upon, and incorporated in the Rocks and Mountains of the Earth. Proving that it was not at, or by the Deluge, as is Vulgarly supposed.

Also

Why and When the vast Hills & Mountains were raised.

As also shewing, Not only the certain Cause of the Ebbing & Flowing of the Tides. But even the Two places where they are once in XV Dayes originaly moved; and where they ultimately meet each other. By which, as also by divers Arguments, the Vulgar Notion of the Moon's Governing them, is fully confuted.

Together, with

Many other Philosophical Doctrines & Discoveries, sutable to such a Subject; not before advanced.

The whole being deduced, from the Visible and Tangible Phenomena's of unerring Nature, and proved by plain an familiar Experiments; and not from the uncertain Opinions of humane Authors; who, in things of this Nature, frequently disagree and contradict each other.

By W: H. a Lover of truths drawn from Nature and Reason.

PLATE I Photographic reproduction of the title page of Hobbs's treatise.

THE EARTH GENERATED AND ANATOMIZED

Wherein is shewn
What the Chaos was: How and when the
Oyster-Shells, Cockle-Shells, and all other Marine
productions, were brought upon, and incorporated
in the Rocks and Mountains of the Earth. Proving
that it was not at, or by the Deluge, as is Vulgarly
Supposed.

Also

Why and When the Said Hills and Mountains were raised.
As also shewing not only the certain Cause of the
Ebbing and Flowing of the Tides, But even the Two
places where they are once in XV Dayes originaly
Moved; and where they ultimately meet each other.
By which, as also by diverse Arguments, the Vulgar Notion
of the Moon's Governing them, is fully confuted.

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Many other Philosophical Doctrines and Discoveries;
Suitable to such a Subject; not before advanced.

The whole being deduced from the Visible and
Tangible Phænomena's of unerring Nature, and
proved by plain and familiar Experiments; and not
from the uncertain Opinions of humane Authors;
who, in things of this Nature, frequently disagree
and contradict each other.

By W. H. a Lover of truths drawn
from Nature and Reason

—Wine are in their Feasts; But they regard not the works of the Lord; neither consider the operation of his Hands. Isai 5 v. 12.

The Invisible things of God from the Creation of the World, are clearly seen by the things that are made. Rom. 1 v. 20.

For he hath Given me the true knowledge of the things that are; So that I know how the World was made, and the Power of the Elements. Wisdome 7 v. 17[1]

To the Reader

It may be discovered by the Title Page, That the ensuing Lines, do not only differ, from the opinion of many Learned Writers, of This and the former Ages; but alsoe assert other Propositions, not before advanced: And though this may be a presumption in the Author, yet if it be duly considered, 'twill apear highly needfull to have been done, for many Ages past; For tho' the Mathematicall Sciences, are Treated of, with Such Nicity and unanimity; as that there seems no Room to correct what has been Written; not but Little for any further Advancement: Yet in those Sciences, 'tis quite otherwise; For there are Such Diversity of Opinions concerning, even the Visible Appearances in Nature; that a man knows not which is true, or which is false: From the Consideration whereof, I was induced to Lay those opinions, wholy aside; Not for want of Gratitude to Some and due Respect to the Rest of those Authors: But to try what I could Discover, as well by observing the Said Phænomena's; as by Searching into the Causes thereof; in hopes that Some Right Foundation might be Laid for *this*, as well as other Sciences.[2] In Which Enquiry, haveing had the advantage of makeing my observations in near half the Countys of this Kingdom, as well in the Inland parts, as on the Sea Coasts[3] I allways found; That in all Deep *Roads, Pitts, Quarries, Mines*; etc. the Constant Position of the Stratas, or rather Beds of Earth; whether it was Level, Hilly, or Mountainious; were exactly parrallel to each other; as in the 1st: 3d and 4:th Fig:s[4] is described: Which Position I never before found treated of, tho' it Teacheth, as much or more, than any Terrestriall Phænomenon whatever.[5]

After this I observed the Position of the fish=Shells[6] and found them to be immassed, as well in the Solid Rocks & Stones, as in earth, and looser matter, and tho' they are not generally So,—in all places,—yet what is described in the following Figures, is no more than I have actually seen, especially on the Sea Coasts, for Severall Furlongs; and Sometimes for Miles together; and in Some places, even to the depth of 2 or 300 foot perpendicular;[7] So that you may certainly depend, upon what you [p. 2] See therein decyphered. Now when I had made these observations; I further observed, That if a greater or Lesser Tree (or any of their branches) be Sawn a Sunder; At the Ends thereof, the Veins will appear as exactly parrallel as they do Circular; and well knowing, that the Generateing, the Sphericall Earth; was the Same, in its Kind, with any of these cilindricall Vegetables; I was thereby taught, that the Beds of Stone Cley, earth, &c. were at first, not only as is Said parrellel, and Circular, but also Levell, and Horizontally posited: as in Fig: 8:th is described. Whence I plainly discovered, That the shells, were then; to wit, when the matter of the Earth was plain, Soft, and Levell and no Hills raised, brought upon the Earth; and incorporated, and mingled therewith: And that when the Earth was fittly hardened, the Hills were thrust up; together with the Shells and other Marine productions that were then incorporated, and are now remaining therein. And this we may be assured, was the real Means whereby they became **Posited**, (as we frequently find them,) so many hundred feet higher than the Ocean, in which their Species do now reside. All which is evidenced, by their very Position in the Rocks; as is described in Fig: 2:d.[8] Because the Matter must be both soft and level when they were thereinto admitted. For every Housewife can testifie, that the Fruit, must be put into the Cake or puding before, and not after it is baked or hardened:[9] And as the Earth was then undeniably soft and tender; so 'tis as evident that it was level and that there could not, then be any Hills or Mountains raised; For if they Should in that State, the Soft Matter Would Subside, as fast as it was Elevated; as dayly Experience teacheth and Confirmeth.

Now having delineated and transcribed these Visible Symbollicall Characters, imprinted by nature in the Earth, and incerted the Inferences, that did naturally flow from them, upon the following Sheets, I found them to differ from other opinions, as aforesaid: Whereupon I presumed to Examine them by that admirable Compendium of the Creation, Contained in the two first Chapters, of the Book of Genesis; wherein We have a more true, and profound Account thereof; than in all the philosophical Books yet extant; And haveing thus done, I found my mean Endeavours, were thereby So far Justified; [p. 3] as that they seemed to be, but as a Naturall Comment, or Paraphrase upon the Said Chapters; And that this may the better appear, we will here incert an Abstract thereof: In which it is to be noted; That When Moses had given an Account, of the Creating the first Matter, out of Nothing; He then intimates or tell us—[10]

First, That it was a deformed Mass of Water; and that the Spirrit of God moveing thereupon produced Light.*

" 2:dly That God Seperated the waters designed for the Earth from those of which "the heavens were made.

" 3:dly That after the Waters were gathered together, the dry Land was Raised up, or "appeared above the Waters. Whereupon the Earth broght forth Grass &c. "abundantly.

4:thly He formed or made the Sun, moon, and Stars.

5:ly He commanded the waters to Bring forth Fish, and Fowles and

6 "He commanded the Earth to bring forth Horses, Cows, Sheep Lyons, Dogs, &c. and all other Living Creatures Whatsoever[11]

And when he had given us this Brief Account of WHAT, was done, he then in the 4:th Verse of the 2:d Chapter[12] tells us the Maner HOW, or by what Means it was Effected. (namely)

* Note this Light was doubtless the Same in kind (or to which he aludes) with that we now finde on the Surface of the Ocean; for, Especially at Some Seasons of the year, and in hot countries, if a Vessell of salt Water be carried into any Close Roome, in the darkest Night, it will, if stirred, produce Such a light as that I have Seen an hair, by that Light only.

"That the Heavens, and the Earth, were made, by GENERATION: In which Emphaticall, and comprehensive Word, We have the Whole Process of Nature, in forming the Universe, fully described; So that if we know, but what it is to GENERATE, or ANIMATE, we may know the manner how, all Naturall Bodies, from the first Matter, were formed, and produced: And whether I have pursued the Foot=steps, or process, of GENERATEING in the following Lines, I leave to be determined by the Judicious Reader.

[p. 4] But notwithstanding the Excellency of this Account it is to be observed That it has not past unsensured; for some (haply not from their knowledge in the Works of Nature, but for Reasons best known to themselves) have objected, That the Space of one day, was too Little, for makeing the Heavens, when the Earth required 5: Others that the Order in which they are Said to be made, was Sometimes inverted; as in the 4th Verse The Heavens are Said to be made, before the Earth; and in the Close of the Same, the Earth is said to be made before the Heavens; so likewise in the first Words, 'tis said the Heavens and the Earth were Created; and yet after that, we have an Account of the Makeing them both: so also in the Middle of the Week (to Wit) on the 4th day, 'tis observed that the Heavens were made; during which some would infer, That the forming of the Earth was laid by; and reasumed the day following &c.

Now that these seeming Contradictions may be reconciled, I shall presume to Shew, that there can be no Methodicall account given of the Process of Nature in Generateing or makeing the universe, or of that part called the Terrestriall Globe, or any Generated, or Animated Body Whatsoever.[13] 2.dly That the pretended Contradictions; are no other, than Such, as in all probability, the Authur designed; and what Nature, Reason, and our dayly Observations, do allow; or may be justly reconciled unto. And to explycate the Matter; Lett us Suppose that a Statuarist should carve a Figure, (e.g) of an Apple Tree or another person, should make such a Machine as a watch; of which let the first, (as it resembles), be compared to a Vegetable; and the Latter to an Animall: Now tho' these Bodies, when finished, may bear Some Resemblance in Respect of the form, or Regularity in composure; or in Respect of Power in moveing &c: to the Bodies with which they are Compared; yet the Order or **Method** in forming, or composing them, is far different, from the Gradations or Proceedings of Nature in forming Naturall Bodies: For when the Artist, in one day, is giving Shape, Suppose to the Body; or but to any Leaf of the Tree; during that time, all the rest of the designed Leaves and Fruit [p. 5] will remaine formeless and wholy unfashioned; and so of the Severall parts of the Watch or other Machine. But in the process of Nature 'tis quite otherwise; For 'tis well known, That no part of any generated Body is at a Stand, or unaffected, whilst the other Parts, are composing: But that the whole, and all its Parts, are carryed on, by a common Coagitation, and Generall Gradation: So that 'tis impossible to say, this day the Foot of the Head: and that day the Bones &c: in any Fœtus, was formed, or that any part or Member thereof was perfected: before the whole is fully Animated: (And the Same may be understood of a vegetable) Which being well-known to this Wise and Learned Author, he accordingly treated of the Creation promiscuously: by inverting and counterchanging the Order or Method thereof: as is before observed: In which he so Signalised his Wisdome, that instead of being censured or exploded, he highly deserves the greater Admiration.[14]

Now Seeing 'tis Evident, that the Heavens and the Earth were Generated, and that therefore, there could be no Methodicall account Given, of the perfect order in which they were made: We may from these considerations, justly conclude, That the Process of Nature, in Generateing that Part of the Universe called the Heavens: was as certainly carryed on, in the 1: 2: and 3: Days (to wit) whilst the Earth was forming: as it was on the 4: Day; notwithstanding they are not till then, said to be made: And also That the Waters, did as Certainly bring forth all Sorts of fish, if not Fowles, (at least) as well on the 3: and 4: Days; as they did, both fish, and Fowles on the 5th Day. For it appears, by the foregoing Abstract that as soon as the dry Land, was raised above the Waters: it immediately became fruitfull and most plentifully brought forth Grass, and other Vegetables. With what Shadow of Reason then can it be supposed, that the Waters, which had their Being from the first Beginning of the Creation, should be fruitless and barren untill the 5: Day (to wit) 'till after the Heavens and the Earth were made?[15] For 'tis but naturall to conclude That at the same instant in which matter was Created or produced, it was likewise elemented and imprincipled with its productive Nature, or plastick Qualification: It being absurd to Suppose, That the said matter or either of the Elements, could Exist before, or without, its essentiall properties. And this the Father of Solomon fully affirmes when he tells us, That by the Very word of the Lord, the Heavens and all their host were made psal: 33. v. 6[16] (i.e) Matter was thereby Created, and [p. 6] imprincipled in order to generate them, as aforesaid. So that in all probability the designe of Moses, was not so much to ascertaine, an exact Mechanick, or literall Order, for makeing the Heavens, and the Earth: as to convince and Assure us, That they were made, & Not Eternall: And therefore what I have said in the following lines concerning the Shell=Fish &c. being brought forth, or generated before the Fifth day: (to wit) before the Hills were raised, (which some perhaps may object against,) is not so contrary to the said Compendium but that it is comformable to the designe of its Author: And is fully warranted, from the process of Nature, in Generateing or Animateing of Matter: and also abundantly confirmed by the Shells being Visibly found incorporated in the Rocks as aforesaid. And what is more by this Hypothosis, Nature, Reason, and our dayly Observations, will be mutually reconciled: and the Manifold Absurdities, so inevitably arising from the contrary: be dessipated & prevented.

And forasmuch as diverse other things contained in the following lines are either New, or at least but rarely treated of; I am not unsensible, That there are Two things wanting, which might recommend it to the Readers approbation; (Namely) First, That it proceeds not from the Pen of Some famous Learned Author: And Secondly That it is not confirmed by the Concurrent Testimonies of Such.

As to the first of these, I readily grant, that if it had been promulgated by the Learned Grotius, or DesCartes, or by our adjacent neighbour [two words undecyphered] I mean the Author of the famous or rather infamous Leviathan their very names might have given it such a Sanction as would perhaps Silence Objections But insomuch as I am not endowed with the learning of the former, so I think fitt for some Reasons to acknowledge that notwithstanding the Vicinity before mentioned I am not any way related to the latter. I must therefore commit it, as it is, destitute of the said advantages to the Censures of the Judicious Reader.[17]

But however to Shew, that it ought not to be rejected, barely for want of these accomplishments, in the Author; I shall endeavour to prove, That Learning especially of Languages;[18] conduceth but little, to enquiries of the Nature: For 'tis evident That [p. 7] Learning (I speak not to lessen its Excellency, for 'tis what I highly honour and admire:) may teach us what is *already* known [to others;] But 'tis not that alone, that will finde out *new* Discoveries; or infallibly unfold the deep misteries, imprinted in the Volumes of Nature. For know in Musick, he that learns the Theoretic Part of *Contra Puntum* can play but only what is first composed, Whereas he that knows the latter can perform what the former never played,[19] though he that imploys his time, in Reading what is already published; may know what other men have known; Yet 'tis the Setting one thing against another, by *Contemplation*, that finds out what his Authors never knew. Had what I have herein after treated of, or discovered, depended only upon **Mathematicall Sciences**, or **Orientall Languages**; it had not been a Secret so long, as 'till the Days of ***Euclid***, or ***Aristotle***; But as it is derived, from a Dilligent Searching into ***Natures*** **Symbolicall Characters**, the bare knowledge of a multitude of Words, can contribute but little thereunto. How absurd would it be to thinke That Columbus's dark and Midnight conceptions of the Western World, that had lain so many Thousand Years in Obscurity, and undiscovered, Should proceed from Learning Spanish, Welch, or Irish; Why then Should we undervalue our selves or Language, so as to thinke the knowledge of Greek, or Hebrew; as the Vulgar doe, to whom I am now Speaking, will teach us the Secret Misteries of Art or Nature? Is every Native of Greece, a Philosopher by Virtue of his Language? or every Jew, a Mathematician by means of his? Nay I'll appeal to Reason, Whether the more a man Spend's his time in attaining Such knowledge, he be not thereby the more hindred and diverted, from Contemplation? by which, as is said, all new discoveries are attained. And that they are so, will appear by the following instances; For

Was it not by Contemplation, that Pythagoras found out the 47th Problem in the I Book of Euclide's Elements,[20] at the Discovery of which so many Oxen were slain in Sacrifice; and on which so great a part of Mathematicall Learning depends. 'Twas [p. 8] also by thinking and not only by Reading, (for whatsoever is prædicated or published, is already known,) that the Reverend Bishop, in the age of ignorance, lost his Life; for Asserting, The *Earth did not Rest on the Sky beneath them*.[21] And 'twas by the same, that the aforesaid *Columbus*, found out that Vast Continent of *America*, for those who after he returned, most ungratefully Slighted, and afronted him. 'Twas also by thinking, That *Archimedes* found how to Discover, the fraudulent compounding of Mettles:[22] at which he was transported as to forgett his Cloaths when Naked. And of later Ages, 'twas that by which the Hon:ble L:d *Napier*[23] of North=Brittain, by his profound and famous Invention of Logarithms, converted Multiplication and Division, into Addition & Subtraction. And, Pardon my presumption, 'Twas also by thinking that I obtained the Discoveries; with which you are presented, in the following Lines. In a Word, Learning produceth Knowledge; Knowledge fitts man for Contemplation; and Contemplation, finds out new Discoveries; From whence Learning was primarily educed; and is still improved and increased. To conclude therefore seeing what is herein advanced was principally obtained by Contemplation; it may nevertheless be true, though it does not proceed from such an Author, as these before mentioned.

2. The next thing that's wanting to recommend what is herein Writen; is because, it is not confirmed by the concurrent Testimonies, of such Authors; Which indeed I have very rarely mentioned: But my reasons for so omitting, are First because they could not be obtained: And secondly, Because they are either Needless or useless and,

First, That they could not be obtained, is manifest; Because a great Part of What's herein Advanced, was not before discovered:[24] As the Time When, and manner **how**, and places **where**, the Waters are originially moved; with Divers other things of like Nature; as in the ensueing treatise will more fully appear. And being, as is said, not before Discovered, 'tis therefore impossible to obtain concurrent Testimonies for their Confirmation. And truly had I not been Assured of their Verity, as well as of [p. 9] their Novelty, I would not have given my self the trouble of Writing, Nor you of Reading, what is herein contained; But would even now tho' finished, bury it in Obscurity. Seeing therefore you finde me wholy averse to publish what has been already, *rightly* treated of by others; I hope my endeavours herein will be the more acceptable; and the rather because there are so many that have Writtin, even on the uncontreverted Mathematicall Science who might, (as Mr. Lilly[25] has done, in his treatise on that imaginary and imperfect Art of *Astroligie*) who might I say, have terminated their Labours, with a *Nihil dictum quod non dictum prius*; as haveing left the Science whereon they treated, but in the same state wherein they found it.

And since I have here, as well as in Section the Second, &c. taken Occasion to mention the said Art of *Astrologie*, I must beg leave, tho it be a digression, to show That 'tis even such, as I have Deemed it to be.[26]

And 1st That it is but imaginary is evident, in that it is founded on an imaginary, and invisible Influence, of the Planets and Fixed=Stars; of which, as is Shewn in the said

Section they are wholy destitute; and therefore cannot in the least affect us therewith: Whereas in other Sciences there are real and Visible objects, Whereby to demonstrate, the Rules and Propositions depending thereupon: As for instance, in the Noble Science of *Astronomy*, There are Instruments, and the Visible Bodys of the Stars; by the use, and Observations whereof, their Position, Motion, and Revolutions, are plainly Discovered and computed.

2^{ly} In Geometry and other parts of the Mathematicks, there are real and Visible Lines, Circles and Numbers, to Demonstrate the Powers, Proportions, and affections, that they bear each other. And 3^{ly} in the *Philosophicall* Science now before us, We have the Visible and tangible Phoenomena's in Nature, to guide us in our enquiries, after the Causes thereof; as also for the Inferences and deductions [p. 10] drawn therefrom: But, in Judiciall Astrologie, ther's nothing but Arbitrary Rules, and imaginary Aphorisms, to Guide them in all their Enquiries: So-that if M^{r} Lilly had thought fitt, he might have changed, even the *Ptolomaick* Table, of the pretended Essential Dignities of the Plannets; by putting *Taurus*, for the day or night house of *Mars*, instead of Aries; for the like house of *Venus*, instead of *Taurus*; and so of the rest, at his pleasure: and accordingly their Effect or Influence, would be equally the same, to the Native or Quærent. For the whole art, unless what Relates to Astronomy, proceeds but from the Arbitrary Rules and Assertions, of their first, or procceedent Authors, as aforesaid.//

And 2^{dly} That the said Art is but *Imperfect*, is evident, Because that in, and near, 66 Degrees of N^{o} and S^{o} Lattitude (Viz^{t}) in *Norway Finland*, and the north part of *Tartaria* and other like places; the Art is as it were wholy Extinct; For if any Native be born, or any Question asked, at, or near the time of the *Suns* (or any other planets,) Setting from the 11^{th} of June to the 13^{th} of December. Or, at the *Suns* (or any Plannets) Rising; for the other halfe of the year; all the signes and Plannets, will be then and there in the First & Seaventh House, and all the rest of the Houses will be void and Tenantless: So that all the Astoligers in Europe, cannot Determine What Plannet, Such a Native, of Such a place is borne under; or what is Lord, or Lady, of the Ascendant; or any other, of their imaginary Houses: By which it appears, that the said Art is imperfect and Deficient; And in those parts of the world; even according to their own pretended Rules, wholy useless: as could be further demonstrated: But I must return.

Haveing already Shewn, That the Concurrent Testimonies of Authors, cannot be obtained, for the Confirmation of *new* Discoveries; I shall now proceed to Shew; that they are Needless, or useless, to confirm, or confute; what is herein [p. 11] Advanced. And first that they are Needless is evident Because, that which Relates to the Discribing, the Phænomena's imprinted in the Rocks, and Mountains, of the Earth; are in them so conspicious, that all persons may Satisfie themselves, of their being Such, and so posited as is described; even by Visibly beholding the Same: And as for that common *Phænomenon* in the waters, I mean the flowing of the *Tides*, it is so generally known and granted, That it would be, not only needless, but even ridiculous, to spend time to conform, that there is such a motion therein. From whence it is manifest, That Such Testimonies, are altogether needless, for confirming the Being, and Position, of the said *Phenomena's*. And as they are therein Needless, so they are also Useless, for confirming the Inferences, and Deductions drawn therefrom: For should we depend upon such Testimonies; to prove what we have assigned, for the *Causes why*; the *manner how*; and the *Time when*; those Characters or Symbols of Nature, were imprinted in the fixed parts of the Earth: Or *how, & where*, those in the Marine parts thereof (to wit, the Tides) are originially moved; I say, Should we endeavour to prove, what we have Advanced by Such testimonies; we should have spent time to no Porpose: For as we have already hinted, there are Such Diversity and Variety of Opinnions, concerning many of those Things whereof we have treated; That should they be enumerated, it would Seem to be; *Tot homines, quot Sententiæ*;[27] So that neither of them, how Learned Soever can be depended upon, for confirming or Confuteing what is herein Asserted.

For a Conclusion there=fore, Seeing it is manifest That Such Testimonies, are not only Uncertain; but even needless and useless: And forasmuch as what I have asserted was deduced and Established from the *Visible*, and *Tangible*, Phænomena's of Unerring Nature; My request therefore is; [p. 12] That what I have Written, may be Approved, or Rejected; but as it shall, or shall not be Warranted by, and from, the same Symbolicall Impressions from whence it was Derived; without haveing respect to the Opinion, of any Author whatsoever. And by *Such* a Tryall, or Examination, I doubt not of being Justified, in what is presented in the Following lines:

By yours[28]

July 1715

William Hobbs
Weymouth

The generating the Earth, &c.[29]
Sect: I.st

That fish=shells are found plentifull in the Earth as described in the figures hereunto annexed. That the matter of the Earth was soft and even, when the said shells were admitted thereinto. What the **Chaos**, or first matter was. An Account of the Generateing an animal; and that apply'd to the Animateing the Earth. Why Creatures differ in their shapes, and Why they were not all Orbicular.

WHEN. the Almighty *Creator*, formed Man after his own Image, tho' he did not endow him w.th that *perfect Omiscience* which is one of his owne peculiar Attributes, Yet he gave him Such a share of Knowledge, in his innocency; that he was then but a little beneath the Angells of Heaven: And if he had So continued might doubtless, with facility, have given us, an exact Account of the Works of Creation: But his disobediently Aspiring after Knowledge, defaced the Image of his Maker, enstamped upon him, and thereby, clouding his understanding, made his *Ignorance* dayly Increase with his *sin*; so that we have, now, no more knowledge of that great Work, than which God has been pleased to reveal in his secret Writing. Or else what by our investigateing, and prying into the Secrets of *Nature*, we are able thence to Collect; But the Account thereof in the Scriptures, being designed, to let Man know, That as he himself; So all things else,, had their *being*, from that one God which we are commanded to adore; And not to teach us *Phylosophicall* Systems of the Creation; or to fill us with *Metaphisicall* Notions of things Created:[30] the latter way, has, with Various Success, been followed by the most Ingenuous, and Inquisitive Persons of all Ages: Most of whom, tho' their Conceptions have been Deep and Regular; and their Methods and Reasonings, Elegant and Admirable; Yet by their not closely following *Nature's* foot=steps; have therefore Given us but lame Accounts, of its Operations; And more puzled us, with multiplicity of Idea's, than cleared our Understandings:

[p. 14] Now tho' I know my self in divers respects, very unfitt for Such an Undertakeing as has been thus attended; Yet haveing for many Years,[31] diligently Observed, and enquired into the Various *Phænomena's* of Nature; and from thence Collected the following Hypothesis; am the more willing to Communicate the Same; Because 'tis founded and Evidenced, *by* and *from*, such Observations and appearances in nature, as are even *Visible* therein; And therefore Subjected, to the Censure, or Approbation, of the meanest Enquirer: They being chiefly Such as these.

1. First That a multitude of Shells, (to wit,) of *Oysters*, *Musells*, *Cockles*, and severall Marine Productions, both in their Maturity, and some even in their Embrio, are dayly found in almost all the parts of the Earth; not only on, and near its Superficies; but also to the greatest depth we have as yet, been able to arrive: As is evident from the works of many Learned Authors;[32] and also to all Such, as shall please to enquire thereinto, from the said Productions, in the Volums of *Nature*.

II. Secondly, That these Shells, are not only dispersed in Loose Earth, and the less Solid parts of the Glob; but also in the hardest Rocks, as well of Marble, and Flints, as of other common Stones; and also in Chalk, Copperas=Stones; and all other Terrestriall Fossils;[33] unless Minerals, comon coals,[34] and Cornish slate, or Tiles; in which I could never yet see any; tho' I have diligently caught them, in the latter, in divers parts, of the South of *Devonshire*, and *Cornwall*; where the Deep Roads, do expose such Rocks to publick View, in many places, to 8, or 10. Foot in Depth, for Severall Miles together; besides the many *Quarries* that are there, to be seen. However, that they are not found therein; is not to be admired; if we consider, how unfitt Such black, and Sulpherious matter was, when fluid, either for the production of such Animals, or for their Sustentation when produced. But tho they are not found in these particular things; yet in the said Stones, and Rocks, and all other matter, before mentioned; They are nevertheless, immassed and incorporated, in such a plentiful manner, as that I have seen some stones, of 50. or 100. Tunns in Measure, to appear almost intirely Shells, or their Impressions;[35] And these lying in severall Beds or ranges of the Earth, to the depth of 60. or 100 Foot: And, on the sea Coast, as well some hundred feet above, as at, and under, the Waters; even for Furlongs, and sometimes, for miles Together. Being there, as well as in the Innland=parts, [p. 15] generally posited as in the following Figures is described. From whence we may inferr, as it cannot be denyed; That the Rocks or whatever contains those Shells, or their Impressions; were, at the time of Receiving them, of a *thin, soft, fluid, substance*; And that the hills and Mountains, wherein those Shells are now found, were not raised, till *after* the said shells were immassed and mingled therein; (see Prov. 8: 24: 25)[36] And this is plain because the earth being *soft* it must therefore *then* be smooth and even; Tho' it is since condenced and hardned into Clay, Stones, Mineralls &c; and the Mountains and hills raised, as we now behold them.

III. Thirdly, That the body of the Earth, dos now, consist of Severall Beds or Ranges of Clay, Stone, Mineralls &c. Runing alwayes exactly *parrellel* to each other As in Fig. 1?[37] The bed or stratum of Clay D.D. is parrallel to that of stone E.E. and that again parrellel to F.F. and soe of the rest, as the Figure, do plainly intimate; which I desire may be well noted, as being a principall Thing herein to be considered.

IIII. Fourthly That tho' these stratas are *parrellel* to each other, Yet where Hills are raised they are not parallel to the Horizone, but do sometimes cutt the same Angles of 20. or 40. degrees, more or Less as is plainly intimated by Fig: 3.[!38]

V. That is they run parellel to one side of the hill, (as the Side A.A. Fig: 3.[d]) then the other side A.B.C. is butted against by the *Ends* of those Beds which are shuting out against the Surface of the Hill, as at A.B.C. aforesaid. And that it is thus Scituate, is *visible* to all persons travelling in any hilly Country, where the Roads are washed into Hollow-wayes; unless perchance, at the time of the Raising such hills; or since, some of them have *accidenttally* fallen from A. towards B. and remaining in such a position have made them seem otherwise, But diligent Enquiry will convince, that their *naturall* Position is exactly parallel as described and accordingly they are generally found.

VI. That if the Elevation of an hill, is caused by an *equall force* at the same time; thrusting up *all* it's Parts alike; then in such hills [p. 16] the Beds do continue their naturall and primitive Scituation (that is) parrellel to the Horizone, and to each other; and their Ends coming or pointing forth, against the surface, on all the sides of such hills; as in Fig: 4.th [39]

VII. My last Observations, are *Negative* (Viz.t) First, that we can never finde, in any Hill whatsoevever, the Beds or stratas, to be equally parallel to *both*, or *all* the sides thereof; as described in Fig: 5.th but alwayes Scituate, as is before described in Fig: 1: 2: 3: & 4. and not otherwise.[40] 2.dly That the hills and Mountains of the Earth could not be formed as the matter *precipitated* as is commonly Supposed; Because if soe, the hills would be allwayes found posited as in Fig: 5.th [41] or else confusedly without order, as in Fig: 7.th [42] In neither of which Positions we never finde them; and therefore they were not so formed and raised; but were certainly thrust up, by some internall force, after the Matter was hardned as aforesaid. And seeing these things are the Basis, on which I build my Hypothesis; 'tis not amiss to add a word or two for their further confirmation.

First then That the Matter was *soft* when these Shells were immassed therein, is manifest, even from the very walls of our houses; for we all know that the hair and straw, that's found therein, must be mingled therewith, when it was soft and tender, and not afterward: soe in like manner, the mettle of which any Molten Stattue is made, must be *thin*, and *fluid*; when cast into the Mould: And the Wax alsoe, must be melted; before it can receive the Impression. All which being soe plain and evident, I need do no more, but leave it to the Reader to make the application.

Secondly, That the Earth was *Smooth* and *even*, and no Hills raised when these shells were incorporated therein, or mixed therewith; will be likewise evident, From what is Visible to common Experience (Viz.t) Because the hills and Mountains in which they are found, *are now* much higher than the Ocean, wherein such fish are Now bred; and being soe posited, 'tis naturally impossible, that the Water and shells should come up thither, for the latter to be [p. 17] immassed therein:

And therefore the Hills at that time, must of necessity, be noe higher than the Waters then were, or now are; as was before proposed. But to be more particular; we have an Instance in the Ile of *Portland*;[43] where, near the Surface of the Earth, and to the depth of 60. or 100. Feet, may be seen Thousands of stones, (some of 40. or 50. Tunns a peece) soe full of shells throughout the whole Mass, and some soe full of their

Impressions (only) as that it seems difficult to judge, how more shells could be mingled therewith, or Impressions formed therein: As appears by Fig. 2^d. from one of which, I delineated the Rock therein described.

Now whether from these considerations, it be not more Reasonable to conclude, That the matter of this Island (and soe of all the rest of the Hills and Mountains of the Earth) was, at that Time, (to wit) when the Shells were mingled therein noe higher than the Bottom, or at most, than the Surface, of y^e Water; Than it is to conclude that the shells, and water, were soe unnaturally raised 420. Foot (for soe much I found its perpendicular height) higher, than the greatest Tide or Flood, dos ever rise up to: You know the story, That the dirty Raffter in the Roof of the Barn, might *formerly* be down with the Cow, tho' the Cow, could not *then* gett up, to dung upon the Raffter: soe the Matter of the Mountains, could, and must of necessity, when soft, be even or Level with the Bottome, or at least with the Surface of the Water; tho' the Waters were never so high as the Mountains now are, since they were hardned, and raised; unless at the *Deluge*,[44] and then the Rocks were too hard to admitt them thereinto, as Will be fully evidenced, when we come to spake thereof.

And being describing the *Position* of the Bedds or Ranges of the Earth, there is one thing in these Observations that I have frequently thought might be of publique use, in the Digging of Quarries; or mining for coals, or Lead, &c.[45] And it is from Fig. y^e 3^d. In which if you suppose the Top of the Hill at A. to be 300. foot high And supposing at **G**. you should digg 130. foot deep (to wit) to 2.B. [p. 18] and there finde a Mine or Quarry. Now you see by y. said Figure That if you open the Earth but 3. or 4. foot, at B.1. (on the side A.B.C.) you will then be in the same Debth with respect to the side of the Hill **A.G.A.** as you were, when 130. foot under ground, at **G.**2.**B**. And very probably you will there (to wit) at **B.**1. meet with the *same* Quarry or Mine, as at **G.** when at the debth aforesaid. And soe in like manner, that which is Level with the Horizone, as at **C.** and A. is nevertheless in respect of the side **AGA** above 300. foot Deep at **C.** tho it be there, but the very surface of y^e. **H**ill, and Levell with the **H**orizon as aforesaid.

Haveing thus described the figures, and also drawn and confirmed the Inferences, I shall Add these few naturall Propositions; as Postulata's, to the following Discourse.

I^t All Matter being without life, or not Modified or imbodyed; is now, and at all Times, in its *Caotick* Estate only; and is to be soe deemed and taken, untill it is assumeing, or hath assumed, a Life, either *Animall*, *Vegetable*, or *Minerall*.

II. As no Animall or Vegetable, can naturally be generated, but from *Caotick* matter only; so neither can they be Sustained; but by and from the same.

III. As all *Matter*, by Generation & vivification, dos cease to be Caotick; soe all Bodyes, by Mortification and putrefaction, are thereunto again returned.

IIII. As there can be no Life continued, without a *Regular* Motion; soe there can be no Motion, without more or less degrees of Heat; and as heat and motion, are

Inseperable; soe is that which is produced by y^{e} violence of Excess of Motion, (Namely) Fire, and light.

V. As no *Gross* or Fixed matter, (only) can admitt of Intrinsick Motion; soe neither can any *Thin* or *Fluid* matter, (only) admitt of any regulated Motion; Therefore all animated Matter; (or Bodyes) doe and must (besides the Active part) consist of *fluid* and *fixed* parts; the first to admitt of Motion; and the latter to regulate y^{e}. same.

[p. 19] **VI.** As the Naturall Motion, that is *continued* in a liveing Body, is the same in kinde, with that which give^{n} i'ts *first* forme or Modyfication: soe that which gave it i'ts first forme must needs be of the same kinde, with that which is *continued* therein, for its Subsist:^{ance} or Sustenta:^{tion} y

VII. As all things in the *Chaos* (as shall be afterwards manifested) were thin and fluid, soe being imbodyed, that universall body, must consist of some parts more dense, and others more fluid, or rarified; And as the coagulated and uncoagulated, doe make the *Lactea Materia*; soe the Dense and fluid, or the Celestiall and Terrestriall orbs, and transparent Æther, doe make or constitute, y^{e} whole universe, equall to the *Chaos*, Nothing can be added *to*, or taken *from* the prima Materia, for it can only be converted or discriminated, into matter or Bodys of different Denominations.

VIII. As all *Putrefaction* is but a Languid and gentle Fire, so all Fire is but a more swift and violent Putrefaction; y^{e} end of both being to seperate y^{e} three principles of Matter, in order to fitt them again for Generation.

IX. As the Cloudes, or any other Chaotick Matter, cannot imbody itself into Vegetables or Animalls, whilst it is *moved* by y^{e} Air &c. but must be at rest before it can putrifie, and become of a Viscous Nature, soe neither could y^{e} earth and plannetts &c. vivificate, untill they had taken up their Centre of Rest; and become Viscous and Mucilaginous likewise.—

X. To Sume up all in Brieff; All matter in its Forming is divided into these three grand, or Universall Principles (viz^{t}.) *Mercury*, *Sulphur*, and *Salt*, or Active, Passive, and Fixed, or Musculous Matter;[46] of which the *Active* part is allwayes Inclosed within the Interiour Part of the Body Animated; and doth Naturally consist of an Intrinsick self=moveing, varifying and condensing, or dilateing and contracting Nature; by which, it is capacitated, to act upon the fluid or passive part thereof; soe that the s^{d}. active part can be no less than the life, Spirrit, or soul of that body wherin it is inclosed as is [p. 20] evident by the Motion of the heart whence life, or the circulation of our Blood, is produced. I might add many more of this kinde but designing Brevity shall proceed.

Haveing thus premised and intimated, from what Terrestriall *phænomena's*, and philosophicall *Postulatas*, the ensueing discourse, is drawn and Established; I now come to consider, what that Materiall substance was, whereof the Heavens, or at least the Earth, were made; and of what it did Originally consist; according to the words of *Moses*, and our observations in naturall things to this Day.

By the account then which *Moses* has given us of the *Chaos*, or first matter, it plainly appears, that it consisted only of *Water*,; for he tells us, "That the spirrit of God "moved upon the Face of the waters; and God divided the Waters, from the Waters; "and that he separated the waters, that were under the Firmament; from the Waters, "that were above the Firmament; &c, Gene: Chap: 1.[47] And that this has also been the "Opinion of divers Philosophers, is also evident: In particular, from the words of *Basil* "*Valentine*, in his last will and Testament page: 95.[48] in which he tells us, That God hath "made the first seperation, according to his Word: "The Spirrit of yᵉ Lord, moved "upon the *Waters*; The whole Elementall Body, hath been *Water*; But the spirrit of the "Lord *Zeboath*, hath divided it, and fashoned the Earth, from the Mudyness of the "*Water*; And therein all Metalline Fruits, that ever were created, and generated under "ground. All These were first *Watter*, and may be reduced again to Water: All other "Creatures, be they Animalls, Vegetables or Minerall, are produced from yᵉ first Water "&c.

Seeing then it is evident as well from these testimonies, as from the Pænomena's now Visible in the Earth, That the Matter thereof (as has & will be manifested) was at first soft and Fluid: And since *Experience* confirms what is asserted, (Vizᵗ) That all things may, by a proper Calcination, be converted again into Fluidity; We may therefore reasonably conclude, That the first Created Matter or Substance whereof the Heavens and the Earth, and all things therein Contained, were made, Was not from seeds, or Solid Attoms of different weights &c. [p. 21] But from a *Similar, Rare, and insiped Liquor, or Water*; consisting of a Vast and incomprehensible Orb, as to its form and Quantity; and of a Crude Lifeless or indigested Nature, in respect of its Quallity. And as yᵉ simple Water of a Cloud, dos to this day, potentially Contain the Bones, flesh, Forme, Substance, spirrits, and senses; of all *Animalls*, and *Vegetables*, thence produced; soe this first Chaotick Liquor, did potentially containe, all the *Cælestiall* and *Terrestriall* orbs, and other Created Bodies, of what nature or kinde soever; which matter being by *God* the maker thereof, imprincipled with an indispensible Nature, Faculty, or Power, of imbodying or Animateing it self; it did by virtue thereof; *first* Engender and begett therein a Germinateing Heat, whereupon *Motion* ensued; and from thence proceeded a Secretion or discrimination of the *prima Materia*. And to Illustrate our meaning herein; This Seperation, (as it relates to the whole Chaos or Universe,) may be resembled to *Milk* actuated by any acid Quallity; which will thereupon, (by ascending & descending,) soe divide or Seperate it self, as that one part will become more *Opake*, and *Gross*; and yᵉ other more *rare*, and *transparent*; as by the **VII**ᵗʰ Postulatum is more fully declared; To which Job, in Chap: 10.V. 10[49] rightly alludes when he spakes of the Generateing of that Animall which is yᵉ Epitome of the whole Creation.

And as this Germinateing Heat, attained greater Power, and Energie; according to the Process, of Naturall Heat, and Motion; it formed and disposed those discriminated

Parts of matter, whilst fluid, into such Globular shapes, as doe spontaniously result from all Suspended Liquids; (as may be evidenced by throwing a Bason of Water into the open Air; from whence many hundred Globular Sphers will be instantly produced,) and from thence Namely, from y^e s^d propensity in all fluid matter, the Bodyes of the Earth, Sun, Moon, and Numberless Host of Heaven, Attained their Naturall, and most selfsubsisting Formes of *Roundness*; of which we see them Universally consisting unto this day: Being also disposed, and suspended in [p. 22] that Transparent, unmoveable, Cristalline, and imperceptible *Æther*, or remaining Water; which fills or posesseth, all that Vast Roome or Space, which the said first matter occupied or possessed, before y^e separation was made; as may be inferred from the former Similitude; for the Lacteall Matter, is the same in its Dimensions, *after* y^e seperation, or Discrimination of its Parts, as when promiscuously mingled together; as is also asserted in Propos: **VII.** beforegoeing.

But for asmuch as those *Cælestiall* Bodyes are too remote, for our Observation to Anatomise; and seeing y^e Process of Nature, in Generating y^e smallest Animall, is the same, or applicable, to that of the Greatest; I shall therefore proceed to what I chiefly intended, being more particularly to treat of this Globe of Earth whereon we Live. And supposing, (as we reasonably may) That at its first Forming out of the Grand Chaos; It did then consist of a round, smooth, opacous, Liquid, Forme & subsistance, (see Prov: 8. V. 24. 25. &c.)[50] I shall in the following lines attempt to shew, how it came to be generated, & converted into that Diversity of matter; I mean of stones, Rocks, Water, Cley, &c. into which it is now, so visibly Changed. And for the Foundation of my Discourse shall lay down this proposition (vis.^t).

That the Matter of which all things were made, being by the Author thereof impregnated (as aforesaid,) with a Vivifiyng or selfformeing Quallity; That Part thereof which was assigned, to constitute this Terrestriall Globe *whereon we live, was* generated *and converted into a Liveing Body; conformable, in respect of its* Vitality *unto that of a Liveing* Animal: *And that y^e Converting the said fluid matter;* into Rocks, Stones, &c. *was gradually carryed on, & accomplished, as the Body attained, its maturity and perfection.*

Now for the Illustrating and Explaining this Proposition I have transcribed the Generating of an Animall from *S^r: Kenelm Digby's* Treatise of bodyes, Page. 275;[51] that the same may be applyed to the Generating the Earth.

"To Satisfie our selves in the *Generation* of *Animals*, it were well (says he) if we "made our remarks in some Creatures that might be continually in our power, to "observe in them, the [p. 23] course of Nature every day &c. Which may be done by "meanes of a Furnace, so made as to imitate the warmeth of a sitting Henn."*. In

*. *I made my Observations more easie (viz.^t) By putting 8. or 10. Eggs under such a henn, and takeing thence one at a time.*

"which you may lay severall Eggs to Hatch; and by Breaking them at severall Ages, "you may distinctly observe, every hourly Mutation in them: The first will be that on "one side you will finde a great resplendent clearness in the white; after a while a Little "spot of red matter like Blood will appear, in the middle of that clearness fastned to the "*Yelk*, which will have a Motion of *opening* and *shuting*, soe as sometimes you will see "it, and Straight again it will vanish from your sight: And indeed at first it is so little "that you cannot see it but by the Motion of it; For at every Pulse as it openeneth [sic] "you may see it; and immediately again it shutts in such sort as is not to be "discerned—From this red Speck after a while, there will Stream out a Number of "little almost imperceptable red Veins; at the end of some of which in time there will "be gathered together a Knott of matter, which by little and little, will take the forme "of an Head; and you will ere long discern Eyes and a Beak in it: All this while the red "spott of Blood grows bigger and Solider, 'till at length it becomes a flessly Substance, "and by its Figure may be easily-discerned to be the heart, which as yet hath no other "Inclosure, but the substance of the Egg, But by little and little, the rest of the Body of "an Animal is formed out of these red Veins, which stream out all about from the "Heart; And in process of time, That Body incloses the heart within it, by the Chest "which grows over on both Sides, and in the End meets and Closes its self fast "together. After which this little Creature soon fills the shell, by converting into "severall parts of its self, all the substance of the Egg, and then Growing weary of so "Streight an Habitation, it breaks Prison and comes out a perfect formed Chick.

"To this may be added an account to the same Purpose, from the Works of the "Hon:ble *Rob: Boyle* Epitomized, page 73 (viz.t):[52] "That the Rudiments of the Chick, "Lodged in the *Cicatricula*, are nourished only by the White, till it becomes a great "Chick; the Yelk being reserved, as a stronger Nourishment, till the white is spent; and "then the Chick is able to digest it, and in Effect the Chick seems to be furnished with "Head, Wings, Beak, and Claws, before the yelk is touched, Lastly (says he,) it is not a "Little to be admired, that so *soft* and *similar* a Liquour as that of an Egg, should be in so "short a time, changed into a Chick, endued with Organicall Parts, of different "Fabricks, and, Similar ones, different in Feature very much one from the other &c.

Now that it may not be objected that these Changes and Pulsations, are wrought in the matter of the Egg, by means of this artificiall way of hatching, or by any Virtue derived from the hen, when therein Enganged; any otherwise than only by the applycation of heat thereunto; It is to be noted that the same Operations, are wrought in the Eggs of an *Ostrich*; which being by them laid in the Sand and warmed only by the *Heat* of the sun, is as naturally hatched, as any Eggs under any Fowle whatsoever. I shall therefore in the ensueing Discourse, mention the Ostrich instead thereof, and shall conclude this head, with a short Relation of what, I have my self further Observed (viz.t)., *That in the spring and summer seasons, near y.e sea shore, there is frequently found, a certain matter or substance called, in these parts by the name of Bulls; much like y.e White of an*

Egg in Taste and Colour; and in Bigness, about the Breadth of a mans hand, in Forme Circular, and thin on the Edges; but in the middle, on the uper side thereof, which is flatt, there appears as they float in yͤ salt water, a Circle somewhat whiter than yͤ said matter. This Circle I have seen to dilate and contract it self in a constant Motion; somewhat swifter than the Beating of our Pulse; But into what Body this matter is thereby Engendered, or Animated I know not; however it is not to be doubted, but some sea Animall or other, is thereby, Especially, at such a season produced.[53]

Haveing given you an Account, of the *Generating*, [p. 25] *Oviperous and other Animalls*, and indeed therein of the Generating all other Animated Bodyes whatsoever, for as certain as the least line BD. ffig: 6ᵗʰ[54] is equall in Power, to the greatest Line A.C. (see Eu: li: 3. pro: 35.)[55] soe certain it is, that the *least* Animall, is Equall, in its self=moveing, self=preserveing and self=Multiplying facultyes, as the *greatest* Animall whatsoever, I say, haveing thus done we will now proceed to apply the Same to yͤ Generating the heat and motion, within the Body of the Earth which we told you was vivified with a Life resembling that of an Animall; whose *vitallity* we all know, dos principally consist in yͤ Motion or circulation of its fluid parts; as the Effects of its internall Pulsation.

Now inasmuch as yͤ Earth, is one of those Bodyes, that were Generated without yͤ applycated heat, or Assistance of any other Naturall Body; It will therefore follow, that she must by the infused plastick Power before mentioned, accomodate herself, with such an intrinsick Heat; or otherwise it could not *Naturally* (for we are only so speaking) be Quickned and Vivified, as is before proposed And that such liquid, indijested, or unanimated Mater, will gradually Engender and produce, such an intrinsick Heat and Motion, is Evident from all Mucculent or Slimy Filth, whence wormes and Vermins are to this day, frequency Engendred; as also from Worts or Beer (though cold) put together in a Guile=Tunn; and moreover in Stacks, or Reeks of Hey, which are thereby, Sometimes, burnt to Ashes.[56]

Now this gentle Heat, and therewith Motion, being (Like the said Moving speck in the Egg) Engendred in the interiour Part of this liquid Globe; it had the same Effect thereon which is common in the Works of *Generation* to this day; (viz.ᵗ) to Discriminate, and Conjoyne; the three then promiscuous parts of matter, to themselves respectively; for although this Orb, was at first (as is said) somewhat like the Water of a Cloud, which to Appearances, seems of one homogeneall Nature; yet after it had lain Brooding or compressed together, and [p. 26] thereby Engendred the said Heat, and Motion, it did there=withall, not only Viscate, and Coagulate; but also Segregate Discriminate, and Dispose; the *Active*, *Passive*, and *fixed Parts*; that are potentially inherent in all such Matter, (according to the **V**ᵗʰ and **X**ᵗʰ Aphorisme before mentioned) in manner following; (that is to say,).

Those that were coagulated and Converted into **Fixed** particles (i.e.) stone &c. were disposed, and transposed, in such manner as to Give Shape and forme, to the

Exteriour and interiour parts of the Body of the Earth; (being then in its Generating or Animateing Estate).

Those that were by Nature, designed for yᵉ *Active* part; were collected and transposed in such sort as to Constitute the Cordious part, or (if it might be soe called) the **Spirit** or Soul thereof. And at yᵉ same time, (for the universall or constant process of Nature, is to carry on the forming of all the parts of an Animall together,)

Those that were designed for the *Fluid* or *passive* part; were so disposed of, as that yᵉ Active part might give a regular Motion thereunto; Which being fully Effected the Body was compleatly Animated. And this will further appear by duly considering the aforesaid Example of Hatching the *Ostrige*; For as the Naturall Heat of the *sun*, Begetts an internall Motion in the Glutenuous matter of the Egg, which formes the heart, and therewithall the whole Body, with a *Cavity* wherein the heart may Dilate and contract it self: soe in like manner, the Motion that was Generated in the said Orb, did convert, transpose and conjoyne, the said conglaminated matter in such sort, as to forme this Independent Body of the Earth;* with a sphericall Cavity whereby the Active or Cordious part, might be capacilated to Pulsate; [p. 27] and retexerate the then whole *fluid Mass*, and thereby Vivificate or animate the whole Body; as before asserted. And truely were there not such a Cavity gradually formed; there could be no Motion, and Consequently no Life. For if the Body was (according to the 5.th Postulata,) All Solid and compact, there could be no *Dilation* and *Contraction*; which are the only Symptoms of Life, in all animated Bodyes whatsoever.

But to be more particular as yᵉ said viscous Matter of the egg, is converted into *Bones Flesh Sinues* &c: And the yelk into the *Bloud*; soe in like manner, part of the liquid Matter of the Earth was as is said, converted into a viscous Substance, and afterwards turned into *Cley*, which in process of Time, was hardned into *Rocks*, *stones*, *Flints*, *sands*, &c: which constitutes the Fixed or exteriour Part, or Forme of yᵉ Earth; as is intimated, and Sett forth in the Foregoeing Figures and their Descriptions; One other part thereof, was congregated or converted into a *Cordious* Active matter, and was disposed of, as aforesaid. And the third part thereof was converted into *Passive* Matter; being that which to this day constitutes the salt fluid *Ocean*: And that the Ocean is only passive, and not selfmoveing, is evident; in that, if any Lake or other Quantity, be seperated therefrom, it has no more power to move it self, than any Dead or Lifeless matter whatsoever; as is evident by the *Caspian* sea, and other Lakes. And now we are speaking concerning the disposing of the different matter of the Earth: It is to be noted, that it was not according to the strict Rules of Specifick Gravity,[57] as many in times past, and of late, would have it to be; For if soe yᵉ Minerall and most ponderous

* I call that an Independent Body which is generated of an Orbicular Forme, and is not radicated in any other Body, Nor doth depend upon any food for its subsistance; yᵉ contrary may be called dependent Bodyes.

Matter, would have been next unto, or used for; the Seiling, of the Sphericall Cavity in the Earth; and consequently, would have been soe deep in it, as that we should never have known what Gold, Silver, or Brass had been. But for=asmuch as dayly experience shews; that Bedds of Chalk, are under Bedds of stone; and Bedds of Chalk, Cley, Sand, and [p. 28] stones; are under Bedds or Mines of Lead, Tin, silver &c.: I hope there is no Roome for such Notions, as are so visibly confuted. And therefore we may reasonably conclude that the said matter was disposed and conjoyned according to the Course and Process of Nature, used in generateing the *Ostrige*, or in the forming of any other Animall; as before porposed. But perhaps it may be objected; That if the Earth, be an *animated* Body; why was it not converted into *Veins, Leggs, Bones, Members* &c: as well as other Animalls.[58] To Which,

I answer, the Author of all Things, haveing made some creatures to be independent, or not needing the Assistance of other matter for their preservation, has therefore made such; of a perfect *orbicular* forme; and as it were Hermitically sealed up their Spirrits, or active parts, within themselves, for their perpetuall Preservation: But haveing on the contrary made other Creatures, soe porous; as that their Heat and Fluidity, are perpetually avapourating or flying away from their Bodys; (which renders them always needing a supply, for their preservation,) has therefore ordained, that these Avapourations, Decayes and Volitions, shall be supplyed and Compensated, by the Heat and Nourishment, a rising from the *putrefaction* of other liveing Bodyes; (or such like Matter,) in its being converted or turned into a Caotick Estate; and by the re=incorporateing or re=animateing, part of y^e same Matter again, into the very Essence or Existance of that Body whereinto, and whereby, such matter is Received, and Concocted. And this appears by his haveing formed Various sorts of Creatures, and furnishing them, respectively, with members, Caveties, and Capacities; for obtaining, receiving, concocting, and converting, such Bodyes, or matter, to, and for, their own peculiar nourishment, and Procreation. And hence it is, that all Terrene Animalls, and Vegetables; (being dependent Creatures) As they had their Generation, Life, and [p. 29] Being, *from* the Earth; soe they must also unavoidably have their food and nourishment, from y^e same likewise; but as these parts are thus necessary for the Existance, and support of those Bodyes; soe they are altogether as superfluous and needless, for such as are independent; as the *Earth, sun, Moon*, and *Starrs* are: And seeing he that is infinite in wisdome and Power, has made Nothing in vain, It cannot rationally be supposed, That he should make any thing, either to Long, or to short, deficient or superfluous; and therefore it would be absuridity in us to imagine, he should have formed the Earth with *Veins, Bowells*, Leggs &c. Because they are altogether needless in respect of its being, or future Sustentation: For if we should imagine her to have *Leggs*, Whereon should she tread? Seeing *the Lord hath Stretched out the North over the empty places, and hanged the Earth upon Noth*ing Job. 26. 7.[59] If a *Mouth*, whence should she receive food or whereinto should she eject it: and soe of the rest;

The consideration of which independancy, will lead us to see the naturall Cause, Why the Earth, and the other Orbs have that perfect Forme of Roundness; which they do so visibly retaine: But the *Cause* why the forme of all other Animalls, are soe different from yᵉ of the Earth; will more fully appear, if we compare the manner of the *Subsistance* of one Creature, with another; which may be done in this wise:

No common Animall can Subsist or receive nourishment from the Earth in *one* place only; As a Vegetable by the fall of Raine, naturally dos. But must remove themselves, to seek their Food in divers places; and therefore they are Variously furnished with parts, Members, and abilities; as their wants & necessityes, do Severally requir. And hence it is, That a *Worme* tho' in respect of its internall Heat and Motion, or Vitality is as has been said the same in proportion with the great ***Leviathan***,[60] or any other Animall; Yet the Roots of Vegetables, or the humidity of the Earth, being assigned for its food; and she also placed therein, [p. 30] is therefore formed without Leggs, or Whings, as being needless for obteyning its Subsistance. But oviparous and other Animalls, being such as are unable to subsist, in one place, or on any one thing; are therefore accomodated, not only with Leggs to Walk, but respectively with Wings to fly; as well for self=subsistance, as for self=preservation: soe in like manner, *Doggs*, *Woolves*, *Lyons*, *Hawks*, and such other Creatures, as are appointed to Live by Preying on other Animalls; have their Agillity, strenght, and Swiftness of Motion, proportionably assigned them. And as we thus finde, the Causes or Reasons of the Difference, in the Formes, and members of Creatures in generall, are only Such as theire Self=Subsistence, and Self=preservation doe necessarily require; Soe in like Manner we may find, That the Severall *Senses* (and the Degrees thereof, where with they are Soe variously furnished, is only on the Same consideration likewise; For if the Beasts of prey, had not *Sight*, and *Smell*, added to their Agillity, they could not obtaine Food For their Subsistance; nor distinguish what was fitt to be Eaten or what to be refused; From the want whereof, theire Species, would unavoidably cease, and be discontinued: and soe of the rest of the Senses. Nay this is also manifest, even from Man himself; who in Respect of the Forme of his Body, (he walking Erect, and his Head, tho' not his Thoughts,) raised So far from the Earth, is thereby the most unfitt of all Land Creatures to feed on Vegetables; and by the paucity of his Feet, the same, in respect of his Obteyning Animalls; and therefore to supply these Defects, he's soe admireably furnished not only with senses, common to other Creatures, but also, with crafty Wisdome and Knowledge; insomuch, that they are therein soe inferiour to him, as to become a prey, not only to his hungry Appetite; but also, many Times, to his *Shamefull* Excess and Ryott.[61]

[p. 31] And thus might we finde, the Naturall Cause of the *Forme*, *Members*, *senses*, *Wisdome*, *Ignorance* &c: of one Creature, compared with another; and also, that if they had (like yᵉ Earth) been formed perfectly round; they would not have needed or required any such Members, or senses for their Subsistance. But the Reason why they were not *soe* formed is because the liquid matter that produced them, (by its being posited in divers Lakes and Ponds upon the Earth, And not Suspended (as y^e^ Orbs are,) in the open *Æther*,) could not be Globular; and Therefore Nature generated them, with diversity of Shapes, and Magnitudes; according to the Nature and Quantity of the Menstruum, whereof they were Engendred or produced: As also with Self=moving powers; because *Locall* Motion is indispensibly necessary, for all Animalls, that are not orbicularly formed; as has already and will in Sect. **IV**. be more fully confirmed.

But though we have Shewn that *such* Members, Senses, and Faculties, are Needless, in the Body of the Earth: Yet the *Heat* & *Motion*, or Pulsation; as also the *Cavity* found in all Animalls; are so essentially necessary to the Subsistance of the Earth likewise; as That it cannot be a Living animated Body without them; We will therefore in the next place shew, that these Qualifications and Capacities, are to be found therein. But before we enter thereupon, It may not be amiss to Acqaint the Reader; That altho' we have frequently proposed, the Earth to be an Animated Body; Yet our principal design, was only to finde out y^e^ manner how, and when, the Shells, and other Marine productions, came to be immassed and mingled in the Rocks and Mountains thereof; As also what is the Originall or Naturall Cause, of the Flowing of the *Tides*: so that as, what we have intimated, in respect of the Earths being an *Animall*, is cheifly, to illustrate our conceptions, in Relation to the Said Enquiry: soe the Earths appearing to be Such, [p. 32] is but only as a Corollary, arising from the same Enquirie; and therefore what is otherwise Asserted, in relation to the premisses; may be granted as *true*, Whether the Earths being an Animall, be believed or rejected. But however this I must Assure You; That although I had Spent Severall years, in Contemplating and Reasoning, upon the said Phænomena's; Yet untill I had, (at a certain time, and place well remembred) clearly discovered the Body of the Earth, to be an *Animall*; I always found it impossible to conceive, how the Said Shells, Could, (without a Miracle,) be posited in the Rocks, and the Waters made to *Ebb* and *flow*: Though Now, not only the before mentioned *Phænomena's*, but all others, relating to the Earth, are, by supposing it to be an Animall, made plain and evident, and very easie to be accounted for: Seeing therefore, it dos so naturally, and unavoidably arise *from*, and depend *upon*, the said Enquiry; I should not speak the thing that is *right*, concerning the Work of *Creation* (Job: 42. V. 7.)[62] should I avoid calling it, what it so plainly appears to be; haveing then already shewn, that there is a perfect resemblance, between the Earth, and its Inhabitants, in respects of their Vitality, and Essentiall parts; I shall further Shew, that there is the *Same*, in respect of their Natures, and Productive faculties.

And in the first place, it is to be noted, That as the Heat, and Serous Sweat of the Earth; did naturally produce *Horses*, *Sheep*, *Swine*, *Doggs*, and other Creatures: So the like Sweat of Those Creatures do Still produce, *Fleas*, *Tiks*, *Lice*, and other like Animalls; . . . and Some of them (like the Earth), even of more than one Speices: And by the Same Analogie, no Doubt, but many of these lesser creatures do in like manner, produce and nourish others [p. 33] that are, to us, unknown and imperceptible.

Secondly, As the *Earth*, by its Sweat, (or what is thence produced), dos feed all Creatures, that did, or do proceed from it: So in like manner, the Said Animalls, do naturally feed and Nourish, all those that are produc'd by *them*, And as all those lesser Creatures, that are externally produced by *the* Sweat of common Animals are of different *Species*, from those by whome they are produced: So those *greater* Animalls, that were Externally produced by the Earth; were, and are, of a different *Speices* from the Earth: But those Creatures, that are now *internally* generated; by, and from, Such a *Menstruum*, as that by which the Earth at first produc'd the said greater Animalls; (Namely) By, and from, the same matter, that is by Nature Concocted and Assimulated, to *that* Body, By which they are to be produced; I say, These are always, (Naturally) brought forth, of the same species with the ***Producer***; and not otherwise. And therefore, as we have already Shewn, Why all Animalls were not formed Orbicular; so we may from hence further learn; That the Reason Why, they were not of the Same forme and *Species* with the Earth; was because they were Externally brought forth; and, if not wholy, yet perhaps, cheifly, by its own Serous Sweat only; and not by the Same numericall Matter of which its own Body was produced. And therefore it could not produce them, as is said, but of a *different* Species; altho' the producer, and Produced, were both of them, perfect Animalls: And this is Confirmed, from the Production of such Creatures to this day, (Viz.[t]) In that a *Flea*, is an Animall; tho' it be not a *Dogg*: And a *Dogg* is an Animall; tho' it be not a *Flea*; and the same may be understood of the Earth: For as the Earth's Inhabitants, are Animalls, tho' not shap'd, as *it* is; so the Earth, is an Animall, tho' not shap'd as *they* are. [p. 34] By which it is evident, That cōmon Animalls and the Earth are both alike, or Assimulated to each other; as before porposed.

And as they are thus Assimulated in respect of the productions Upon their Bodies; so they are likewise in those that are Radicated within their Superficies: For as the Earth produceth Vegetables and Mineralls, (to wit) *Trees, Grass, Coals, Lead, Tin, Sulphur,*[63] and other living and Growing Excresciences: So the other Animalls, do in like manner produce, *Hair, Nailes, Feathers, Hooffs, Teeth*, and other Excrescencies, Radicated in and upon their Body'es likewise; and as these Vegetables, and Mineralls, are perpetuated, the first of them, by their Seeds, to supply the Species of those that will perish through Cold or otherwise And the latter, (to wit) the Mineralls, by their Roots only; so the Hair, Nailes, Teeth, Hooffs, &c. of these lesser Animalls are perpetuated, (Not only during the Lives of the said Animalls, but even after Death,) only by their Roots, likewise. Because seeds, are altogether needless, and useless, to such Excresciences, as have *no* Menstruum provided for them, as the Vegetables and Mineralls have; nor being exposed to Cold; as aforesaid. From all which it is evident, That the Earth, and its Inhabitants, are Assimulated to each other, as well in respect of their Natures, and Productions; as in their Vitality, and Essentiall parts. I shall now proceed to speak of The Earths Internall Heat and **Pulsation** before proposed.

Sect: II[d].

That Heat, Motion, and Pulsation are in the Body of the Earth; as well as in other Animalls. Divers Arguments from Nature, Reason, and Experiments proving That the Moon hath not the least Influence over the waters: Nor any Planet (besides the sun) over any Terrestriall Animalls: As by a Register of the Tides, Kept by the Author, for above two years Successively; By which it appears, that they Flow in a Rogarithmeticall [sic] Motion, and not according to the Moon's: That the Flowing of the Ocean, is y[e] Cause of the Earths Rotation; and that That, is the Cause of the moons Revolution; illustrated by an Experiment. That the Moon has no attractive power over the waters. And that the Gravitating power, lately ascribed to her, when in her Perigæon, is but an imaginary Supposition.

IT appearing, by what has been Said, That the Earth cannot be an animated Body, without an internall *Heat and motion*, or pulsation; we Shall therefore endeavour to prove that -- those Properties or Quallifications, are to be found in the Earth, as certainly as in any other Animall; and the First of these to wit its internall Heat will appear *First*, From the hardned Cley and Rocks, that are Scituate at the Bottome of the Sea, and many hundred Fathoms deep in the Earth, where the Suns Heat, nor any other, but that of the Eath, can be pretended, to harden the Same. 2[d]: From the Sulpherous Heat, frequently occuring in Mines, and other Subterraneous Depths; as also from hot Baths, and the manny Sudden and constant Eruptions of Fire, which are mett with, in manny Parts of the Globe. But this Heat in the Earth being [p. 36] generally granted I shall not Spend time for Its Confirmation; butt proceed to what I cheifly intend; being, in the *Second* place, To Shew, That the Earth, hath an internall *Motion* or Pulsation; And though this is evident, from the **IIII**[th] *Postulatum* or Aphorism, (viz.[t]) because heat and motion, are inseparable; yet I shall attempt to prove it more fully, from the visible Effects it has in moveing the Waters in the great Ocean; and Shall, in order there unto, Lay down this Proposition; namely,

"*That the Ebbing and Flowing of the Ocean, called the* Tides, *is caused by the internall motion or Pulsation, always agitating within the Body of the Earth, or under the Ocean; And that it is, with Respect to the Earth's magnitude, in a naturall proportion, to the* Pulsing, *in the Bodys of all other Animalls; Which motion, as it is observed, in lesser, more swift; and in greater, more* *slow;* soe in this *vast Body of Earth, it pulseth only once* in 15: Days: *being (as the effect thereof approacheth on the Respective Coasts) then commonly called Spring=Tides: All other* Ebbings *and* Flowings *therein, being but only from the the [sic] Surge, or consequents, of the said fifteenth Days* Pulsation. *And this I propose to prove, both* Negatively *and* positively and.

First, **Negatively**. *That the* **Moon**, *is not the Cause, of the* **Ebbing** *and* **Flowing**, *of the* **Tides.**

Forasmuch as my chieff designe, in this Negative parts; is intended to unhing, an Antient, and almost universall Opinion; I cannot expect, but that the taske will be the same, with what is common to persons concerned in rebuilding antient Edeficies (to wit) prove more [p. 37] Labour to remove the *old* than to Lay the Foundation of the *new*; I must therefore begg leave to be more large on this head, than otherwise might be required. Now what this Opinion is, we cannot be ignorant; For we all know, Tis a common Notion *That because the Ebbing and Flowing of the Sea: (dos,* (as is pretended) *exactly corespond with the Motion of the* moon; *Therefore she is presumed, to be the only cause thereof.* Which I conceive to be more irrationall, than to ascribe the Motion of the *Moon*, to the Ebbing and flowing of the sea: and that, for these severall Reasons following.

First the *Moon*,[64] is by Astronomy found to be forty-five times less than the Earth; and but a Secondary Planet; and allowed to be of an Earthy Nature; and therefore destitute of any such ignious Rays as do usually proceed from the sun: And being but a *Sattellite* to the Earth, is therefore, (according to the Rule of the Major governing the Minor) more liable to be influenced by the Earth; if there was such a thing as Influence in any of the Orbs, (besides the sun,) than to be presumed the Lady Governess of the greatest Part of the Earths Superficies: And indeed of that part, which keeps it, from returning to its first *chaotick* and lifeless Existence, for Experience tells us, that if the Blood in our bodyes, be wholy stagnated; the Life is thereby fully extinguished; nay I would appeal to any rationall Person; whether it may not be more probably concluded that the vast Bodyes of *Saturn, Jupiter*, and the *Earth*, do give motion, to their respective Satellites, (of which the moon is the Earths') than that such small Bodyes, should Influence, or give Motion unto them, or any of such their essentiall Parts.

The second Argument is this, (Viz.) That the *Being, End*, and Effect, of all internall motion, in all animated Bodys; is appointed and appropriated to, and for, y. proper use and Subsistence of the *same* Body only. Hence the flowing of the sea, the pulsing of our Blood, the igneous Vapours or Rays of the sun &c. are necessary Effects of their [p. 38] internall Motion; and are peculiar to the use, and Subsistance of these Respective bodyes only; for the *Sun*, dos not Send forth his burning rayes on purpose to Vegetate the fruits of the Earth; as some may imagine; But as it is an Effect of its own internall, and ambustuous Nature; It being the Same to the *Sun*, whether the Spring or fall, dos, or dos not, correspond with his presence or absence; or whether his Rais, do or do not touch the Earth; (for there are as it were infinitly more that do not come near it; than those that are darted therupon as appears by Fig: 10:)[65] Soe in like manner; tis the Same to the flowing of the Sea; and to the Motion of the moon; whether they doe; or doe not correstpond with each other: And here it is also to be Noted, That altho' the Sun has Power (by insinuating its Rays, or rather ignious Vapours into the Terrestriall Waters) to rarifie it, even almost in a parpendicular Elevation, as is common in Raising *Watter=Spouts*, and Vapours both at Sea and Land; Yet there is no power or Influence in the *Sun*, (nor yet Volgarly ascribed to him) whereby it can in the Least, incline the Sea to Ebb, or Flow towards any point of the Compass whatsoever. And if the *Sun* that has Such visible Influence, to Exhale the Watter, in Such wise; has no power to cause the Ebbing or Flowing of the Ocean; How the *Moon*, that has not power to Send the least Ray of Ignious Influence upon, or to draw the least Vapour from the Earth; not to keep it up by Night, when the Sun in the Day time has rarify'd it; I say, how the *Moon* should have power, to move so vast a Body of water, is to me a seeming impossibility, and very unreasonable to beleive.

And as these things are very improbable, if not impossible: soe is also that common received Opinion of the Moons *attracting* the Ocean as the Load=Stone dos Iron; or as others; That the Waters do naturally move towards the moon. For the weakness of both these Suppositions, will plainly appear, by compareing the constant, and regular Influence of the *Magnet*, over the Needle; with what is falsely ascribed to the Moon, over the Ocean:[66] In which 'tis manifest. 1st That that [p. 39] *LoadStone* which will lift up, but half a pound of Iron, will if joyned to halfe a Dozen pound, hung by a string, or posited in Equilibrio, (as the Ocean is) will, I say, draw it which way you please; either backwards or forwards, or retain it, where you fix or posite the stone, (within its influence) and not otherwise. But the motion of the Moon, if compared with the Tides, will be found far otherwise, (Viz.t) to be one half, like *attraction*; and the other half like *Rejection*; For 'tis well known, The very Tides of Flood, do, as constantly, twice in 25 hours, runn up the English Channell, (and else where) as Swiftly, [from] that point of the Compass which the moon is on; as they do alternatly [towards it] whereas if the moon had any Magnetick Virtue, it could not admitt of such manifest contrarietyes. And as there is not a Similar Conformity in their Motions, in *this* particular; soe it dos as evidently appear, by the Waters of ye *Caspian Sea*: (which in Quallity, is like the Ocean, in saltness; and in Quatity, above 2000. miles, in Compass,) For if she had such Influence; or if the Waters did naturally move or Incline, towards the Moon; they would in that vast Lake; either be carryed round, or move themselves, to every point of the Compass, according as the Moon was posited: But instead of Such a Conformity, or Influenceing, there is not the least Motion found therein; (other than what is accidently given it, by the Winds) although the Moon be at full, or Change, or what other Estate soever. And what is here said of the *Caspian sea*, would be also found in *Pontus Euxinus* and the whole *Mediteranean sea*; were it not for the small connections, made by the *Streights* Mouth and the *Helespont*. Now that these (comparatively) small seperated Quantities, should not be moved, nor Influenced by the Moon; and, at the same Time, the vast Ocean, allowed to be agitated by her; can be no otherwise granted; than that the same gust [p. 40] of Winde, which can drive, the largest Vessell, has not power to move the Smallest Feather: Or That that Magnet, which has power to lift up a pound of Iron, has not power to take up a diminutive Needle: The Absurdity of both which dayly Experience manifesteth. And as to the great and vulgar Argument, (Viz.t) *That the Moon must Govern the Tides, because they do exactly correspond with her Motion*, (tho' I hope by and by, to convince those who have taken this upon Trust, that there is no such exact Correspondence between them;) Yet in the mean Time; I answear, that if there were such a conformity, it dos not thence follow, that the moon is the *cause* thereof; and to Illustrate the matter, Lett it be supposed, that an Ingineer at *Bristoll*, should make a pair of Chimes; soe, as to goe every Time, it was full sea at London Bridge: Another at *London*, should make a Clock soe, as to strike every Time, it is full sea, at the *same* Bridge; surely it cannot follow, from this Correspondence, that either of these Movements, had any Influence, or were dependent upon each other; but that they were Severally agitated by their own *respective* Causes: And the same may be understood of the Motion of the Tides if compared with the Moon: From whence I presume it dos plainly appear, that the moon, has no *magnetick* virtue, or Influence over the Waters, notwithstanding the said conformity if allowed: And tho this may be Sufficient, to convince some persons, yet, that a full confutation, may be given to this generally received Error; I shall also shew, that she has no *Soler=like* (or other) Influence whatsoever, by which she can in the least affect this Globe of Earth, or any part thereof; and in the first place, shall lay down this self=evident *Postulatum* or Proposition, (viz.t)

"*That* no Plannet *or* Fixed Star, *nor any other* naturall *Body whatsoever*, (*devoyd of* "*sense*) *can* influence *or* affect *another like Body; unless such Bodys, or their Atmosphers,* "*do actually* [p. 41] touch *each other: or else both of them*, do touch *some proper* "Medium, *that can convey the* action, *or* Influence *of one, of them, to the other*.[67]

Now that this Globe of *Earth*, not its Atmosphere, is not touched, by the Body of the Moon, or any other starr, nor by any of their Respective Atmospheres, (unless the suns';) and that the Sun's Atmosphere, is not a proper Medium, to convey any Influence, *to* the Earth, from any other Celestiall created Body; is what I purpose to demonstrate; and in order thereunto, that things may be plainly evidenced, I have, (as the Room would admitt,) Subjoyned a Scheme, in Fig: 10.th of the *Position* of the Planets, and the proportion of their Magnitudes, compared to each other; according to that naturall, and well approved System, of *Copernicus*; By which it plainly appears, That the Body of the Moon, tho' she be ten times nearer the Earth, than any other Planet; is nevertheless, allowed to be above 114000. Miles distant from it; And their Atmosphers but very littleless. For tho' that ot the *Sun*, is so vastly great as to extend from B. to A. in Fig: 10.th (viz.t) from its own Body, to the Body of *Saturn*, and perhaps much farther. Yet the Sublimations of the Earth, as has been, by *M.r Hally*, ingenuously computed;[68] do not extend above 45. miles in height: And the Moons, as by *M.r Huggens*, much less.[69] From whence it plainly appears, That y.e Body of the Earth, not its Atmosphere, cannot be touched by y.e Atmosphere of the Moon; nor by any other Planet, or their respective Atmospheres (unless the *Sun's*) and consequently they cannot, by reason of their remote bodily position, in the least affect, or Influence each other; as was before asserted.

I now come to prove, That the Sun's *Atmosphere*, is not a proper *Medium*, to convey that which is called the Influence of the Cœlestiall Orbs, to the Body of the Earth. But in the First place Lett us explain, What is to be understood, by what is Vulgarly called ***Influence***,[70] and to ***Which***, there has, in all Ages, been so Secret, and so Occult Vertue ignorantly and falsly ascribed: Now to guide us herein we have the *reall* and *Sensible* Influence, of one of the Planets; namely, the *Sun's*; By which, if we rightly understand, what his Influence is; we may, by comparing it, truly finde out, what is meant, by that ascribed to the rest of the Planets.

The *Influence* then of the Sun, is, (in breiff) nothing but the ignious Vapours or Sublimations, arising from that burning Globe of Fire; which perpetually ascend from and, (like our Watry and Airy Vapours,) precipitates again upon its own Body.

Now inasmuch as this reall and Sensible Influence of the *sun*, is nothing but the said Vapours, & Sublimations thence arising; and forasmuch as we have Watry Vapours, in like manner, perpetually ascending from, and returning upon our Earthly Globe, (which in imitation of the Sun's might be called the *Earths Influence*:) And Seeing the Moon and the rest of the Planets, are found by Observation, to resemble the Body of the Earth; as well in their Nature, as in their Forme. What may be justly concluded from this Analogies. But that by the **Influence** ascribed to the Planets, we ought, (in a Word), to understand nothing else, but the Watry, or Firy *Vapours*, arising from their respective Bodys: Since then it is evident, that those Vapours, or Sublimations, must be what is meant, and to be taken, for the **Influence** of the Planets; And Seeing those respective Vapours, cannot, as aforesaid, touch each other; we will examine, whether the Sun's Atmosphers, be a proper *Medium*, to convey them to the Body of the Earth, or to its Sublimations. and

In the first place, it is to be remembred, That we have in the Scheme annexed, (See Fig: 10.th) already Shewn; That the nearest of the Planets (namely) the *Moon*, is by Scituation, distant from the Earth above 114000. *miles*; [p. 43] what is further evident, is from their Position in the Line ♄.♃ ♂ &c.[71] wherein it is to be noted, That if the Vapours, of any of the Plannetts, could be conveyed, by the Sun's Sublimations; yet those that belong to the Moon, (when in Opposition, to the Sun) as also to *Mars*, *Jupitir*, and *Saturn*, would, instead of being conveyed *to* the Earth, be carryed farther off from it; as the Ignious Vapours of the Sun, ascends towards the bounds of its Atmosphere, at A.A. &c. soe that there is only the Vapours of the *Moon*, *Venus*, and *Mercury*, (and those but only when they are in conjunction with the Sun) that can be pretended, to be convey'd to the Body of the Earth: For when the said Plannetts, are removed, but 4. or 5 Degrees, from the Conjunction; their Vapours, if conveyed, *in* the Said *Ætheriall* matter, would not touch, or come near the Body of the Earth; as is manifest by the said Diagram; where the Speck, or the planett *Venus*, is removed to the Letter D. in which position, its Vapours could not, in the least, be conveyed by the sun beams, to the Earth, to influence the same; and so of the ☾ when removed to F. as is before asserted.

But besides all this, 'tis very ridiculous to think that the Vapours of any of those Earthly Bodyes, if, even (when they were in a right line, as at **SE** in Fig: 10.th) should be convey'd or carryed, for soe many hundred thousand Miles, in such a different Sublimation, as the Sun's is: and after all, be brought back again, in the *same* Quantity, to their respective Bodys; (which must be done, or else such a Globe would be destroyed:) I say these Things are soe improbable, nay impossible, that they ought not any Longer to be mentioned or believed by us. Wherefore, for a Conclusion, I shall only acquaint, (as I am fully perswaded,) That the Sense of the *reall* Influence of the Sun; has, for want of the aforesaid, or a [p. 44] Like Examination, induced soe many, Wise and Learned, to believe; that there was in Like manner, a respective Influence peculiar *to*, and communicable *from*, the rest of the Planetts; and thereupon, the Moon (contrary to Nature and Reason) has, from time to time, been allowed, to be the Governess of the Waters of our Earth; and, (with the Rest of the Seaven,) foolishly and unreasonably, deemed the Authors, of the good or ill fate of its Inhabitants. But should we conclude, because this vast Globe of Fire (Viz.t) the *Sun*, (the proportion of which to the rest of the Planets is, in some sort, in the said Diagram exhibited) dos, at a great Distance, by its heat and Sublimations, Sensibly warme and Influence us; That therefore others, that are not only very Small, as by the said Scheme appeareth, but also Earthly and Cold, have Influence likewise; & do thereby affect us, at a like, or far *greater* distance; I say thus to conclude, would be, as if a Man should pretend to warm his hands at an Iron Bullet that is frigidly Cold, because he may do it, at one that is red hot; Which to Suppose, or effect, would be contrary to *Nature*, *sense*, *Reason*, and *Experience*; and therefore I hope this may Sufficiently evidence, that the waters in the Ocean cannot be Influenced, or agitated, by the Moon or any other, cold, earthly Plannett, or by any naturall cause or causes whatsoever; other then what is before and will be herein after Assigned.

And now I come to what was before proposed, (Namely) to Shew, That there is noe such *Correspondence*, between the Consequentiall *Tides*, and the Motion of the

Moon, as is Vulgarly pretended. And in the first place, tis to be noted, That because the dayly difference of the Moon's comeing to the South, (as by the common Tide Tables appeareth)[72] is 48. Minutes. Therefore they pretend, That the Dayly Difference from one Tide to another, is the same likewise—And *Secondly*, That on what point of the Compass soever the Moon is; when it is full Sea in any port; on her comeing to the *Same* point, and its *opposite*; She causeth full Sea [p. 45] again, in the same place, at all Times Both which I have found by observations to be utterly false; For on my apprehending the Moon, to have no power over the Waters, I kept the following Regester[73], of the Ebbing and Flowing of the Tides, (with some intermissions,) for two or three years Successively; By which I found the true *difference*, and Nature of their Flowing: Observing, with all, the point of the compas, or Azimuth, on which the Moon was at such times.

And, as to the *first* I allwayes found, That about Three Dayes after the new and Full moon, (it being then the greatest Spring=Tides; and not at the New and full, as is commonly reckoned) the dayly difference in their comeing (unless the Windes interupted them,) to be about 28. or 30. *Minutes* And, about three Days after the first and Last Quarter, (it being then the greatest Neap Tides) I allwayes found the dayly difference to be 90. 95. or 100. *Minutes* Whereas, the said difference in the Motion of the Moon, is 48. *Minutes* only: By which 'tis Manifest, That there is noe such Correspondence in their Motion, as is Vulgarly reputed: Neither can, as I humbly conceive, the said unequall differences, in the comeing or flowing of the Tides, be any ways accounted for, in the Motion of the moon: The inequality of which will more plainly appear by the following Register and by the Tide=Table from thence Æquated, and deduced.

A REGISTER

A Register shewing the Time of Highwater at Weymouth Bridge, kept by this Author, Anno. 1700 &c. To which is added, the time of the New, and Full, and other States of the Moon: to be compared therewith. Being the same from whence the following Table was Equated and deduced.

1700		Moons State	Full Sea Ho.	Full Sea min	Morning Afternoon
Aprill	14		10	30	mo
	15	☽ S mor			
	16		1	15	af
	17		3	00	af
	18		4	20	af
	19		5	33	af
	20		6	25	af
	21		7	15	af
	22	○ 7 m	7	57	af
	23		7	32	mo
	24		8	37	mo
	25		9	07	mo
	26		9	33	mo
	27		10	11	mo
	28				
	29		11	03	mo
	30	☾ 2 m	11	53	mo
May	1		1	07	af
	2		2	53	af
	3				
	4		3	0	af
	5		5	38	af
	6		6	30	af
	7	● 6 af	7	12	af
	8		7	52	af
	9				
	10		8	55	mo
	11		9	15	mo
	12				
	13		11	00	mo
	14	☽ 2 af	11	55	mo
	15		1	00	af
	16		2	26	af
	17		3	48	af

1700		Moons State	Full Sea Ho.	Full Sea min	Morn. Aftern.
May	18				
	19				
	20		6	45	af
	21	○ 5 af	7	30	af
	22				
	23		8	25	mo
	24		9	00	mo
	25		9	19	mo
	26				
	27		10	07	mo
	28				
	29	☾ S af			
	30		12	08	af
	31		1	56	af
June	1		3	04	af
	2				
	3		5	[illegible]	af
	4		5	55	af
	5		6	12	af
	6	● 2 mo	7	30	af
	7		8	[illegible]	mo
	8		9	[illegible]	mo
	9				
	10		11	[illegible]	mo
	11				
	12	☽ 5 mo			
	13		12	37	af
	14		2	22	af
	15				
	16				
	17				
	18		5	04	af
	19		6	45	af
	20	○ 6 m	7	30	af

A Register of the Tides.

1700		Moons State	Full Sea Ho	Full Sea Min	Morning / Afternoon
June	20		7	30	af
	½ 21		7	30	mo
	22		8	11	mo
	22		8	30	af
	23		-	-	-
	24		9	15	mo
	25		..		.
	26		10	22	mo
	27		11	00	mo
	28	☾ 10 m		.	
	29		12	08	af
	30		1	15	af
July	1			..	
	2		4	25	af
	3				
	4		6	08	af
	½ 5	● 10 m	6	48	mo
	6		7	55	mo
	6		8	00	af
	7		9	00	mo
	7		8	42	af
	8		9	27	mo
	9		10	08	mo
	10		10	45	mo
	11		11	58	mo
	12	☽ 1 m	..		.
	13		.		.
	14		.		
	15		2	58	af
	16				
	17		5	25	af
	18		..		.
	19	○ 9 n	6	55	af
	½ 20		7	15	mo
Omitted till August					
Aug	1		4	51	af
	2		6	00	mo
	2		6	22	af
	3		6	51	mo
	3	● 3 af	7	23	af
	4		7	37	af

1700		Moons State	Full Sea Ho	Full Sea m	Mor / Afte
Aug	½ 5		8	16	mo
	6		9	13	mo
	7		9	45	mo
	8				
	9				.
	10	☽ 11 m	11	28	mo
	11		-	-	
	12			-	
	13				-
	14		4	6	af
	15		5	00	af
	16		5	45	af
	17		6	30	af
	18	○ 1 af			
	19				
	20		8	15	af
	2 21		8	30	mo
	22		9	00	mo
	22		9	28	af
	23		9	37	mo
	24		9	45	mo
	25				
	26	☾ 7 m			
	27		12	00	noon
	28		1	45	af
	29		3	15	af
	30				
	31		5	50	af
Sept	1		.	.	
	½ 2	● 1 m	7	28	mo
	3		8	19	mo
	4		9	00	mo
	5		9	33	mo
	6		10	00	mo
	7		10	33	mo
	8		11	15	mo
	9	☽ 1 m	12	00	mo
	10		12	13	af
	11				
	12		3	30	af
	13		4	52	af

A Register of the Tides

1700		Moons State	Full Sea Ho	Full Sea mi	Morning After
Sept	14		8	45	af
	15				
	16				
	17	☽ 5 mo			
	18		8	00	af
	19		8	23	mo
	20		9	00	mo
	21		9	30	mo
	22		..	..	..
	23		..	..	..
	24	☾ 6 mo			
	25		11	53	mo
	26		1	37	af
	27		3	19	af
	28				
	29				
	30				
Octob	1	● 10 mo	7	15	mo
	2		8	07	mo
	3		8	45	mo
Omitted untill July 1701					
1701 July	3		2	00	af
	4		2	49	af
	5		4	10	af
	6		5	20	af
	7		6	15	af
	8	☽ 10 aft	7	00	af
	9				
	10				
	11		8	47	mo
	12		9	12	mo
	13				
	14		10		mo
	15		10	30	mo
	16		11	05	mo
	17	☾ 2 mor	11	45	mo
	18		12	15	af
	19		1	45	af
	20				
	21		4	30	af
	22		5	45	af
	23		6	30	af
	24	● 9 mo	7	25	af
	25		7	45	mo
	26		9	00	mo
	26		9	00	Af
	27				
	28		10	07	mo
	29		10	53	mo
	30		12	00	mo
	31	☽ 1 mo	12	30	af

1700		Moons State	Full Sea Ho	Full Sea mi	Morn After
Augu	1		1	17	af
	2		2	15	af
	3				
	4		5	17	af
	6		6	45	af
	7	☽ 5 aft			
	9		8	23	mo
	10				
	11		9	22	mo
	12		10	00	mo
	13		10	30	mo
	14		10	50	mo
	15	☾ 6 af	11	30	mo
	16		12	30	af
	17				
	18		3	00	af
	19				
	20		5	30	af
	21		6	21	af
	22	● 5 aft	7	05	af
	23		7	45	mo
	24				
	25		9	21	mo
	26				
	27		10	32	mo
	28		11	10	mo
	29	☽ 10 mor	11	42	mo
	30		12	30	af
	31				
Sept	1		3	25	af
	2				
	3				
	4				
	5		[illegible]		mo
	6	○ 5 m			
	7				
	8		8	30	mo
	9		8	53	mo
	10				
	11		9	41	mo
	12		10	12	mo
	13		10	30	mo
	14	☾ 7 m			
	15		12	15	af
	16		1	33	af
	17				
	18		5	3[illegible]	af
	19		6	15	af
	20				
	21	● 2 [illegible]			
	22		8	15	mo

A Register of the Tides

1701			Moons State	Full Sea Ho	Full Sea mi	Morning Afternoon
Sept		23		9	06	mo
		24		9	30	mo
		25		10	00	mo
		26		11	04	mo
		27	☽ 8 n	11	30	mo
		28				
		29		1	15	af
Omitted till June 1702						
June		25		4	37	af
		26		5	32	af
		27		5	57	af
		28	○ 10 m			
		29		8	00	af
	½	30		8	03	mo
July		1		9	17	mo
		2				
		3				
		4		11	00	mo
		5	☾ 11 my			
		6		11	51	mo
		7		12	45	af
		8		2	00	af
		9		3	30	af
		10		4	30	af
		12				
		13	● 10 my	7	00	af
	½	14				
		15		8	10	mo
		16				
		17		9	40	mo
		18		10	15	mo
		19				
		20	☽ 10 my	11	30	mo
		21				
		22				
		23		2	40	af
		25		5	21	af
		26				
		27	○ 8 mo	7	20	af
		28				
	2	29		8	15	mo

1702			Moons State	Full Sea Ho	Full Sea mi	Morning Afternoon
July		30				
		31		9	15	mo
Augu		1		10	00	mo
		2				
		3		10	40	mo
		4	☾ 5 af	11	15	mo
		5				
		6		12	35	af
		7				
		8		3	30	af
		9				
		10		6	05	af
		11				
		12	● 9 m	7	12	af
		13				
	½	14		8	52	mo
		15		9	30	mo
		16				
		17		10	35	mo
		18				
		19	☽ 3 m	12	03	af
		20				
		21		2	30	af
		22		3	57	af
		23				
		24		6	33	af
		25		6	49	af
	½	26	○ 8 m	7	15	mo
		27				
		28		8	25	mo
		29				
		30				
		31		9	40	mo
Sept		1				
		2		10	45	mo
		3	☾ 11 mo			
		4		11	45	mo
		5		12	30	af
		6				
		7		4	30	af
		8		5	33	af
		9		6	22	af

A Register of the Tides.

1702		Moons state	Full Sea Ho	Full Sea mi	Morn Aftern
Sept	10	● 6 m	7	00	af
½	11		7	55	mo
	12		8	21	mo
	13		9	08	mo
	14		9	45	mo
	15		10	30	mo
	16		11	10	mo
	17	☽ 10 m	..	..	
	18		2	30	Af
	19				
	20				
	21				
	22		5	45	af
	23				..
	24	○ 11 m	6	55	af
½	25		7	45	mo
	26		8	15	mo
	27		..	..	..
	28				
	29		..	..	
	30		10	00	mo
Octo	1				
	2		10	30	mo
	3	○ 4 m	11	10	mo
	4		11	00	mo
Ye flood [illegible] 4 Hours	5		2	45	Aft
	6		4	25	af
	7		5	06	af
	8		6	00	af
½	9		6	30	mo
	10	● 3 m	7	30	mo
	11		..		..
	12		9	00	mo
	13		9	30	mo
	14		10	22	mo
	15		10	50	mo
	16	☽ 8 m	11	15	mo
	17		12	15	af
	18				
	19		3	15	af
	20		5	00	af
	21		5	30	af
½	22		6	00	mo

1702		Moons State	Full Sea Ho	Full Sea mi	Morn Aftern
Octo	22 Full Sea at [illegible]bury at		10	45	mo
	23		..	.	
	24	○ 5 m	7	30	mo
	25		.	.	
	26		8	08	mo
	27		..		
	28		9	04	mo
	29		.	..	..
	30		9	42	mo
In ye West Bay near the Isle of Portland at —					
	30		10	00	mo
	31		10	48	mo
Novem	2	○ 7 m	12	07	af
	3		1	30	af
	4		3	30	af
	5		4	07	af
	6		5	30	af
	7		..	..	.
	8	● 1 af	..	..	
½	9		8	15	mo
	10				
	11		9	15	mo
	12		..	.	.
	13		10	25	mo
	14		11	08	mo
	15	☽ 9 m	..		
	16		12	15	af
	17		2	05	af
	18		3	35	af
	19		4	08	af
	20		5	15	af
	21				
	22				
½	23	○ 1 af	7	00	mo
[illegible]bury	23		10	25	mo
	24		11	35	mo
	24		..		
	25		8	15	mo
	26				
	27		9	08	mo
	28		10	10	mo

A Register of the Tides

	1702		Moons State	Full Sea Ho	m	Morn Aftern
	Novem	29				
		30		10	53	mo
	Decem	1	☾ 8 m	12	00	mo
		2		12	45	af
		3				
		4				
		5		4	30	af
		6				
½		7	● 11 n	7	30	mo
		8		8	00	mo
		9				
		10		9	30	mo
		11		10	00	mo
		12		10	30	mo
		13				
		14		11	15	mo
		15	☽ 2 m	12	15	af
		16		1	15	af
		17				
		18		3	30	af
		19		4	10	af
		23	○ 7 m			
		24		8	00	mo
		25				
		26		9	08	mo
		27				
		28		9	52	mo
		29		10	45	mo
		30	☾ 7 m			
	1702/3	31		12	15	af
	Janu	1		1	15	af
		2		2	30	af
		3				
		4		4	30	af
		5				
½		6	● 9 m	5	23	mo
		7				
		8		8	00	mo
		9		9	20	mo
		10				
		11		10	16	mo
		12				
		13	☽ 9 n	11	00	mo
		14				
		15		12	02	af
		16		1	10	af
		17				
		18		4	10	af

	1702/3		Moons State	Full Sea Ho	m	Morn Aftern
	Janu	19				
		20		5	15	af
		21	○ 11 n			
½		22		7	17	mo
		23		7	45	mo
		24				
		25		9	04	mo
		26		10	00	mo
		27		11	34	mo
		28				
		29	☾ 3 m	12	15	af
		30				
		31				
	Feb	1		3	52	af
	Omitted till March following					
	March	24		8	52	mo
	1703	25		9	15	mo
		26		10	17	mo
		27		10	47	mo
		28	☾ 5 n			
		29		12	00	
		30		1	30	af
		31		3	15	af
	Apri	1				
		2		5	40	af
		3				
		4		6	30	af
		5	● 4 m			
		6		7	48	mo
		7		8	30	mo
		8				
		9		9	12	mo
		10		9	30	mo
		11				
		12		10	45	mo
		13	☽ 8 m	11	45	mo
		14		12	30	
		15		2	30	
		16		4	07	
		17		5	15	
		18				
		19		7	00	
		20	○ 10 mo			
½		21		8	00	mo
		22		8	30	
		23		9	22	

A Register of the Tides

1665

Month	Day	Moons State	Full Sea Ho	m	Morn Aftr
Aprill	24		10	17	mo
	25		..	..	..
	26		11	34	mo
	27	☾ 1 m	12	30	af
	28		1	34	af
	29		3	30	af
	30		4	25	af
May	1		5	30	af
	2		..	..	..
	3		..	..	..
	4	● 9 n	7	29	af
	5		8	15	af
	½ 6		8	15	mo
	7		..	..	.
	8		9	02	mo
	9		.	..	..
	10		10	10	mo
	11		..	..	..
	12	☽ 11 m	11	15	mo
	13		..	.	..
	14		2	06	af
	15		3	27	af
	16			.	..
	17		5	30	af
	18		.	..	..
	19	☉ 7 m	7	18	af
	20		7	48	af
	21		..	..	.
	½ 22		9	..	mo
	23		.		..
	24		10	51	mo
	25		..	..	..
	26	☾ 11 m	.	..	.
	27		11	48	mo
	28		2	15	af
	29		3	30	af
	30		.	..	.
	31		5	30	af
June	1		6	08	af
	2		6	45	af
	3	● 11 [illegible]	7	15	af
	4		7	45	af
	½ 5		8	12	mo
	6				

Month	Day	Moons State	Full Sea Ho	m	Morn Aftr
June	7		9	15	mo
	8		9	33	mo
	9				
	10		11	15	mo
	11	☽ 10 m	12	19	af
	12		1	30	af
	13		..	..	..
	14		3	45	af
	15		4	33	af
	16		6	..	af
	17		7	04	af
	½ 18	☉ 1 m	7	45	mo
	19		..	..	..
	20		..	..	..
	21		9	51	mo
	22		10	30	mo
	23		11	15	mo
	24	☾ 10 m	12	..	mo
	25		12	45	mo
	26		1	15	af
	27		..	..	..
	28		3	31	af
	29		4	30	af
	30		5	35	af
July	1				
	2		6	45	af
	3	● 2 [illegible]	7	30	af
	4		.	.	..
	½ 5		8	45	mo
	6		9	19	mo
	7		9	45	mo
	8		10	30	mo
	9		11	[illegible]	
	10	[illegible]			..
	11				.
	12			[illegible]	[illegible]
	13		3	08	af
	14		4	30	af
	15			.	
	16		6	34	af
	17	[illegible]	7	45	af
	18				
	19		8	35	[illegible]

A Register of the Tides.

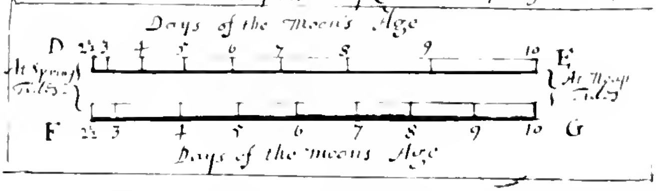
1705		Moons State	Full Sea Ho	m	Morn Aft
July	20		9	30	mo
	21		10	04	mo
	22		10	45	mo
	23		11	30	mo
	24	21	12	02	noo
	25				
	26		1	12	af
	27		2	15	af
	28		3	30	af

Note, The ½ Shews that the Difference must be reckoned for halfe a Day

Note, Also That the great difference, and sometimes the very small Difference, that is found in the Flowing of the Tides is accidentally occasioned by the Sudden Shifting of the Winds, By means [illegible] the [illegible] either hastened or retarded in their Motion

A Table of the Flowing of the Tides as it was found by Observations made An° 1700 1701 &c. in Weymouth Harbour by W. H				The Difference in the two Tables before and after each other	A Table of the Flowing of the Tides according to the Vulgar Account; or as if they were Governed by the Moon.			
Moons Age	Full Sea Ho	Full Sea Min	Dayly Differ minu	Minuts	Moons Age	Full Sea Ho	Full Sea mi	Dayly Differ minu
0 15	12		33	00	0 15	12		48
1 16	12	32	32	16 b	1 16	12	48	48
2 17	1	01	30	35 b	2 17	1	36	48
3 18	1	30	29	54 b	3 18	2	24	48
4 19	2	01	31	71 b	4 19	3	12	48
5 20	2	35	34	85 b	5 20	4	00	48
6 21	3	13	38	95 b	6 21	4	48	48
7 22	3	57	44	99 b	7 22	5	36	48
8 23	4	52	55	92 b	8 23	6	24	48
9 24	6	02	70	70 b	9 24	7	12	48
10 25	7	37	95	23 b	10 25	8	00	48
11 26	8	52	75	04 a	11 26	8	48	48
12 27	9	54	62	18 a	12 27	9	36	48
13 28	10	45	51	21 a	13 28	10	24	48
14 29	11	27	42	15 a	14 29	11	12	48
15 30	12		33	00	15 30	12		48

The difference or maner of their Flowing described by Lines, from Spring, to Nap Tides.



By the Line **FG** is shewn, ~~that how they ought~~ how the Tides would flow, equally) if they were Governed by the Moon.

By the Line **DE** is shewn how they do flow as is found by Observation, and experience By which it appears That the Difference in their Flowing, is in an Harmonicall Logarithmeticall proportion, and not in an Equall progressive difference, as has been Vulgarly accounted Which the dayly difference in the two last Tables, shews

By the Line F.G. is shewn, How the *Tides* would flow (to wit) equally) if they were Governed by the *Moon*

By the Line DE. is shewn, how they do flow; as 'tis found by Observation, and experience: By which it appears, That the *Difference* in their Flowing; is in an Unequall, *Logarithmeticall* proportion; and not in an *Equall progressive* difference; as has been Vulgarly accounted. Which the dayly difference in the two last Tables, [p. 55] from whence these Lines were Extracted, will also evidence; And will more fully appear by the following Explanation.

By these Tables, it appeareth, That when the *Moon* is 4. or 19. Dayes old, 'tis Full=Sea, according to truth or Observation, at 2. of the Clock and 01. *Minute*. But the Same Dayes, by the Vulgar account, at 3. of the Clock and 12. *Min: which is 75. Min: or 1. hour and 15. minuites Difference; as by* the Collumn between the two Tables appeareth; and so of the rest. And on the other hand, it is also to be Noted; That 3. or 4. Dayes *after* the New, and Full Moon; the Dayly difference in the comeing of the Tides, is about 28. or 30 *Minuites*, But about three Dayes *after* the first and last Quarter, 'tis found to be 90. 94. or 100. Minuites; as is before observed. To which the common Tide=Tables, ought to be conformed; That the disappointments, that may happen, for want of knowing the true State of the Tides, may be prevented. And that this is the *naturall* Motion of the waters, is the more certain; because a great part, of these Observations, were made in the year 1700. when by reason of the Dryness of that Sumer, the naturall Motion of the Sea, was not interupted by Windes, as usuall. Nor is it here, at any time, by any River: For this is very small, and riseth, but about two miles distant, from the sea=Coast.[74]

And as to the *Second* part of the Assertion, wherein 'tis Vulgarly Said, That on what point of the Compass Soever, the moon dos make ffull Sea, in any Harbour; on her coming to the *Same* point, and its *Oposite*, she there maketh full Sea again; This (as is said,) [p. 56] I have frequently found to be false, by two or three points at a time. But that which dos fully confute the said Error; is, That whensoever the *Moon* is said to be in the Latter Degrees of *Gemini*, and in a great part of the Signe *Cancer*, she dos then pass, from the *East*, to the *West* point of the horizon; in about 8. or 9. Houres; and from *West* to *East* again; in about 15 or 16 Hours; in our Lattitude; and farther South, she dos the like in 4. or 5; and in 19. or 20. hours: Now according to this Account, the coming of the Tides at such times, would be but 4. or 5. houres distance in one Tide; and 8. or 9. Ho: distance in another; which dayly Experience dos fully confute. The *comon* distance in the coming of the Tides, being allwayes between 12: and 13. Hours.

But tho' I observed this difference, in their *inter=meditate* Motions: Yet I found no such, in their Monthly *Revolutions*; For I alwayes Observed, That whensoever the Moon was about 3. Dayes past the full, and as many past the Change, (falsely so-called for she's at the Full, to a trifle, equally enlightned, (unless when Eclipsed,) at all times,) it was constantly the *greatest* Spring=tides; unless violent Windes interrupt=rupted the

Same; Now this Discord in one Part of their Motions, and conformity in the other, I confess, was for some time, the Subject of my thoughts; Till at last I considered, That the Waters in the Ocean; were, by the pulsing of the Earth, thrust farther off, from the Earth's Center; than otherwise it would be; From whence I Conceived That Such an Elation might naturally bring the Earth out of its *Equilibrity*; (tho I *then*, nor 'till Some years after, knew or conceived the *place* or places where [p. 57] they were soe moved) and thereby cause its Diurnall Rotation; as shall herein after be further evidenced. Which haveing I say, thus conceived I farther traced its Effects; And well knowing that the Earth, and the Moon; are both Suspended in the open *Æther*, or Sublimations of the Sun; and not fixed in any Grosser matter; I thence collected, First, That the Earth's Rotation, dos, (as experience confirmeth.) Give motion to its own *Atmosphere*—Secondly, That this Atmosphere, being (as is said) Suspended in, and enclosed by the Said *Æther*, must unavoidably give motion thereunto: And lastly, the said *Æther* being moved as aforesaid, and also touching the Body of the Moon, and she haveing no Rotation of her own (the Earth being the Center of her Orbit;) I say this Æther might, by the contiguty of its Matter, move, or draw round, the Body of the Moon, after the Earth; and thereby cause her, to make one Revolution, in the time that the Earth maketh 27 & $\frac{7}{24}$.[75]

Now seeing what is herein advanced, is, (I presume,) in some respects wholy new or at least, but rarely treated of; It cannot therefore be expected, I should confirm it by the Testomony of former Writers; Yet that I may not be found arbitrary in my Assertions; Will therefore Indeavour to prove them, by an easie and familliar Experiment: which in deed is what has too frequently been wanting in those who have Written on things of this Nature. As for Instance, one Author affirms,[76] *That the Earth at the* Deluge, *was broken into pieces, and the four Quarteres thereof,* raised *by the Tilting up of some of those peices*. Another Supposeth and Asserts, other things; [p. 58] But neither of them gives us any Experiment, to prove their Propositions; and therefore they may be, all of them, as well false, as true; For Speculative Notions, without practicall Experiments, or Visible Phænomena's, are not Sufficient foundations, for an *Hypothesis* of this kinde. I shall therefore by the following Experiment prove or illustrate the particulars before mentioned. And in order thereunto, it is to be Observed,

> *That if any* Gross Body, *be moved round, in any* Fluid Matter; *it will not only, give a like Motion, to the Said matter; But also move,* any other *Gross Body, swimming on or Suspended in the Same fluid; tho' it be posited at a Vast* distance *from the Body* first *moved.*

Now that this is true, will visibly appear, by puting a Round Tubb, or other like Vessell, into a Pond or Cistern of Water; Wherein if you move it circularly; or turn it but a Little time on its Center, as a Mill=Stone is (to wit) parellel to the Horizon; You will See the *whole* quantity of Water; as also my thing floating tho' at a distance in it, gradually, & naturally, to move Round therewith—In which, the Revolution of the Body so drawn round; will be in a just proportion to its distance from the Body first moved.[77] Which so exactly agrees, not only with the proposition above mentioned, But also with the worthy *Keplers* late Discovery (Viz.[t]) "*That the time Spent in The* [*p. 59*] *Revolution of the Planetts, are in a Fixt, certain proportion, to their Distance from the Center of their Orbit;* as that it even Demonstrates the same.[78] Now that the Earth has a Diurnall Rotation, is (especially of late years,) So generally granted; that I shall only refer you to the Post=Script, hereunto annexed, for its Confirmation. and

Secondly, That the Diurnall Rotation of the Earth, dos Give Motion to its *Atmosphere*, is evident; in that its Atmosphere, dos always turn round, and accompany the Earth, in its Rotation; and that even in all parts of the world; unless about 30. degr:ˋ on each side the *Equinoction*: and in that part too, in the Continents; where the Hills and Mountains Stand up in the *Æther*, to further the said Motion. So that the *Trade=Winds*, which are those that do not quite keep an even pace with the Earth, are only found on the Smooth Ocean, between *Africa*, and *America*, and thence to *Asia*; where, we know, there can be no Mountains Standing up, to interupt the Said Windes: or to Cause the *Atmosphere*, to turn with; and accompanny the Earth, as it dos at Land: And if you would have this turning of the Earth, in its Atmosphere; (whence the said windes are produced,) plainly represented, and illustrated by an Experiment; It is but to draw a peice of Board, or the Like, on the Surface of a Cistern of Barly when the water is first fill'd up, about 2. or 3. Inches above the Corne; or on any Shallow water, haveing Dust or Chaft Strawed thereon; And you may see the Floating Dust, turn in, on each side, as you draw it along; just as the Said windes do, on each Side the Æquinoctiall Line: [p. 60] And (if drawn from *West*, to *East*,) the waters will turn in on the Same points likewise; And by the uncertain or irregular rufflings, and Calmness, of the Wateres; at and near the End of the said Board; will in like manner be plainly Shewn; the Calms, and intermitting Concussions, of the windes; on the West Side of *Africa*, and else where; called the *Tornedoes*. And what is more, if Two Boards, be cut in the Forme of the two Mapps, (or rather, only of the Forme and breadth, of that part of them which is between the two *Tropicks*) and fastned, or joyned by two or 3 Wires, standing up, arching over the waters; I say you will, in drawing them as aforesaid, evedently see the Cause, Why the said Windes turns in, on the South side of the said Line, on the Coast of *India*; and not on the North: As also the constant Calms, that are found in those and other parts of the World. All which I have with pleasure beheld by the Said Experiment. And as the turning of the Earth, is the Cause of the said windes: so the very Being of these Winds, dos plainly Demonstrate the said *Rotation* of the Earth; For if the Earth did not so turn; it would be naturally impossible, that those Windes should be Produced.[79]

Now seeing it is evident that the Rotation of the Earth, dos so move its *Atmosphere*, (or at least that part which toucheth, or is nearest to the Earth,) as to cause it almost in all places, to keep an even pace with its own Body: And seeing it cannot be denyed, but that the fluid *Æther* or Sublimations of the Sun, dos touch and incompas the Earth, and its Atmosphere; and also the Moon & Her's, as by Fig: 10th appeareth: And seeing also, in the said Experiment, [p. 61] the fluid matter that toucheth, or is nearest to the Body *first* moved; dos almost accompany yͤ Same; Whilst that at a greater distance, will in proportion, move more Slowly: **How** can it be denyed from the conformity of those Motions, and the contiguity of the Said Ætherall Matter; But that the Earth, by its Diurnall Rotation, dos move its *Atmosphere*; and that this Atmosphere, dos move the *Æther*; and consequently That the said Æther, dos give motion to the Body of the *Moon*; altho', by reason of her Distance, her Motion is about 27. times Slower than that of the Earth; as is before observed—So that by what has been Said, I hope it is evident; That the Moon is so farr, from being the *Cause* of the Flowing of the Tides; as that instead thereof, the lifting up of the Ocean, (whence the Tides are produced, as will herein after be shewn,) is the originall Cause of the Motion of the Earth; And consequently, that the Rotation of the Earth, is the very *Efficient Cause*, of the Motion of the Moon: Which I presume may Suffice to Shew; why the *Spring*=Tides do agree with the full and Change thereof; as was before observed. I Shall now proceed to Some other *Pænomena's* that are Vulgarly said to be caused by the Moons pretended *Influence*: And herein shall instance only in three Sorts, because I conceive, that most, if not all the rest, may be thereunto referred, and the *First* shall be of *Lunacy* which by reason of its revolving with the Motion of the moon, as is pretended, may seem to be governed by her, and yet notwithstanding is not. The *Second* sort Shall be of Such as do really depend upon the Moon for its Cause, in respects of its *Light*, but not otherwise. And my *third* and last, shall be of Such as are not reall, but only imaginary or at best [p. 62] but uncertain Phenomena's.

And First, as to that humane Infirmity called *Lunacy*[80] we all know the Earth is the Mother or Originall of all living Creatures, man himself not excepted. And inasmuch as all Creatures, do generally resemble or partake of the nature of the Dam or Root, from whence they had their Being, whether they be produced of the Same or of another *Species* (as is manifest in the Smaller Animalls, bred by the Heat, and sweat, of Doggs and Sheep &c. The pulse or circulation of the Bloud, being the very same, proportionably, in the *lesser*, as in the *greater* that produceth them.) And Seeing there is in such persons at such times, as they are so affected; a greater flowing, or a different Motion, or Circulation of the Blood, than at others Seasons, or States of the Tides; it is but naturall and reasonable to conclude, That the cause of this Infirmity dos proceed from the said superabounding of the Blood, or of its motion, in the *Lesser* Animalls; at the same time, and in conformity to, the Like grand or Monthly fluxing of the Waters, in the *greater* Animall; I mean to the pulsing or flowing of the Ocean, at or near, the new and full Moon; upon which the coming of this Distemper, is said to depend: And, if soe, whether this inference; be not more reasonable & Naturall; than to allow the

Moon; at so many thousand Miles distance; to be the Cause of such a *Phenomena* in humane Nature; I leave the Reader to Dertermine; as also of all others, that may be thereunto referred.

The *Second*, is the Monthly increasing & decreasing the Flesh of Some Fowles; (and perhaps other Animalls;) which indeed at First, would seem an irresistable Argument; But [p. 63] when we consider That the *Heron*, the *Owle*, &c. (being those in which the *Phænomena* is found) are such Creatures as doe cheifly seek their prey by night; Tis no Mistery to conceive, that the *Light* of the Moon, when at and near, the full; should contribute to their more plentifull Feeding; as also That the *darkness* of the Nights, at the Change, should prevent them therein: From which vicissitudes, of Light and Darkness, their Bodyes must gradually, be increased or diminished accordingly: But nevertheless, the moon cannot be the Cause of this Phænomena; (other than by its reflecting the Light of the Sun upon the Earth;) for if soe, it may be as well said, that the Candle threads the Needle, and not the Man; or the Sun dos Catch the *Hare*, and not the *Dogg*; because they doe, in like manner; comunicate their Lights to the performance of these respective Actions.

The *third* and last Instance is concerning the Times and Seasons, that are esteemed propitious for letting Blood, cutting haire, killing Swine, and the like; to which, my Answear in generall is, That I presume they are only traditionall and groundless Imaginations; derived to us from the Antients, and not reall Phænomena's in Nature: And that the first is such, is evident from experience; For 'tis well known, that 'tis as Safe Letting Blood, when the moon is in the Sign *Gemini*, or in any other such fabulous* position wherein you propose to Bleed; as if she was opposite thereunto; or at any other distance whatsoever. But however for people to observe the full, and Change, in cutting of Hair, and the Like. I confess; may be very usefull; (tho' not in respect of the Moons Influence;) Because 'tis evident [p. 64] that the Constant, and regular cutting, and pruning of Trees, Herbs or other Vegetables, (which is the same with the Hair in an Animall) will Cause them, to take Root and flourish the Better: And in this Respects, a like *regular*, or constant observing of that, or any other Season, for cutting hair; may further its Growth and Increase; whereas by a careless Neglect; the Effect may be otherwise. But tho' this be So Yet inasmuch as we all know, that those Vegetables are produced, and nourished; only by the heat, and humidity of the Earth, (intermingled with the accidentall Sublimations of the Sun:) and knowing tis the Same with the Hair, in respect of the humidity and heat of the Animalls that do produce it; There can therefore be no Room for the *Moon's* pretended Influence: And as

* *I call them* Fabulous *because their very being, as well as their pretended Natures, are only feigned, and imaginary Institutions, or Astrologicall Impositions, and groundless Machinations: And were it not soe yet according to the Copernican System, now approved; it may as well be said, that the Clouds, when moved in the Air, doe pass from one sign to another, as it may be the Moon, or any the rest of the Planetts (as could easily be demonstrated.)*

Little Occasion, for observing her 30. Days Revolution: For the event will be the *Same*, if you Observe, but 5. or 6. and twenty; or 7. or 8. and forty, dayes Distance, in Such Cutting or pruning: as if you ahould keep exactly to the Revolution aforesaid. And as for the Seasons vulgarly appropriated for killing of *Swine*; I must acknowledge, I have soe little Esteem for *Lunaism*, that I leave it to Such as are Judicious therein, to finde out a Reason: Why one State of the Moon, should be more propitious, than another, for killing *that* Creature; and not for Cows, Oxen, Sheep, or other Animalls.

There is one other Argument that I would have omitted, had it not been lately urged against me; (viz.t) The Moon (says they) dos certainly govern yͤ Tides, because it Governs yͤ Fluxions in the Body of *Venus*, and her offspring: To which I answear, That 'tis rather an Argument to the contrary; And that, because tis Manifest, that 'tis only when Nature disposeth thereunto: For if you consult Madam—she can tell you that in 20. of them it will be found at twenty Severall Times, or States of the Moon; and not only at the new and full as is pretended: And that even [p. 65] in those whom you would deem to be one and the Same *Constell*ation or *Complexion*.

Thus have I attempted to Shew the invalidity, of all the old and vulgar Arguments, now accruing to memory, which are offered, to prove, That the *Moon* has *Influence*, over the Terrestriall waters; or over the Animalls that were thence produced: but yet I finde one other of a Fresher Date, which I cannot pass; For altho' Some of these Authers seem to lay aside the old Notion of the Moon's Governing y. Waters by a Magnetick Influence;[81] (which I was pleased to hear, in expectation, that between the two Stools, both Errors would have fallen to yͤ Ground) yet instead thereof, they affirme the same motion, to be produced or effected, by the pretended *Squeesing* or *pressing* power of the Moon,[82] which they would demonstrate by the following Observation; (viz.ᵗ) "*That heavy Bodyes, incumbent on the Center of their Gravity; the "nearer they approach thereunto; the more they Gravitate:* From whence 'tis inferred, That " when the Moon is in her *Perigæum*, or nearest to yͤ Earth; She dos press harder, (I "suppose on the Æther) than when in her *Apogæum*, or greatest Distance from it: And "soe consequently, according as the Degrees of Pressure is made; the *Tides* are either "Increased or diminished.

Now that the Bodyes soe approaching, may gravitate as aforesaid, when removed from their naturall position; I will not dispute; for 'tis very probable, that if one of the Rocks of the Moon at N. (see Fig: 11ᵗʰ)[83] could be removed thence towards the Earth, it would before it came to B. have the *Same* Inclination to the Earth, as to the Moon; and soe on the Contrary; And therefore at such a Distance it would precipitate more *Slowly* than in its nearer Approaches, unless when arrived to our [p. 66] *Atmosphere* where its grossness, would doubtless somewhat retard its motion: But tho' this Observation may be True, yet it dos not follow, that the Inference thence drawn, is soe likewise, For we See in other Examples, That *Erroneous Notions* may be derived from reall Phænomenas; As for Example, in the *Torescellian* Experiment.[84] The Pressure of a

Collumn of Air, being the Assigned Cause of the Rising and Sinking of the Mercury in the Tube; some will therefore Infer, That the Motion of the *Thorax*, and consequently our Lives, are owing to the Like pressure;[85] But that this is a groundless supposition, is evident from our Liveing soe long underwater, in those Sort of diving Engines[86] Wherein the Said Collum, and its pressure, is wholy interrupted whereby, if it were So, Death would imediately ensue; But we finde by experience the Contrary.

Another like Notion is that of Monsiur[87] when he traveled with one of the *Asian* Princes; wherein he pretends, with the Said Instrument, to Measure the Height of a very high Mountaine, or rising Ground, tho' it required Severall Dayes Journey to Ascend it: In which Time, 'tis well known; that the very Change of Weather might naturally Cause a great difference, in the Hight of the Mercury; and thereby render Such a Calculation very uncertain and Erroneous—And as tis thus uncertain, soe likewise needless; For by a Chain,[88] Or the Wheell of his Coach, and a Land Quadrant, he might have [p. 67] taken the *Hypothenusa*, and the Angle at the *Base*, and thereby have obteyned his desire, to a moral perfection. From which Instances as also from others of like nature, it is evident; that Erroneous Inferences may be derived from reall *Phenomena's*, we will therefore now Enquir whether the pretended *pressure* of the moon before mentioned be not one of that number.

And in the *first* place, I humbly conceive, That such a *pressing*, or Gravitateing Power is not to be found in any of the Celestiall Orbs; Specially whilst they are naturally posited, as the moon is (tho it may be supposed of Commetts, or of Bodyes occasionally removed as aforesaid:) And my Reason is, Because if soe, whensoever either *Saturne*, *Jupiter*, or *Mars*, should approach towards, or come in opposition to the *Sun* (which is their assigned Centre of Gravity,) they would then Gravitate towards the Earth, as well as towards the *Sun* (seing the Earth is at such times alwayes between the Sun and them; as will plainly appear by Figure the tenth; and the better if you turn up the Book, so as that *Saturn* may be at the top of the Said Figure,) Whereupon I say, if there were such a pressing Power in them, they would then cause Such great Tides, That we Should be induced to conclude; That the universall Deluge, was as soon after the Creation, as those Three Vast Bodys, (or but any two of them) came, in some proper Signe, to such an opposition of the sun; as is described in y^e^ Line **S.E.** in the Fig: aforesaid.[89] And if you would know what Signe that was; To be Sure the Scheme=Makers, will tell us, 'twas in Aquarius, or the water bearer; (tho' others would have it in *Gemini*), And some reconciling Naturillist, perhaps *D^r^: N.*[90] will [p. 68] refer us to the *Rainbow*, for the Reason why their Gravitateing power is *now* restrained. But how improbable, and inconsistent with Experience; these conjectures are, I leave to be determined by the judicious Reader; and proceed (2^dly^) To the Moons causing (as is pretended) full sea, when in her *Perigæum*, or nearest distance from the Earth: And this I conceive is not in the least to be regarded neither; for if you consult but a common Almanack, you may in one years Time, find her in that position, at all States of the

Moon; as well at the *Quarters*, as at the full and Change; and consequently if *that* was the *reall* Cause; it would accordingly be spring=Tydes; some times at the Quarters of the Moon; and again, at other times, at the full and Change; which common Experience dos dayly confute. Nay what is more, if there was such a pressing power as is pretended: How the *Apogæon*, and the *Perigæon* of the moon; should both produce, one and the *Same* Effect, (as by their account it must) is a self=confuting Mistery, as great, if not greater than the former.[91]

By what has been said, it may reasonably be granted, That there is noe such Gravitateing Inclination in the moon, or any of the Planets (whilest naturally posited) as is pretended: For if twa's; what should hinder them from executing their propensity? seeing the *Commetts* can precipitate, soe near the Sun without Interuption, as to be sett on fire by it. But however, that I may not seem to begg the Thing in Question; we will Suppose there is such a Nature in them as is proposed; Yet nevertheless, I conceive it is impossible, That the Body of the Moon should soe press the *Æther*, as to cause it to produce the Ebbing and Flowing of the Ocean: And that my Reasons for Such a conception, may the better appear; I shall lay down these two Propositions or Postulata's.

"First *if* two, *or more Gross Bodyes (of equall Magnitude,) doe move, or precipitate, in any* "*unconfined fluid matter*; The Quantity *of such matter, by them respectively moved, will* "*be in a just proportion, to the* Rarity, or Density; *of the Fluid matter, in which they* "*move.*

[p. 69] Therefore any such Body moving in *Æther*, or Air, will move many Thousand times Less in Quantity of those thin fluids; than if moved in Mercury or in Water.

"2[dly] *If any Gross bodyes should press down, or precipitate into any fluid matter*, confined, "or circumscribed, (*in a Tube or the Like*) *so close to all the sides, of what contains it,, as* "*to permitt none to press out; such body must then gradually give motion*, to the whole "mass *of matter therein inclosed, or Conteyned.*

Therefore (e.g.) If a Tube of Air (see Fig: 12.)[92] be 7. or 17. foot Long; and if but 5. or 6. inches be pressed down at the Top: That pressure will affect and give motion to the whole: Because the Air, or matter therein contained, will gradually seek to restore an uniformity, in its consistency.

Now to explicate these Propositions It is to be noted: *First*, That the proportion of Air to Water, is found to be, as 840. is to 1.: soe that if 840. Gall: of our *Gross* Air, be condenced; twill make but one Gallon of Water; and if the Top of the *Atmosphere* (allowing it, as 'tis lately found, to be 45. Miles. high) be equated with the Bottome; 'twill require 6700. Gallons, to produce that Quantity; And as the Air is thus Thiner, and Lighter than Water, soe tis so much the more feeble and yielding. For though

Water cannot be compressed yet Air will admitt of being condenced to 60. Times Less; and also of being rarified, to 70. Times more, than its common consistency: Now seeing 'tis evident, That the Air is 6700. times thinner and Lighter than Water; we need not doubt but ther's the Same, if not a greater Disparity between the *Air* and *Æther*; and consequently the *Æther* is above thirty Six Millions of Times, Thinner, than water; and [p. 70] therefore, according to the 1st *Postulatum*, soe many Times the more yielding and less liable to be moved or affected, by the Motion of the Moon, or of any Gross Body pressing downe, or moveing in it.

2^{ly} That the Bodyes of the Earth, and Moon, are both of them openly suspended in this unconfined, and as it were, infinite Space of thinn fluid, transparent *Æther*. And that it is of such a vast Extent, is evident from Fig: 10th before goeing (tho' we should therein suppose it to be extended, but Little farther, than from the Body of the *Sun*, to the Orbit of *saturn*, only.)

Thirdly That there is also a vast Disparity between the Body of the moon and her Orbit, and also between her Orbit and y^{e} Body of the Earth; as appears by Fig: 11th:[93] (Wherein I have laid them down in as just proportion as the Circumstances would admitt) From whence we may also conceive, That the Bodyes of the Moon, and the Earth, are but as it were soe many *Attomes*, if compared with the Vastness of their Distance as aforesaid. And 4^{ly} (as is also evident by the said Diagram). That the moons *Perigeon*, or approaching towards the Earth, (to which there is of late,[94] as is said, soe much weight or Virtue ascribed;) is altogether as inconsiderable, as their Magnitudes. For, if from the 114000. Miles of their mean distance, be deducted the 5000. Miles that's allowed for the Equant, or *Eccentricity* of the Moons Orbit; there will Still remaine above 100000. Miles for their nearest distance. From whence we may justly conclude, That if all these Things be duely and impartially compared, and considered; it will appear to be as impossible, that such an *Attom* as the Moon, at soe vast a Distance, Should give Motion to such a thin yielding Medium as the ther is; and thereby, cause it to press upon another like Attom, as the Earth is, so as to give Motion to the Ocean, or its fluid part, and not thrust the whole Globe out of its Orbit; as that the Man in the Moon should hear, what I am now Saying of his antient Habitation: Especially, seeing we finde, That a Cannon Bullet in [p. 71] its Swiftest Motion, in a many thousand Times Grosser Matter, will not move a *Feather* (excluding the Motion of the common Air, made by the Explosion of the powder at the Mouth of the Cannon) perhaps half a Dozen Yards before it comes to it, much less at its first approaching (to wit) at 2. or 3. thousand yards distance.

But, if what has been said, be not yet thought Sufficient; we will Illustrate the Matter by another Example. And herein it is to be noted, as has been intimated, That the Magnitude of the Moon, is to her Orbit near as 2. is to 100. and her *Perigeon* as 5. is to 100: Therefore, according to such proportion, Lett us suppose, (as in Fig: the 9th at A.)[95] That a Sphere of 2. Foot Diameter, be hung up at one End of a very lofty Room, that's 130. or 140. Foot long; and at the other end thereof, (at 100. foot Distance) another Sphere of 4. Foot Diameter be in like manner Suspended, representing the Earth; before which. Lett there be a *Feather* hung by a small Thread as at D. Now if the Sphere at A. (in Immitation of the moons pretended pressure) should in 12. or 13. dayes, according to the moons Semi=Revolution, (or if you will have it, in halfe a Minuite) be moved 5. foot (viz.t) from A. to B. I say can it be Supposed, That that motion, at such a Distance, and in such a wide Room will, by moveing the Air, press the Feather against the Earth at E. And if this cannot be affected; How much less can the Moon at 100000 Miles Distance press the Water, by a Medium that's 6000. times *thinner* than our Air; and therefore, (according to the first Proposition) so many thousand times the more invalid, and *less* liable to be moved by the moon to produce such an imaginary Effect as is pretended.

I could likewise show the impossibility of this Lunar Notion, by Experiments in water; But I pass to the *second* Postulatum or observation.

[p. 72] Wherein we have supposed the Body of the Earth to be inclosed in a Tube, as in Fig: 12.th and the moon at A. pressing or precipitating towards it: In which respect we allow That such a Pressure, (if the moon touched the Sides of ye Tube so as that no Air or Æther could pass out,) might affect the fluid part of the Earth at B. But the Supposition being soe inconsistent with Nature, Reason, and Experience; 'twould be even ridiculous to spend time about it: shall therefore conclude, as we justly may, That the moon by this pretended pressure, has no more power to *Cause* the Ebbing and Flowing of the *Ocean*; Than the Noise of the Frying=panns, formerly rung by the Old Women, when the moon was Eclipsed; could, as they intended, prevent the moon from being perpetually darkened, or from being removed out of its Orbit.

I shall close this Negative part with only reminding you, That the Dayly difference in the coming of the Tides, on the third day after the ffull and Change, is naturally, but about 30. minutes; Where as on the third day after the first and last Quarters, it is found to 90 or 100 minuts By which it is Evident, That the motion of the Tides is *three* times swifter (or slower,) at one time, than at another. And to confirm that this Phenomena or Observation is soe unequall as herein Asserted, (seeing I finde some *very* fond of the pretended Lunar Regimency) I therefore presume to Challenge, not only such, but also all the Mathematitians and Naturallists in Europe, to confuse the Said: Observation.—As also to prove, That the motion of the moon dos, (especially at its full and Change) correspond with the said Inequallityes; For the small Difference, that is in the moon's dayly motion, (viz.t) from 11. Degrees to 15. cannot in the least be applicable [p. 73] hereunto; Because the said Swift Flowing of the Tides, are in this respect; promiscuous; (to wit) as well when the moon is in her Slowest, as when in her Swiftest, Motion; and therefore has no relation thereunto. But Supposeing it were not Soe, The said Difference of 11. Degrees to 15. is but nearly as $1\frac{1}{3}$. is to 1. which can never correspond with 30. to 90. (being as 1. to 3.) And therefore seeing the pretended *Cause*, dos Not correspond with the Visible *Effect;* we may fully conclude, That neither the Moon's Motion, her pretended pressure, nor her Influence, is the Efficient Cause of the Motion of the Tides. From the whole then, of what has been said, I'll appeall to the im*p*tiall Reader, Whether it be not as reasonable to Allow, That the great man in the moon; dos breath only twice in a Moneth; and then blow upon the Ocean; and thereby cause it to Ebb and Flow; As it is to allow, of the pretended Pressure, or influence before mentioned.—

Sect: **III**

Sect: III.[d]

That the Flowing *of the* ocean *is caused by its being lifted up from an Horizontall position, once* in 15. dayes by the pulsing *within the Cavity of the Earth which is compared to, and confirmed by the* Systole *and* Diastole *of the heart of an* Animial. *That the Waters being so raised, will exactly Answear to all the* Phænomena's *found in the flowing of the* Tides, *proved & Demonstrated by Experiments. And the places assigned where the Tides are first Moved. By which the Various* Ebbings & Flowings *may be accounted for.*

HAVING in the precedent Lines, by divers Arguments, *Negatively* proved, that the moon is not the cause of the Ebbing and Flowing of the Ocean We now come to The *positive* Cause thereof; Namely to Shew,

"That *the grand Fluxes and Refluxes of the* Ocean, *called* Spring=Tides, *are caused* "*by the* pulsation, *within the Interiour parts of the Earth. and,*

"Secondly, *That the* intermeditate *Fluxes, are only derived from thence,* "*as the necessary Consequents thereof.*

Now although we have frequently hinted, at the first of these Propositions; yet it will more plainly appear, by comparing the said pulsing of the Earth, with that of other living *Animalls* In which it is to be observed, That as the active or Cordious part of an Animall, causeth pulsation or flowing of the Blood; in some fifty or Sixty, and in others, an hundred times, in a Minuite [p. 75] (somewhat according to the magnitude of their respective Bodyes; as before intimated;) soe the Vast Body of the Earth, by its Cordious Motion, dos lift up the Waters, and cause a pulsing, or flowing of the Tides, in a time (naturally) proportionable thereunto; (namely,) once in 15 Dayes; as is before asserted. Now altho this *pulsing* of the Earth, is near in proportion to that of the humane Bodyes, as 1296000. is to 1. and seeing her Body if compared with such; dos farr exceed that proportion; From whence it may be argued, that her pulsing, should be much Slower, than 'tis found to be; yet inasmuch as all Animalls, (when formed) do consist, of different matter from the Earth; And one Animall exceeds another, in Swiftness of pulsing; according to a proportion peculiar to their respective *Natures*, as well as to their *magnitudes*: As for Instance, if the pulse of a *Sparrow* should be to that of an *Elephant*, as the disparity of their magnitudes would produce it, the Violence in its pulsing, would unavoidably convert the matter, whereof the Sparrow was to be hatched into Ashes; even whilst it was in its Embrio; From whence we may conclude; that the pulsing of the Earth, once in 15. dayes, is as natuarall, to the Life or Existance, of that great Animall; as the other pulsings are to the least Animall whatsoever; tho Such an Arithmeticall propotion cannot be found between them.[96]

Nay 'tis manifest to Sense. That the Motion of the *Tides*, is So diminished between one pulsation, or Spring=tide, and another: That Should the time be suspended [p. 76] for 10. or 15. Dayes Longer, in all probability, The ocean would be quite destitute of any Motion, other than what is accidentally caused by the Windes; and what the consequences of such a Stagnation would be, is not difficult to guess; seeing all Animated Bodies, doe sustain their very being; by, and from, the constant and regular Motion of their fluid parts.

Seeing therefore it is evident, as well by the motion, in the *Waters*, as by what we have said, that there is a naturall, constant, and Proportionable Pulsation, peculiar to the Body of the *Earth*: And forasmuch as we cannot have access, into the interiour parts thereof; to finde out the Means whereby, or the manner how, it is effected,; We will endeavour to show it, by considering and comparing the like Motion, in other Animalls; for we may be well assured: That if the Earth, was to *its* Inhabitants; as [*they*] are, to the *Ticks*, *Fleas*, and other Animated Creatures, that are generated or produced by them: It would be as easie to know how the Pulsing, is caused in the Earth; as to know how it is agitated in our own Bodyes: Because (as is before observed) it is the same in its kinde, in the Greater, as in the Lesser Animalls. But inasmuch as the Earth is a self=existing, or as independant Body and these are not, We cannot expect to finde, such a Just anologie between them: And therefore it must be obteyned, by a more genearall searching into the Works of Nature; and, (in order thereunto) as we have already shewn how the Earth and its Inhabitants, are Assimuled, in respect of their *Externall* parts; soe we will now.

First *shew Wherein the Earth dos* internally differ *from other Animalls*; and, [p. 77] Secondly, *in what respect it is* assimulated *to them* and,

As to the *first* of these, It is to be observed; That although Nature has So variously formed, the Severall Species of Dependant Animalls; As that some of them, (viz.t) *Crabbs*, *Lobsters*, *Oysters*, and almost all Shell=Fish, have their Bones (i.e.) their shells, posited *without* their Bodyes, and their Flesh *within*; and on the contrary, other Animalls have their Bones, posited within, and their Flesh without; Yet I say, notwithstanding these and many other Varieties; all of them are furnished, with Mouths, Entrals, and other Capacities, for Receiving Food into their Bodyes; to supply the Decayes, that are incident thereunto: And not only Soe, But all of them, have their Bloud or fluid part, inclosed and agitated, in Veins, *within* their Bodyes: Where as the Earth is not only destitute of these Capacities, but hath its Bloud or fluid Part *Excluded*, and, (in all probability,) agitated on its Superficies only; So that in these *two* respects, the Earth dos plainly differ from all common Animalls.

Now when I had observed these Varieties in those Animalls and found them thus to differ from the Earth: I thought, If there were any Animalls *Orbicularly* formed; such might, from their uniformity with the Earth, Guide us in this Enquiry, better than those before mentioned; and accordingly, I obteyned the Sight of a Fish, (whilst living, for it liveth Severall Dayes out of Water,) called an ***Orbis=Minor***;[97] or Sea=Egg; Which indeed, is soe well assimulated to its first [p. 78] Name, That it was needless to add any other;

But in this Animall, as well as in the former, I observed a Mouth, (tho indeed so uniforme, or Circular, as that it met every way, like the Meridians, at the Poles;) Yet it has no Head, nor any Finns or Claws, to move it self withall: Then I examined the interiour parts; Wherein I observed the Cavity of the Body or Shell, to be Smooth and even; and equally Sphericall with its Superficies; And the greatest part thereof, being filled with Air; the Rest contained the white milky liquor, in which this Oister=like Body, was posited, and Sustained by Severall *Veines* leading thereunto, from the Inside of the Shell: Which was no thicker than a Sixpence, tho it was 4 or 5 Inches *Diameter*

How forasmuch as this Orbicular Creature, as well as those irregular or diversly Shaped, is furnished with a Mouth, and concequently with Bowells, and other Entrails And Seeing tis well known, that the use of all these members, is only to Receive Food whereby to Supply the decays, and Volitians, that are naturely incident, to the Bloud or fluid part of these Animals: And seeing the Earth hath no mouth, (unless you'll have the *Vulcano's* to be Such, which rather sends forth, than receives matter thereinto;) Nor any need to receive any thing within it self, to Supply Such or any other defects; because there can be none, by any dimunition of its fluid parts; For whatsoever is Sublimed in Vapours, dos precipitate on its Body again by Raines; Whereas they continually fly from other Animalls into the open Air, and thence fall to the Ground; And Seeing tis generally granted, That the God of Nature, never [p. 79] made any Thing in Vain; I say from these, and other Like Considerations, it will naturally follow, That the Earth has not any Entraills, inclosed within its Body; as other Animalls generally have; For if it had, it must certainly have a Mouth likewise; Because they Doe inseperably depend upon each other.

Having thus Shown wherein the Earth dos internally differ, from other Animalls; I shall now show, wherein it is assimulated to them; And herein it is to be noted, That although the Earth is wholy destitute of the said parts and Members; Yet it cannot be destitute, of that more nobler part of an Animall, (Viz.t) of an ***Heart***, or pulsing faculty which we have ascribed thereunto; for we finde in the Hatching the *Ostrige* before mentioned; not only, That the heart is the first, which is formed, in all Animalls; But also, that such a Cordious motion, is *potentially* in all Matter, even before the Heart, or Entrals are then Educed; as well as continued (by the *heart*.) after the Body is compleatly Animated; And experience teacheth, That the *very* Office thereof, in all Animalls; is principally, to give motion to their fluid parts. Wherefore seeing the Fluidity of the Earth, (i.e.) the Ocean, is Visibly agitated on its Superficies, (whereby its motion is much more conspicuous, than that of our Bloud;) It is but naturall to conclude, That the Waters, are by the same, or Such like corduous power as constantly, and regularly, sett in Motion, *upon* the Earth; as our blood is [by the heart] caused to Circulate *within* our own Bodyes. And therefore, in this respect, the Earth is assimulated to other Animalls; as was before proposed; and accordingly I purpose to Explicate the said Motion. And herein I shall [p. 80] shew, in what manner it is effected, as well *Negatively*, as *Positively*. And,

In the **First**, place we may observe, That if the waters, (as the Bloud in all dependent Animalls,) were agitated, and circulated, by an ***Aorta***, and ***Vena cava***, (Viz.t) by two, or more, Great Veins, leading [*from*] the two poles of the Earth, (being the places where the waters are first moved as is fully shewn in the Postscript herunto annexed,) [*unto*] two *Ventricles* of an Heart, posited in the Center of the Earth; and by the Systolation and Diastolation thereof, Drawn into and driven from thence, to the said Poles; the Waters would, (besides the prodigious, and inconceivable force, that must be exerted to raise it so unnaturally, for above three thousand miles in a parpendicular height, (to wit) from the Earths Center to its Superficies,) I say it would, if soe driven, be much Warmer, at, and round about the two Poles of the Earth; than it would be, an any other parts of the Ocean: Because the Earths interiour part, must needs, (and is found to) be, much hotter, than the Exteriour part thereof: But inasmuch as this ***Phænomena***, is not found or allowed; and seeing the same Motion, may be effected, by a more easie and naturall means, (as shall herein soon be described) we may justly conclude, That the heart, or Active part of the Earth, is not posited in the Centre thereof; notwithstanding it is generally soe seated in all dependent Animalls; And now I proceed to the *positive* part of the Proposition, Namely, to shew *Where*, or in what places of the Earth, its [p. 81] Heart, or Active part is posited; by which the *Tides*, or fluidity of the Earth, is originally and constantly Set in motion.

And in the *first* place, by the way we may learn, from the Forme, and proportion of the aforesaid Sphericall sea Animall; (its Shell being in thickness to its *Diameter*, but as one is to about 250.) That the shell, or ffixed part of the Earth; is not, according to this Computation, above 10. or 12. *Miles* in thickness: Which is soe small in proportion to its Diameter, as that it cannot be Scaled or Represented; unless by the Smallest of the Circular Strokes before inscribed. in Fig: the **VIII**.[98] For which reason I could have no regard to the proportion of the Earths thickness; and as little, to the debth of the Waters; in delineating the same; only I have made the latter, much less than the former; as being most certainly so: For I am well assured, (notwithstanding the Vulgar Notion of the Sea's immensity,) That its Debth in any place, is very inconsiderable; if compared, with the wideness of its *Superficies*: For I finde, between *S.t Malo* and ***Torbay***, and in most other places of the English Channell, that the Depth of the Waters, is but 50 or 60 Fathom;[99] though 'tis there an 100 Miles broad; Which is in proportion to each other But as one foot, is to about 2000: And if compared with the Earths Superficies would be but as 1. is to 360000, and therefore 'tis (as is said) impossible to represent the said *Debth*, in proportion to the Earths *Superficies*; tho in a much larger figure than that before mentioned. And from this Instance we may further Learn; That the Debth of the English Channell, is soe inconsiderable to its Breadth; That [p. 82] There are many hundred Valies, in *Great Brittain*; which are deeper, in respect of the Hills round about them; than the Waters are in any part of the said Channell: Insomuch as that if any of these Hills were pared off and sunk therein; they would stand up, severall Yards above the Water, tho' Sunk in the deepest places. And as we have thus shewn the disparity of the debth of the Waters if compared with their Superficies: so we may finde the Lifting them *up* at the Poles; to be much less in respect of the Earths *Diameter*; For 'tis found by Experience; That at all Islands in the Open Ocean, which are the properest places for these Observations; the Water riseth but about 6. or 8. *Foot*: And therefore, doubtless, at the very places where it is first moved not above 10. or 11. Which is soe little, that it cannot be described, by the Smallest Line in the said *Diagram*; Though I have therein made it far otherwise, for explanation's sake. And therefore we may justly conclude, from the said forme, and proporportion of this *Orbis minor*; if compared with the *Great Orb* of Earth; That its Crust or Fixed part is not above 10. or 12. Miles in thickness, as before proposed.

Secondly, That the Earth, like the said Sphericall or Microcosmick Animall, is formed internally, with a Smooth Obicular Cavity, and ffilled with Ætheriall matter; which haply, is soe much thinner than the Sublimations of the *Sun*, as that it is thereby capacitated, to Float therein;[100] as we see the said Fish dos, in the Waters of the Ocean; or as a *Buble*, when Blown up, and suspended in the open Air. And also that the said *Æther* being thin; will therefore, like other Air, or Æther, admitt of being compressed and Extended; according as the Motion, of the Earths *Cordious* part, dos every 15. dayes require; but to return to what we proposed.

Thirdly That the Active, or Cordius part of the Earth; is of a Flexable or musculous nature; and withall capacitated to dilate and contract it Selfe, as the Heart of all other Animalls are; And seeing this Cordious Substance of the Earth, as we have already Shewn, is not posited in its Center; We may reasonably conclude and Assert, That it is Scituate, next *under the Ocean*; at, and to the distance, of an hundred Miles, more or less, round about the *two poles* of the Earth; Being the places were we now finde, the Watters are first lifted up; as is clearly manifested in the following postscript; and is accordingly intimated at **AA**. in Fig: **VIII**.[101] where I have Made it full Sea, at both places, in the said Figure, to shew that tis *so* (and also Low watter) at one and the same time, at both the Poles of the world. and

Fourthly That by the *Diastolations*, and *Systolations*; (or Lifting up, and Sinking downe,) of the said Cordius Substance; the Visible motion of the watters, which we commonly call the *Flowing* of the *Tides*; is constantly agitated and produced; As has, and shall be herein further described.

Lastly that the said Waters of the Ocean being thus raised from their *Equilibrity* Do thereupon repair, as well towards the *Æquinoctiall*, as to the severall Shoars: In which interim, (Viz:t) after it has been about 6 ho: and 12 minuits in raising; the said Active part, in the same quantity of time contracteth it self again; and the Waters therewith Subsiding, [p. 84] makes these places gradually become the lowest; whereupon they naturally returns to the said places where they were *first* lifted up; By which returning the watters there, becomes almost as high as when they received their first Elation: on which they repairs again towards the *Æquinoctiall* as aforesaid; and so it continueth, in a diminishing manner to *Ebb* and *Flow* with this once lifting up, for about 15. Dayes or 29. times Successively (viz.t) untill it receiveth a new Elation; and by this means in all probabillity is that admired motion of the watters caused and continued.

Now to confirm what I have before Asserted, I shall prove: *First*, That there are such Active, Passive, and Fixed parts, in all other Animalls, which doe act upon each other, in like manner, as those discribed in the Earth. And *Secondly*, That the before mentioned, Consequentiall or Succeeding Tides, do depend upon every 15.th Dayes pulsation, or lifting up; as before proposed.

And to prove the First, We have an Instance in the Body of an *Eele*, in which it is to be observ'd, That if you Cut out the Heart, and Entraills; and thence Sqeese the Blood; yet the Heart, notwithstanding this seperation, will dilate and contract it self, for the Space of two or three Hours, after it is soe Seperated; and that even though it seemeth, to be as cold as a Stone; as my self with many others have experienced: So that in this Animall, The said three principall parts (viz.t) The *active* Heart, the *passive* Blood, and the *fixed* Body: are manifest, even to Sense. And what is here said of the *Eele*, may be fully understood, of all other Animalls whatsoever; Specially of *Wormes*, and all such, as in like manner, live [p. 85] under the Earth; to whome the Air is of little use, or can have but little or no access. For a conclusion therefore, From what has been said, we may fairly Assert, That 'tis more Reasonable to allow, That the Waters are moved in manner aforesaid; Than it is to allow, the Heart of an Animall, to be the *Cause* of the Circulation of the Bloud in its own Body: For we only feell the Cause, (i.e. the Pulse of the Heart,) and *suppose* the Effect; in the one; Whereas we visibly behold the Effect, (i.e. the Flowing of the Waters,) and *suppose* the Cause; in the other. And that too from what is likewise visible in the Eele before mentioned: All of which being soe plain, 'tis needless to Spend time, for the further Confirmation thereof. Wherefore seeing 'tis evident, that there are, these Active, Passive, and fixed parts, in all Animalls; And inasmuch as the two latter, to wit, the Flowing passive Waters of the Ocean; and the fixed Rocks, Cley, sand, &c: of the Earth; are visible in its Superficies: How can it be denied but that the First, to wit its Active part, is posited, under the Waters to give motion thereunto at the two Poles of the World, as was before proposed: And consequently, That this Globe, whereon we live, is a perfect *Animated Body*, or a Living Animall.

I shall now proceed to the *Second* part of the proposition, Namely, to shew, That the Succeeding Tides doe depend upon the first lifting up of the Waters; And herein you may remember, we have asserted the pulsing of the Earth to be only once in about

15. dayes. If so, it may be [p. 86] asked, How it comes to pass, That there are Nine and twenty Ebbings, and as many flowings, in that Space of time. To which I answear, that these intermediate Motions, are naturall, unavoidable, and common, to all fluid (and other) matter, putt, or posited, in *Æquilibrio*, (as the Water in the Ocean is;) whensoever it is therefrom, any waves moved, and,

To prove this we have verry familiar Examples in Nature (e.g.) In a Plummett of Lead tyed to a String, and hung at large on a pin: or in an equall poized *Beam*, or Scales: For if you Swing the one, or lift up the other, they will either of them, (in a diminishing Manner,) move 20. 40. or 100. times with that *once* moveing only; much like the Motion in the Waters of the Ocean. But that which I found exactly agreeable thereunto, was from an Experimt. which I tryed with Water it self; being put into two Wooden Shoots or Spouts, one about 22. the other about 4. foot long; Which being respectively at one end, gently moved up, and lett down again, the Water in either of them, did thereupon naturally run to the other end: and being there Stopt, as the tides are, by the Land or by meeting each other in the Ocean, I observed that in its turning, and returning, it would Ebb and flow 15 or 20 times, more or less, with that *once* lifting up: In which it allwayes kept to that naturall and remarkable *Phenomena* in the Tides, (viz.) of Raising higher, and running Swifter, at the time and place, of its being first lifted up, and soe gradually decreasing and diminishing, both in height, and Motion, till it quite ceased; which exactly corresponds with what is [p. 87] allwayes observed in the Motion of the great Ocean; as is before asserted, and illustrated, by the *Tyde Tables*, and their explaination: Now the reason of the diminishing difference of its flowing and returning is plain; Because at its *first* lifting up, it is raised farthest, from its Horizontall position; and hath thereby more advantage to hasten thereunto, than when 'tis allmost in Equilibrio: As water will run Swifter down a steep place, than it will down a Stream with a small descent: And as it will then run Swifter, So it will also float any thing faster, and farther, than when the Motion is become more faint and languid. All which doe plainly Indicate that the deep Waters (being posited as aforesaid) are moved up, Only *once* in 15. Dayes; and that their other *intermediate* Motions are only the products or Consequents of the Said Original Motion: or otherwise, they could not decrease and increase, the Difference in their Ebbing & Flowing as before described: For the Dayly difference, in the southing &c: of the Moon, if that governed the waters, is, as it were, allwayed Equall; And the Magnitude, and Light of its Body, unless when Eclipsed, is allwayes the same//

I could now proceed to prove, that the places where the Waters are first, moved, are as we have hinted at the two Poles of the World: And that they do ultimately meet, in, and near the *Equinoctiall* line: as also how they make (in the wide Ocean) a *Floud*, and *Ebb*; at about every 700. Miles Distance: by means whereof there are severall Ebbs, and Flouds, alwayes existing between the Poles, and their Equinoctiall meeting; (it being 5400. miles asunder. 2dly That the *Disparity* or great Quantity of water, brought, by the Said Flowings; between *America*, and *Asia* compared with the Parvity so brought, between [p. 88] *Africa* and *Nova Holandia*; is the *Cause* of the Earths Rotation; And that the said Rotation is the *Cause* of the *Trade=Windes*; as also of the *Tornadoes* & *Monsoons* thereunto belonging. But inasmuch as I have, as is Said already *hinted* at some of these; and *fully discribed* the others, in the *Post Script* hereunto annexed; I shall thereunto refer, and proceed to the *Raising* the four Quarters of the Earth//.

Sect: IV.

Showing *The time When the fishes were Generated; and the Veins made in the Rocks & stones;* also, *when the sea=Fowles were Generated. That the fowr Quarters of the Earth were raised, by its Pulsing: That when these, were* raising, *the shells were then immassed or mingled therein: As soon as the Earth was* hardned *the Animalls were gradually Generated; and* why *it dos not* now *produce such* great *Animalls: That they were nourished by the* Umbilicus. Why *and* When, *the* hills *were raised.* How, *and* when, *the Earths* Rotation *was produced. Why Trees have no* Females; *& why some Animalls bring forth* many *young and others but* few. *That the Rivers are caused by Rains. That the Earth was probably, what we now call, many years in Forming. That twa's naturally impossible for the* Deluge *to immass the shells in the Rocks. And lastly that the Earth, was not from* Eternity.

It being evident that the Earth has *pulsation* as well as other Amimalls; I shall now shew some further Effects thereof in the forming its own Body. And in order thereunto you may remember; when we at first Spake of Generateing the Earth, we then left it consisting of a [p. 89] smooth, round forme; and of a liquid Substance; with its internall heat and Motion, agitateing within the interiour part thereof. Our buisness in the next place shall be to shew, in a more particular manner, how from this liquid Substance; the four terrean parts of the Earth, were raised or increased: But Before we proceed thereupon, must Acquaint, That the Severall Species of Fishes, were Generated [before] and [in] the raising thereof; or otherwise they could not be incorporated therein, and mingled therewith; as we now generally finde them. And in order to evidence the same; It is to be observed, That whilst the Earth existed in this almost fluid State, the Superficies thereof must then, be naturally soft and tender; Whilst that which was nearer the Center, was by the Earths internall Heat, made more Gross and compact: And Forasmuch as the Waters were, as has been said, at the first Creation, Fresh or incipid, and also imprincipled with a *plastick* or Generating Nature; and being (as the form of the Earth was educed,) gradually made more cleer, than when the whole mass was promiscuously mingled together; I say this Water being by these Quallifications, become more fitt for Generation; The Great **Command** of the Almighty, (wherein the said, ***Let the Waters bring forth abundantly Fish, Fowles &c.***) was *then* (to wit) before the Superficies of the Earth was hardned, or any Hills raised; most admirably and effectually put in Execution: And thereupon, not only the great, and small sorts of Swimming Fishes; as the *Whale, Porpoise Salmon* &c. But also those crawling, and other almost immoveable shell=fishes; as the *Musle, Oyster, Scallop,* Cockle, and the like; were [p. 90] most numerously generated and brought forth: and the Waters thereby most plentifully replenished: as is evident, in respect of the matter that produced them, from Gen: 1. V: 20.21.22.[102] And that this was the *Time*, wherein they were soe produced; is also Evident, from their being to this day visibly immassed in the Rocks, as has been frequently asserted; and will further appear by the following Lines.

The Fishes being thus generated, and, according to their *Species*; either Swimming in the fluid Ocean: (Which then incompassed the whole Earth;) or lying in the Bottome thereof: We shall therein leave them, and proceed to Shew, how the four Terrean parts of the Earth were formed, or raised above the Waters: And herein we must reminde you of the **VI**.th *Postulatum* before mentioned, Namely, *That the same Motion, that dos give*

> *Life, and Forme, to any Creature; is continued therein for its Sustentation*: And so, on the Contrary, *That Motion, Which is* continued *for its Sustentation*, is y. same *with that, which gave it its* first *Forme, or Modification*.

From whence we may plainly discover; That the Motion which is now continued in the Ocean, is the *same*; with that by which the Earth, was first formed into a Living Body: Which being granted (as it cannot be denyed.) We may thence infer, That as the Waters doe now by pulsation, rowl and overflow the Marine parts of the Earth; soe in like manner, whilst it was forming, it then being smooth & even, and no Land raised to hinder the Same, the Waters did *then* Ebb and Flow, over the whole Surface of the Earth; even over what is now the Land part; as well as the sea. And as in the Generating of other Animalls, their perfection is gradually [p. 91] educed; by the disposing and transposing of the respective matter, whereof their severall parts are formed, by means of Pulsation only; So in Like manner the Body of the Earth in the multiplicity of its fluxings and overflowings; Did transport, or cast up; not only the thin, but also the argilacious and Grosser water, which was in the Bottome of the (now) *marine* parts of her Body, upon what is (now) the *terrean* parts thereof. Makeing then, and thereby, the Beds or Ranges in the Earth, exactly parelel to the Horizon, and to each other, as is described by Fig: 1.st & 8.th[103] In which naturall pulsings and rowlings of the said Gross Matter; these Fishes especially that were incapacitated for Locall Motion, (as the *Oysters*, *Wrincles*, *Cockles* &c.) and were then, as before premised, Engendred on that part of the said fluid Mass, which is now the terrean part thereof, Were I say, by and with the said soft Matter, covered over, mingled, immassed and incorporated; in such a manner as we have before described, in Fig: the 1 2 and 3:[104] As also Cley, rowled into round formes and hardened into Pebles &c. All which *Fishes*, *shells*, *Pebles*, *sand*, and the like, are now generally found, as well in the Rocks under the salt Ocean, as in and on, the terrean parts of the Earths Superficies; and that in many places of the latter to the Debth of 40. 50. or 100. Foot; as I have frequently observed, and is before asserted and discribed: And that the shells &c. were thus frequently covered over, is evident, because, there are many ranges of them, in the said Debth, one above another, with Rocks and Earth between them; which have noe shells therein, as the Figures doe plainly exhibit: (see Fig: 2.)[105] in which [p. 92] that part marked with **F.F.F.** have no Shels, tho' under and above they are plentifully immassed. Where as, if the forming of the Earth had been otherwise (to wit) by the precipitating of shells and Attomes of Gravell, and Earth together, or such like means; (as some would have it,) The shells, being Lightest, would have been all uppermost; or at Least the Matter, would have been promiscuously mingled; as in Fig: the 7.th[106] and Not have been parelel, and evenly seperated, as we now finde them. And this may suffice to Confirme That the *time when*, and *manner how*, the shells were immassed in the Rocks; was whilst the matter was soft, and no hills raised, as has before been frequently mentioned. And the Reason why the said shell=Fish, are found in the Rocks, more plentifull than other Fishes; Is because they were not capacitated to extricate themselves out of the said Muddy matter, as the other Fishes were.[107]

And further to put it out of all doubt, That the mucilaginous Water, was thus transposed or emtyed, out of the Marine parts of the Earth; and cast upon, or Fluxed over the four Quarters thereof; will plainly appear; Not only in that the said *Strata's*, or rather fluxings, are all parellel to each other, in the Bedds or Ranges of the Earth; but also because, that in all cornish Slate or Tyles; as also in almost all sorts of thin Stones; you may see the said *fluxings* of the sea, that were roled over, or cast up in forming them; soe plain, that Nothing but a Confirmation is to be found therein. For as we all know, a small Rush by frequent diping into a fatt, fluid matter, is increased into a Candle: soe in some stones, [p. 93] if but 2. or 3. inches thick, we may finde halfe a Dozen, or halfe a Score, severall fluxings, in the makeing thereof; And some of them may be split, into thin Shivers answerable thereunto: as I have frequently seen and performed. In which it is further to be noted; That as long as the matter thus cast upon the Earth, was *homogeneal*; or was not dryed between each Fluxing; there was no partitions, or Beds made in the great Rocks, nor in some lesser Stones; as is shewn by Fig: 2. But when different Matter, was cast upon the former; or the former matter was

Dryed between the fluxings; it then caused those Horizontall Ranges, or partitions in the said thin Stones, and in the Rocks and Beds of the Earth, which at this day are visible therein; as in Fig: 1. 2. 3. & 4.th is described; and is also evident even by many of the stones in the walls, of the Royall Exchange[108] **London**; and by many thousands of Buildings else where: And from this Fluxing of the Ocean; and at this time, (to wit) before the hills were raised; (for after it could not be;) it was, that the sand, as also the Pebles & other Marine productions, that we frequently finde, as well on the Mountains, as on the more Leavell Parts of the main Land, were cast up and made: For by the Rowling of Lumps of soft Cley, the Pebles were made; and by the Washing of the Earth, the sand was and is still produced, and that this is true, is evident to our *visible* Observation; For on the sea Coast, where any Cley=Hill adjoyneth, in particular about a Furlong to the East [p. 94] of the Passage leading into the Isle of Portlaid,[109] I have seen thousands of Smooth Pebles, that have been made, of irregular Lumps of Cley, tumbled from the adjacent hills into the sea and by its Motion, rowled into smooth Pebles; which in few years have been hardned, into as perfect Stones as those that you would judge to be made a Thousand years before. So that I have frequently with Ease thrust a Stick through some of them; and at the same time with difficulty broke others by reason of their hardness; And that the *sand* was produced as aforesaid is visible to dayly Experience: All Which may serve as a further Confirmation, That the hard Rocks were produced from a soft Substance as aforesaid: And haveing defended to particulars in this; I would also Acquaint, That if any Person is desirous to satisfie his Curiosity, concerning the *Position*, of the Bedds or Ranges of the Earth before mentioned; It is but to walke by the watters side, at Low Water from the said Passage, to Whitenore=Fort, near *Weymouth*;[110] (which is but about a Mile Distance.) or on the Sea coast in the Isle of Portland &c. And he may there see, what I have before asserted, concerning the Position of the Rocks, and Bedds or Strata's of the Earth, and of the shells being immassed therein; as plainly Demonstrated, as any of the Propositions in *Euclids* Elements are, by the Lines and Circles therein contained and Described: And indeed more fully, and far better, that any Words by me devised can express the Same.

The *Marine* part of the Earth being by the said fluxing, and transposing of the *Terraqueous* Matter, (together with the tendancy, intention, and generall designe of Natures Proceess) in some measure emptyed upon the Land; it will follow, That as one part was thus Sunk lower; the other [p. 95] must thereby be made Somewhat higher: And hereupon it was that the Waters began first to be gathered together, and the Dry Land to appear; as we Read Gen: 1. v. 9. 2. Peter 3. 5.[111] Now seeing the Waters were in some measure, thus confined within their bounds; and thereby prevented, from constantly overflowing the Earths whole Surface, as before they had done, we may naturally infer (amongst others) these Three Things (viz:)

First That the Earth, did thereupon begin to Dry and harden into Rocks, and stones, &c. And that in this hardening it Cracked into divers small irregular Joynts or Fissures;

as we see any moist Cley or muddy Earth in hot seasons will doe to this day
Secondly That when the waters, flowed over the whole Surface of the Earth, they must then, (to wit,) when the Earth was soft; be more gross and Muddy, than when the Earth was hardned, and the waters gathered together as aforesaid.
And ***Thirdly***, That although the Waters after they were thus Collected did not constantly, overflow the Earth, yet inasmuch as it was then, and is now, at *Spring=Tides*; severall feet higher, than at other times, I say, it did, at such Tides, nevertheless, overflow its whole surface, untill the Earth was gradually raised soe much higher, as to prevent it there=from:

Now it being evidentt That the Matter of the Earth, must naturally be Crack'd as abovesaid; and that the Waters at the same time did intermitingly flow over it; It will as naturally follow, That the waters or other Clear Glutenous and Cristalined matter, *did*, and must unavoidably, run into the said Cracks or fissures, and therby fill them up; Whence, it will also follow, that this must certainly be the [p. 96] Time *when*, and the Manner *how*, the transparent, and other different coloured Matter,[112] entered into the said Crackled Fissures; and thereby made those irregular, and Various coloured *Veins*, in the Rocks of Marble and other Stone, that we now see incorporated therein. And from thence it was, (namely) From the cleerness of the Matter, That those Veins are commonly more transparent; than the rest of the Stone wherein they are found; As also from whence Diamonds, Flints, Marble, and all other *transparent* Stones are, or were, produced.

And it is further to be noted, That although those Fissures, and other like Cavities, that were made in the Earth . . . during the time that these Spring=Tides did thus flow over it Were thereby, and therewith, filled up and incorporated as afore=said. Yet nevertheless, such of the said Joynts, Fissures, or Cavities, as were Made by the Drying of the Earth; (for that was the only means whereby they were produced,) after it was raised so high as to prevent any Fluxing over it at all: I say such Cracks and Fissures did, and do still remain, open and unfilled: Except those that were Since fill'd up, by the loose Earth, or by the Factitious earthly Matter, that was, in process of time made by the Rotting of Vegetables, and Animalls: and has been Since washed or carried thereinto, by the Rains, and Flouds, running upon the Earth: as is visible to our dayly Observation.//

Neither is this all the Inferences, that may be Drawn from the premises; For seeing it is evident, by the precedent Lines, That before the Waters were thus gathered together, they did constantly, (tho' at first but faint and languidly) [p. 97] Flow over the whole surface of the Earth: And seeing it is but naturall, to conceive, that whilst they did so flow, There could be but little or no *inequallity* in their Flowing, to Cause the Earth (at first) to ponderate, more one way, than another: (For the surface of every drop of Water, suspended in the open Air, is visibly, at an equall distance from its *Center*.) And forasmuch as, especially at every Spring=tide, there was, and is (as is said) more Water brought from the Poles to the Æquinoctiall, than at other times. **And** seeing by the raising of the Land, the waters were gradually and now are, constantly prevented from coming *equally* round the Globe to the Æquinoctiall; as by consulting the following, or any other Map of the world, and Postscript hereunto annexed, will more plainly appear: I say, What may we hence infer, But that this inequallity in the Flowing and Meetting of the Tides, at the place aforesaid, after the Land was raised; (tho not before,) must naturally bring the Earth, out of its *Æquilibrity*; and thereby cause it to ponderate either from the *East*, or from the *West*; in order to Seek another Center, or place of residence. And being thus Set in Motion: We may reasonably infer, That the ***Diurnall Rotation*** of the Earth, was from thence first produced; and (by the constant repeating of the same unequall Flowings) is still continued; **And** consequently from thence, (to wit,) From this Gradual Rotation of the Earth, the Dayes and Nights; and even, what we now call, *time* it self, had its Originall and Denonaination. Which I presume may suffice to shew, **how**, and **when**, the irregular, and transparent Veines, and perpendicular Fissures, were made; that we now see remaining **in** and **Between** the Rocks and Stones, that are upon, and under [p. 98] the Earths Superficies: As also **how**, and **when**, the Earths Rotation was first produced.

But before we pass, from the Waters flowing over the whole Surface of the Earth; to its being fully Dryed, and hardned; it is to be Observed, That the great mountains, and some high Tracks of Land; Must first, (though gradually) be thrust forth, and stand up, (as *S.t Peter* tells us Chap. 3: V. 5.)[113] *in the Waters, and out of the waters*; Whilst all the rest of the Earth, was covered over therewith. And seeing *Nature* is never Idle, we may Well conceive, That when the Earth was in this State, The mucelagenous Water, which remained in Lakes and Ponds, on these higher tracks of Land, did putrify and Generate, all these *Fowles* whose Feet are formed with Fann=likes Claws, to row themselves withall: **And** that the Land=Fowles, whose Claws are Seperated; were Generated with the Animalls next to be mentioned. And that y.t first, were *then* Generated is plain, Because, tho' they Live on Fish; yet, they could not propagate their *Species* on the waters only, without some Land to rest upon; as dayly experience confirmeth. **Haveing** thus shewn some of the Events; that hapned, *before*, *in* and *upon* the gathering together of the Waters; I shall now proceed to some others, that followed, when the Dry Land more perfectly appeared.

The four Quarters of the Earth (viz.t) ***Europe***, ***Asia***, ***Africa***, and ***America***, being gradually raised so much higher than the Ocean, as that the Waters, (even at Spring=Tides) could no longer overflow the Land; it had thereby the advantage in process of time, by the Earths internall heat and otherwise, to be so hardned, as to become a fit Stage or habitation, for Such Creatures as *God*, in [p. 99] his eternall purpose, had designed it should bring forth; (for before its hardening, as twa's unfitt for them to tread upon, soe it would be in vain to produce them.) Wherefore the Earth being now hardened, and the hills but as yet buding forth, it is but naturall to conceive;

That the misty Vapours and Rains (i.e.) the Sweat of the Earth, that did return and fall thereupon, whilst it was thus almost level, must, (together with the water and Slimy matter that was left upon the Earth by the late overflowing of the ocean) unavoidably remain, in the shallow Lakes and Ponds, that were made by the buding forth of the said hills and Mountains, in soe many thousand Miles, of almost levell Ground: Which said slimy Water, and Rainy Vapours, being *then* at rest, and void of Motion, (tho' now the hills are raised it cannot so remain) it must, I say, by reason of this Stagnation (as dayly experience teacheth,) corrupt and putrify; by means whereof, it becames a mucelaginous, Viscous, and Chyle=Like *Menstruum*;[114] Whereupon, (as God had before Commanded the Earth to bring forth Grass, for the use of Cattle: And the waters to bring forth fish and fowles,) so he then further Commanded, Saying, *Let the Earth bring forth Living*[115] *Creatures after their kinde: And it was Soe.* From whence it is evident, that the Body of the earth; from this, its Viscous or Sweaty *Menstruum* (by virtue of the Spontanious Nature, infused into Matter, before or upon the said Command;) Did then, and thereby, naturally engender, and bring forth; First those great Creatures; and afterwards, as the Hills advanced, those lesser Animalls that do now inhabite the same; or at least, what is equall thereunto; (namely) their Severall Species. And that this *Spontanious* nature, tho' but in a lesser degree, is still in all liquid [p. 100] matter when Putrifyed; is evident (among other Arguments that may be produced) Because he that said, *Let there be Light*; and *Let the Earth bring forth*, &c. hath not, in either of these respects reversed his Commands, Nor have the Effects thereof hitherto ceased; For the first (viz!) The Light, is Visible, as well on the Surface of the Great Waters, (as has before been hinted,) as in the Celestiall Luminaries, to this day: And the Latter also, unless to such as will not see the same: For what is a more evident proff, of this *Spontanious* Nature, in all liquid Matter; than that the whole Species, of *Froggs, Tadpols, Flyes*, and divers Sorts of Insects, are Annually destroyed; and as frequently, generated or produced again; And although this cannot be denyed;[116] Yet I am not unsensible, that the manner of their production is Variously assigned: For Some will have it, That because all great Fowles are Now produced and propagated, by, and from, their respective Eggs, after copulation; Therefore they infer, That the Eggs which are produced by these Insects and Lesser Animalls, in one year, are Hatched and brought to Life, (I suppose by the sun for it cannot be by themselves because they are destroyed,) in the year ensuing. Now that all Animalls are multiplyed by their Eggs, I readily grant; For though they were originally, generated without Eggs, or Copulation; yet being grown to maturity, we finde, that every Vegetable and Animal, has, (as *Moses* saith) *their seed within themselves*; or other like means, to propagate their *species* by; And therefore doubtless, in the summer Seasons, these small Animalls, and insects, do accordingly multiply their kinde: But though this be soe in respect of the great Animalls, and also, with respect to the lesser whilst the summer heat remaineth, [p. 101] Yet the Inference will not follow, for the re=production of those that are so small, as to be destroyed, by their incapacity, to bear the Accidents of the Winter; And my reason is Because, If the Eggs of those small Insects; or any other Eggs whatsoever, should be exposed, (as they must then be) to Rain, and Cold; So as the matter therein contained should become frozen; for so many weeks, or Moneths, as the season commonly exposeth them; they would thereby, be made wholy unfitt, to propagate their own Species; Altho we should Suppose them, to remain where they were first posited; and not carried into the Rivers; and thence to the Ocean; by the Winter Flouds; as 'tis very probable they are: Which if these, or either of these accidents should happen; All the severall Species before mentioned, must totally cease; should they not, (as nature disposeth matter,) be *Spontaniously* generated again; as they, and all other Animalls originally were. To conclude therefore, untill it can be fully proved, That the Eggs of tame Fowles, (for others it cannot be so well tryed,) will produce their *Species*, after they have been so frozen, and exposed as aforesaid: it is but in vain to deny the Spontanious Nature in Matter; or the plastick power, that has been herein so frequently ascribed thereunto: For the very Vermine in the Noses of some persons; and the Various Sorts of Wormes in the Bodyes of others; will plainly Demonstrate the same, by their being therein produced without Eggs, or otherwise from their like Species.

I shall not further, at present, enlarge hereupon—only mention one *Observation* that I finde no notice taken of; and it is this,

[p. 102] That the *Eggs* of all Animals; Do, in a great measure, bear a due proportion, to the Magnitude of the Bodyes from them pruduced; As by the Eggs of an *Ostrige*, *Hen*, *Bird*, &c. (if compared) it may plainly be Discovered and conceived.

From whence, by the way, we may be well assured, That the greater Animalls, (as has been frequently hinted,) Were the first that were produced after the Creation:[117] Because as the aforesaid Lakes, or Menstruums on the Earth were at the Creation, *Largest*; so the Magnitude of the Creatures thence produced, were, and (according to the said Observation) must be the *Greatest* likewise: And as we may thus infer in respect of the Greater; soe we may on the other hand conceive, That the Lesser Species were generated as the Hills were raised higher: Because the said Lakes, must be thereby gradually diminished; and also put in motion, (which prevents Generation) by being changed into running Springs and Rivers; neither of which could be, when the Earth was almost level; as Reason, and dayly Experience teacheth but,

What I further intend by the said Observation, is to shew, that Persons, (how curious soever in the Works of Nature,) may Err, in things that are even Visible therein; and therefore much more, in such as are drawn from *Suppositions* only; as is that relating to the Insects before mentioned. And my Instance herein Shall be, That nice Observation, made by the Worthy__[118] wherein he pretends that the *Fœtus*, (and Consequently that of an Elephant,) is Generated from an Egg, which is no bigger [p. 103] than a Grain of Wheat or Musterd seed. Now that this is inconsistant with

Nature, as well as contrary to the Said Observation, is evident to Sense: For every Naturallist must acknowledge, That the very Forme of the *Utriculus* together with the two=fould matter or menstruum, thereunto, as nature requireth, constantly coveyed, by the *Vasa præparantia* and ***Hypogastrick Veines*** **&c**; is the same in its kinde and proportion; with the Shell, White, and Yelk of any Egg whatsoever: And that the internall heat, of Viviparous Animalls, is also of the same use, in generating any Fœtus, in this internall Egg; as the applycated Heat of the Sun, or Fowl, is to the Hatching any of their externall Eggs before mentioned. And therefore unless another diminutive Egg, or ***Hans*** in ***Kelder***,[119] can be found within the common Shell=Eggs; 'tis very probable, the aforesaid Nicity, ought not in this respect to be regarded: For you see 'tis manifest, that the reall Egg, which produceth the Animall, is the Utriculus, and the said Menstruum, thereinto constantly conveyed; and not the Attome before mentioned: And is also that, by the said constant Supply, which beareth the due proportion to the Body thereby produced, according to the Observation before mentioned. And this I hope may Suffice to Shew, That inasmuch as very curious and inquisitive persons, have I presume erred, in things so visible in Nature; they may much more be deceived in the *re=production* of the Insects &c: before mentioned.

And being now Speaking of these things it may perhaps be Enquired. First, Why Trees, and other Vegetables are produced, but in the *Male=kinde* only;[120] without any Female, to multiply their Species by, as Animalls [p. 104] have: And *Secondly* Why most four Footed Beasts, and other Animalls; have each of them, but only one comon Shell or Egg, (respectively) to multiply their Species in; Wherehas most Fowles have many Eggs, to propagate theirs.

As to the *first* of these I breifly Answear; That these Vegetables, (tho they are generaly of the male kinde,) yet they have no need of any such Female to propagate their Species with: For when their seeds are fallen upon the Earth; The Earth is then of the same use to them; as the shell and heat of the Female, is to the Eggs of an Animall: And the rainy Vapours which fall on the Earth, are also (when putrified and turned into Leffas,)[121] of the Same use as the *Menstruum* contayned in any of the Eggs before mentioned is to the Animals thereby produced. And lastly, the Roots of these Vegetables are likewise of the same use to them, as the Umbilicum is to all Animalls; For thereby the said rainny Vapoures are, not only at first, but also constantly conveyed; for the Nourishment and increase, of their respective Bodyes: Whereas all Animalls, are so Nourished, but only whilst they are in their respective Shells, or *Utriculi*; and being from thence seperated; they are allwayes Receiving & carrying the like facticious Earth, and Water, (tho' more feculent in its kinde) about with them; in their Bowells, and other internall parts; as well for their Sustentation, as for their procreation.

And for the Second Enquiry (viz.t) Why most four footed Creatures, and others, have respectively but *one* co̅mon Egg or Utriculus, and Fowles so many; Is because the

Fœtus's of the first are very large: And seeing they must all of them be hatched or brought to Maturity, *within* their Bodyes; it will necessarily follow, That if they should be [p. 105] so numerous, as the Fowles are; it would be naturally impossible for their Bodyes to Conteyn them; And therefore providence has accordingly diminished their Number; and not only So, but hath also proportioned the Lenth, or Shortness, of their Lives, according to the production, of their Severall Species. And hence it is, That those large Creatures, are not only 9. 10. or 18 Moneths, in hatching their young; (if we may so call it) But when produced, many of them Lives to the Age of 30. 40. or 100 years; Whereas many Fowles, do hatch their Young, in a few Weeks, or Dayes; and when brought forth they Live not perhaps, one fifth, or one tenth, of the Age before mentioned; and therefore, as is said, their productions are so much ther fore more quick and Numerous; to the end their *Species* might be thereby preserved. And accordingly it happeneth Annually, with respect to the multitude of Gnatts, and other Small Insects, whose Age, many times is but for a few Moneths, or dayes; and their production doubtless, in as few Howres.

But seeing we have in the Precedent Lines, allowed almost all Creatures, to be multiplyed by their Seeds; it may be objected, that some Vegetables; as the *Vine, Elem=tree, Fern*,[122] &c have no Seeds, to multiply their Species by. To which I answear, That such as are not there=with accomadated, do commonly, propagate themselves by their Branches or their Roots; as I suppose these before mentioned naturally do; But tho it be So, with respect to these, and such like; Yet I presume, the reason why Some Vegetables, do not in some Contrys, produce seed; is only for want of an hotter Clymett, to bring them to maturity — — For it is evident, that not only divers sorts of Vegetables here; but also the wild or fruitless *Orange=tree*, in *Polonia*; and [p. 106] also some Animalls, as Snails &c: do plentifully multiply their Species by seeding and by Copulation: in extream hot and Dry Sumers; which in hot, and wet ones; (viz.t) when y.e Earth Spontaniously produceth them, they do not So propagate themselves; Nor can we but rarely finde, and such Actions, or productions, by, or amongst them. From whence we may learn, That if the Earth, could have continued, in its primitive fertility; There would not have been, (nor needed) a Male and Female, or any other means, to propagate the Severall Species, that the Earth, at first produced; but the said *Spontanious* nature only, and

Secondly. That if the said Fruitless, or Seedless Orange=tree, or a plant of Fern; or any other such seedless Body; that dos live, or propagate it selfe, *under* the Earth, tho' it be but as it were a lifeless Excresence thereof; I say if any such, were removed into an Hotter Climet; and therein gradually, and naturally cherished (and *not abused by heat*,) with the proper *Leffas*, that its Mother the Earth, to them respectively aforded; it would doubtless, as the (*heat*) or the Sumer approacheth, be so brought to Maturity, as to yeild such seed, as would multiply its own Species: Specially if the said seed should be in like manner sown again, in the same, or alike *Menstruum*, wherein the plant, *Excresence*, or *Minerall*, was at first, ripened, and brought to maturity, as before proposed. We might further enlarge hereupon, but I only speak this as an intimation to some persons and return, to the Earth's generating, the Great Animalls before mentioned. And altho, we have already shewn, why the Earth's Productions were more numerous and copious, soon after the Creation; than at this Day; Yet for the further Explication thereof we will Suppose, it may be thus Enquired.

[p. 107] Seeing the Earth did at first *Spontaniously* bring forth such great Creatures; as the *Elephant, Camel Horse, Sheep, &c.* And seeing she dos now, by such means, bring forth only lesser Animalls; as *Froggs, Wormes, snailes, Flys*, &c. (sometimes) without Copolation: How comes it to pass, or for what reason, is She become more deficient therein, than She was, at her first forming. To this,

I Answear, that there are, as we at first Asserted, only two things in Nature, required for the Generating, or producting all Animated or Vegetated Bodyes; (Namely) *Moisture* or Water, and *Motion* or heat: And as a greater or Lesser Quantity or degree of both these are harmoniously joyned together; the Bodyes thereby produced, are accordingly either greater, or lesser: Inasmuch therefore as the Earth, in the time of its forming, was furnished, as has been shewn, with a greater quantity of Water, (which in putrifying must naturally produce an Heat proportionable thereunto,) than it now affordeth; it will from thence necessarily follow, that she had then, in both respects, greater Advantages conducing to such productions, than it now has: And therefore the want thereof must be the Cause, of the Earth's present Deficiency.

But you will say there's Water enough in the Ocean, and Why is not that, soe productive, as to Generate *Whales, Porpices, Salmons*, &c. without Spawning or Æquivocall Generation, seeing it did so, when the Superficies of the Earth was all fluid. To this,

I Answer, That it is because, the Nature of y^e^ Waters of the Ocean, is now changed; For when those Fishes were first Generated, it was then, as is shewn at the tenth *Pustulatum*, of an incipid or fresh, indijested nature; [p. 108] But now 'tis throughly Animated; it is so far from generating; as that by its Saline Quality, now acquired (together with its constant Motion,) it even preserveth things from putrefaction; and thereby preventeth Generathion; as dayly experience teacheth; And that Matter is so changed, in its being animated, is evident in that the Miscelanious *Menstruum*, of the Stomack, is first converted into *Chyle*, and thence into the Bloud, which being put in Motion is thereby prevented from putrefaction and Generation, from Whence it is plain, and evident, that the Ocean, being converted and Animated as aforesaid; cannot further any such Generation; other than by the Serous Sublimations or Exhalations thence arising: For nothing but a *Chaos* or Caotick matter; (as was at first Asserted,) can generate a Living Body; And therefore, no Living part of the Body of the Earth, of which the salt Ocean is one, can conduce thereunto; as being now, noe Caotick matter: Whatsoever is dissected, or Seperated, by Exhalation, Sublimation, or otherwise, *from* a Liveing Body; is the proper Subject or matter, for Generation. And hence it is that the Sweat or Vapours of the Earth (i.e.) Rain; as also the Rayes or Vapours of the sun, mingled with those of the Earth; or the Sweat of any other Animall; or any other matter mortifyed, or dissected; as the Earth is by ploughing, or otherwise Seperated *from* a Body; as the Slimy water before mentioned was; (being then in its Caotick State) I say, these, and such like, and no other, are the only proper Subjects or matter, for generating living Bodyes; on the Earth, in the Water, or on the Bodyes of any Animalls whatsoever: And this is manifest, because, That as the abundant Heat and Moisture of the Earth, did first produce greater Animals: so the heat and moisture, of the same Animals; do produce lesser (namely, pedicular) Animalls to this Day. [p. 109] From what has been said, we may plainly perceive, First, That the Great Quantity of Water lying uninterrupted, and thereby putrifying, on the Surface of the Earth, (being also joyned with the Invenial heat thereof,) had then and thereby, the advantage and power, to bring forth those great and divers kindes of Animalls; which now, by reason of the raising of the Hills, and thereby the Speedy runing off of the Said Caotick Water, it can in no wise bring forth; but in a much Smaller Species: And truly, although the *Elphant*, *Rhenoceros*, &c. are very Large Creatures, compared with others; Yet if we compare them, with that Vastly great Animall the Earth, which first produced them; And then compute the magnitude of the *sheep=ticks*; and other pedicular Creatures and internall Vermin, with the Animalls by Which they are produced; We may have cause to Admire, That the Elephant, Camel, Sheep, &c. were not many Thousand times bigger than they are. But the reason thereof is not difficult to determine, if we consider the Heat and Sweat of the Earth; For we finde the Atmosphers of some of those comparitivly, little Creatures, to be 40, 50, and some 100. times greater in proportion, than that of the Earth is.

And in the *Second* place we may learn, That as the Earth did, and dos to this day, produce all Vegetables, but of the male kinde only; so if the *Adamick Menstruum*, which produced, the said Animalls, had been intended to remain always upon the Earth, in the same prolifick State; it would then have produced them, of neither Gender. For as *Nature* never made any Thing in Vain; so it never ordains, *two* effectuall [p. 110] Means, for *one* and the Same End: But the all=knowing God; foreseeing, That the raising the hills, would prevent such productions; Did therefore Cause the Earth, to produce the Severall Species of Animalls; as well in the Female, as in the Masculine Gender; (tho' the latter first,) to the End the like *Menstruums* might, (between them,) be perpetuated; untill the finall Desolution of all Things; or at least, till the Earth dos cease to send forth its Rainy Sweat; for the Production of Vegetables for the use and Subsistance of such Animalls.

Now the manner of Generating and Nourishing those great and lesser Creatures, was at first, doubtless the same, with what we now finde in generating other Animalls by *Æquivocall* generation to this Day: (viz.t) The abovesaid Heat, being Engendered in the putrifyed *Menstruum*, or liquid matter, lying in Ponds or Lakes on the Earths Supficies, and giving motion thereunto, as is before observed in the hatching Oviparous Creatures; It began to forme or generate the Heart, and therewith the Body and members; and by the *Umbilicall* Veins, (as experience tells us, all oviparous, and other Animalls have;) it administred and conveyed, the aforesaid *Chylous* Water of the Earth, wherein they were generated, for their increase and Nourishment; (for *that* alone is the Mentruum, which produceth the Body; and the Earth but the *Matrix*; as is evident in the Maturating, the Seed of all Vegetables.) untill they were grown to such Maturity, as to break off, the said Umbilical confinement; And being then, and thereupon, capacitated for *Local* motion, they frequently returned to their respective Menstruous Lakes, to Suck (or drink,) thereof: Untill they, (to wit) The *Horse*, *Cow*, *Sheep*, &c. could Sufficiently feed on Grass, which God had before commanded to be brought forth, for their use, or Sustentation: After [p. 111] which the *Lyons*, *Beares*, *Eagles* &c. were brought to maturity and capacitated to pursue, and take their prey; as being First, brought forth for them; and so of the Lesser Species in their order, for there was then, no other Damm to give them Suck; and therefore they must be nourished (as well as produced) in the order, and manner aforesaid: And, (as has been hinted,) we may also from thence, reasonably conclude, That the Beasts of Prey, were the last Creatures, that were produced; (respect being had to the magnitude of their Severall species:) For as the greater Animalls, of what Species Soever, were generated when the Earth was almost level: So were the lesser, proportionably, as the Hills, were raising; only Man excepted, unto whose Wisdome or Authority and for whose Subsistance, the greater, as well as the Lesser of every Species, were, and are Subjected, & made a Prey.

And seeing it is, by the precedent lines, made evident, That the Earth was almost Level when the great Animalls were generated: And that the hills and Mountains, that we now see thereupon, were raised afterwards; (as by the following lines will more fully appear,) we may from hence inferr; That those thinn Stones, or Slates, that are now posited in any hill, how Steep Soever; Did (then, (to wit) when the said Animalls were Generated, and the hills not raised,) all of them lay Levell and parelell to the Horizon; as is discribed in Fig: the 1st and 8th.[123] From whence we have this as a *Corollary*, (namely) That if we should be required; to take any such stone or Slate; (though its position whilst in, (or out of) such a Steep hill, should *now* make an Angle with the Horizon, of 20. or 30. Degrees, more or [p. 112] Less.) Yet I say should we be required to take, any such flatt Stone, and put it in the *Same*, position, as it was two or three Dayes, before Adam was Created; it is but to place it parelell to the Horizon, and it will then be posited again; in the same position, as it was, so many thousand years Ago:[124] And this is evident, because the Bedds of Earth and Rocks; were at first, all of them Horizontally Levell, as before Asserted. Haveing, by the way, made this Observation, I pass on, to the raising of the Hills & Mountains Now Visible on the Earths Superficies.

God *Omnipotent* by his previous quallifying of Matter having thus farr, formed the Earth; and replenished it, with Variety of *Vegetables*, and *Animalls*; and by his Omnicience fore=knowing the Effects that would ensue; if the four Quarters of the Earth, should continue in their prestine Smoothness, and fertility; Did therefore cause the internall Animateing heat and Motion, within the Earth, after it was hardned, (as the matter of the Egg must be before the Leggs, Wings, Bones &c. can *bud* forth;) gradually to raise up, and proturbate, these numerous Hills and Mountains, wherewith it is now, almost generally Bestudded, and Indented: Which being fully Effected, the Earth was thereby compleatly Formed; and its *Animation* wholy Accomplished: And hereupon it was, That the Waters were generally gathered together, and the Dry Land appeared: as *Moses* has, most Philosophically, and as elegantly, expressed the same.

Now that those Hills and Mountains may not be esteemed needless, or (as a Worthy Person, in his Theory of the Earth,[125] lately deemed it;) a Deformity, or an accidentall chance; I will therefore presume, tho' it has been already [p. 113] hinted, to give a Reason for the necessity thereof. For if the Hairs of our Heads, are all numbered; and a Sparrow cannot fall to the Ground; without our Heavenly Fathers pleasure; surely much less, can the least of those Hills or mountains, be raised; without the like providentiall appointment. God has not made any thing in Vain; But if we cannot see the *Cause*; 'tis most certainly ours, but not the makers ignorance: One Naturall Reason therefore, Why the Hills were raised, Was because the God of Nature, foreknowing That the heat of the sun, and the internall Heat of the Earth, would constantly cause a Respiration of its humidity, as all other Animalls in sweating do; and that, That Humidity, by not returning to the Ocean, (as our blood to the heart, to be kept in Motion,) would therefore continue, to Exert its plastick faculty; in Generating, and forming such great Creatures, as were at first brought forth; so that in process of time, by the Continuall Generation, and putrefaction, (or rotting) of these great bodys; both Vegetable and Animal; the Land part would have been Increased, and the Sea, by the not returning of the said Exhalations, (or rather Respirations,) so diminished, as to be turned into a fixed Salt; whereupon its motion would totally cease; and an unavoidable destruction thereupon ensue. To prevent which the Hills and Mountains of the Earth; were, as is said, by the internal Energie of its plastick or Self=forming power, gradually thrust forth, and raised up; as naturall as the *Budds*, *Limbs*, and *Knots*, are thrust forth in any liveing Tree, or other Vegetable or Animall whatsoever; That thereby, through the Vallys, the said Exhalations, might finde a more facile, and expedite passage, to return to the Ocean, to be therewith kept in Motion; and the said Fatal Consequences thereby prevented. [p. 114] For doubtless, if the Waters of this Globe or Earth, should Sustain such a Stagnation; or the Earth be any way deprived of its pulsation, and thereby, of its Diurnall Motion; (Seeing they depend upon each other) it would thereupon precipitate towards the *Sun*, and by it be sett on Fire, in like manner as we saw, it happned to the Great Commet that appeared in 1680.[126] Whose brush of misty Raies, or Vapours, (arising from its Calcination,) did, to appearance, when setting, extend to at least, forty degrees in height above the Horizon; And doubtless, whensoever the generall Conflagration mentioned in Malachi 4:[127] shall be accomplished; (If it be not miraculously effected,) it must be, by such means, as we have now described.[128]

And that this *encreasing* the Land, and *diminishing* the Sea; by the means aforesaid, is no groundless Supposition, will appear even to a visible Demonstration (namely) because the Earths Surface, is generally to the debth of 2. or 3. Foot more or Less, covered over, with a kinde of Black or other coloured Garden=like Mould, though it be Rocks, Cley, and other different matter immediately under it: Whereas the four terreane parts of the Earth were raised, by transposing or emtying its Marine Parts thereupon; And therefore it cannot be supposed, nor is it found by experience, That the Bottome of the sea did, or dos, consist of, or could afford, such sort of Mould to cover its Superficies withall: And therefore it must be otherwise acquired, which we conceive was in this wise, (vizt) The Earth being at first covered over, in some parts, with such matter as produced *Cley*; which in drying Crackled into small peices, and were afterwards hardned into Stones; In other parts, with such matter as is now become sand, and Gravell; a Third Flint, Pebles, &c. [p. 115] I say the Earth being at first thus formed, and, as has been shewn, also covered over with divers Lakes and ponds of Water, which then plentifully produced divers sorts of large Vegetables and Animalls; who liveing but for a Time, and so decaying; were afterwards rotted and turned into such Mould or Earth as is before decribed: and by its soe plentifully doeing at first, and still continuing, (though in a much lesser degree) in generating and decaying; for so many thousand years;[129] the said mould is thereby increased, to the debth of 2. or 3. foot as we now behold it. And that it was by this means Increased, is further evident, not only because to this day, the more fertile the Ground, the thicker the mould: But also, in that the Grass, Corne, Wood, Bones, shells, &c; (all which, is but only Water fixed.) that is produced, in one year, by the said Serous Vapours of the Earth and exhalations of the Ocean, (of which who knows how many Ton is required to make one Ton of Timber;) is not, or naturally cannot, in the *same* year be rotted and turned again into its originall ffluidity; without which, it cannott return again to the Ocean, from whence it dos constantly proceed: And therefore, Whatsoever was or is, Anually left remaining; either of Animalls, or Vegetables; did, and do, still encrease the Debth of the Earths surface in manner aforesaid. Whence we may well conceive, that the Cause, why the Hills were raised, was to hasten the returning of the Water; to the End it might be prevented from being embodyed, into such large Creatures, as would have encreased the Earth and diminished the Ocean, even to such [p. 116] a Degree, as would have exposed it, and us, to the destructive consequences before mentioned. and.

Haveing now hinted, that the waters do originally proceed from the sea, it is to be observed, That many have affirmed,[130] That the Springs and Rivers are produced, by means of the Waters passing from the Ocean, through the Earth; And Not by the

Clouds, and Rains, falling thereupon. Which Doctrine I conceive to be inconsistent with Reason and Experience: For, as the Wise man affirmeth and our Experience teacheth: *all the Rivers run into the Sea*: Therefore their Springs & Fountains must needs be *higher* than the Ocean is, whereinto the Rivers disgorge themselves; or otherwise they could not desend and fall thereinto: And inasmuch as it is manifest, that water cannot raise its self, above an horizontall position; and the spring head, must, as is said, be *higher* than such a position; the sea can by no naturall means, be the Author thereof, otherwise then by affording its Respirations, or Raine, to fall upon the Earth as aforesaid. Nay, I would desire the wisest *Pholosopher*, or Naturallist; to Shew a Reason, why the Waters of the Sea may not more easily run to the head of the spring, by the open mouth of the River; than to press thro the Pores of the Eearth; and unnaturally raise its self, above its Horizontall Levell; that therebv it might be capacitated, as is falsely pretended, to return again to the Ocean: I could further confute this Doctrine but a Word to the Wise is sufficient.

It being in the foregoeing lines made evident that the Earth was hardened into stones &c. before the Hills were raised, and the Cause of their raising being likewise declared. [p. 117] We now come to Speake of the *Time*, that (according to probabillity may naturally, be required or spent in forming the Earth: And herein it is to be observed, That an *Animall* (the largest whereof, is but as an Attome, if compared with the Earth) is not, out of a lifeless liquid matter, converted into a Liveing Body, in an Instant; but in some measure, a Time proportionable to its Magnitude is required, for its Generation; as some of lesser kinde in one Month; some of greater in eleven, and the Elephant in eighteen; so neither must we imagine, That this vast body of the Earth, consisting of 21600. Miles in Circumference, could, according to the course of Nature (which is the only means that we doe herein pursue, and not the power of the Creator,) be thus converted from a soft fluid Substance into hard Rocks, Cley, sands, &c. in a *Moment*; but that some naturall proportion of Time, according to its Magnitude, might be thereunto required.[131] For if soe small a Creature as an Horse, Cow, &c. dos, as is said, require almost one year for its forming and hardening into Bones &c: surely the Earth which is soe many Thousand times greater, might probably require what is now equall to many Years for its forming: And therefore the Words of Moses, when he speake of the *six* dayes Labour, must (as I humbly conceive) be understood as when parts, passions, and Members are ascribed, to the Creator of all Things; (viz:') but only to Sute or adapt Things, to the weak capacity of humane understanding: For seeing it is evident from the Words of sacred Scripture, That a *Thousand years* with the Lord,[132] are but as one Day, [p. 118] why may not the *first* four Dayes, (to wit) untill the Sun and Moon were made; (see Gene: 1. V. 16.)[133] or till the dry Land appeared, and the Earth attained its Diurnall Rotation; or at least whilest the Light was produced by the spirit of God moveing upon the face of the Waters: I say, why may not one such day, be equall to many years: For seeing, as has and will be shewn, The Rotation of the Earth, is caused by the Disparity in the Flowing of the Ocean, And inasmuch, as whilset the Earth was *all* Fluid, (to wit) till the four Quarters were raised, there could be no such inequallity, or Disparity in its Flowing; And therefore no Rotation; and Consequently no measure of time: (Because *that*, is measured only by the Earths Rotation,) From all which, I say it is very probable, That the first Three Dayes, might at least be many hundred times Longer than now they are; Therefore &c: And this *slow*, or *want of Motion* in the Earth, will in some measure appear, from the Motion mention in the said Egg; which at first is so languid, as to be Scarce discernable: Nor is there a perfect Locall Motion attained; untill the Body is as it were, Maturely Generated: But that which makes it further evident is from the great *Oyster shells*, and others, That are found immassed in the Rocks; which though they doe naturally require severall years to attaine such largeness;[134] yet they must be fully grown whilest the Earth was generating; or otherwise, they could not be incorporated therewith, & immassed in the Rocks as aforesaid; And, (which is more,) The Fishes that were in the Shells, at the forming of the Earth, must be quite Rotted, before the thin, *cleyish*, *Stoney*, and *Mettallick Matter* could enter into the shells to fill up the Cavity wherein the Fish formerly lived; (thereby makeing the [p. 119] Forme of the said Fishes, of perfect stone &c:) as we now plentifully finde them: And how Long Time such rotting (or as it were annihilating) would naturally require, when soe covered from the Air, Who is he that can determine? Nevertheless, seeing the truth of what I have, (in Generall) advanced, dos not depend upon this particular; I leave the reader to judge thereof as he pleaseth: Now if the Earth, was, as is very probable, many hundred years (or rather what was equall thereunto) before it was fully formed: And inasmuch as all great Animalls were generated before the Hills were raised, (tho' not before the four Quarters of the Earth, were raised some what higher than the Ocean, as before is shewn;) It will necessarily follow, That whilest the hills & Mountains were *gradually* buding forth, (for Nature abhorreth Violence) there must be in that long space of time, a very plentifull Increase of Land Animalls and Vegetables, (as well by Copulation and seed, as otherwise;) as we finde by the Rocks &c. there were of fish=animalls before the four Quarters of the Earth were raised; Which being granted; we may easily learn, that the *Bones* and *Trees*, that are yet to be found buried and mingled with the Earth, (tho' not immassed therein; because they were not brought forth *till after* the Earth was hardened,) were such bones, and Trees, as happened to grow or stand upon the Edges of the Hills, at the Time when they were almost or fully lifted up: Which Hills being raised to such an height; as some of them to make an Angle with the Horizon of 50. or 60. degrees in Altitude; I say for such Hills as were soe very high raised, some part of them, when come up to such an height must unavoidably tumble down; and haveing then Trees, or Animalls, standing thereupon, (tho the Trees stood perpendicular before the falling of the Hills) must of necessity fall down with them, and be buried; with whatsoever Rocks or Rubbish, did accompany the same; as the Trees &c: standing on the hill at **A.C.** Fig: 3^{d}[135] do plainly intimate. And that the Rocks, and Earth, did thus tumble down, you may see Visibly manifested, (as you Ride [p. 120] on the Rodes) in almost all Steep hills whatsoever, which I desire may be accordingly Noted: For at that End Which the Ranges or Strata's cuts the surface, (as at A.C.) the Rocks & Rubbish, that have so fallen, do in many places, yet remain in that fallen, or irregular position, to this day, though the strata's in the remaining part of the Hills are still exactly parellel to each other, as before described.

And for further Confirmation, That the Earth was not replenished with the larger sort of Animalls and Vegetables, untill *after* the Matter was hardened and fit to be raised into hills, as has before been shewn, is evident from this *Phænomena* in Nature; namely, That notwithstanding there are, as is said, such plentifull Numbers of shells, immassed in the midst of those vast Rocks; yet we can rarely finde, any such Trees or Animalls incorporated in them in such manner as the Fishes are; Whence 'tis plain, that these Trees and Land Animalls must be generated after the Rocks were hardened: And Consequently were tumbled down by the raising of the Hills as aforesaid; or otherwise they could not be found, only mingled with the Rubbish, that fell from thence, and not incorporated in the Rocks as the Fish shells are. and,

As for the Manner how the said Land Animalls, and Vegetables were *preserved*; It must either be, from their being covered up in the said Rubish, and soe allwayes kept in one State of Moisture; or else, their sap being exhausted, the then petryfying humidity of the Earth, filling their pares, preserved them, by converting them into a Stoney Substance: And for the Confirmation hereof, we have an Instance of the first, Way of preserving them, at the Bottome of a very steep Hill near *Shaston in Dorsetshire*,[136] where I lately saw severall Trees that were digged out of the ground, adjoyning to the Foot of such a steep Hill, (one whereof was 20. or 30. Foot long, and about a Foot Diameter, which doubtless was [p. 121] tumbled down and preserved, by being covered over some depth under the Earth, as was before proposed; And of the Second sort (*namely*) *Petrafied Wood*,[137] may be seen in severall places in this Kingdome, in particular amongst the Curiosities of Grasham Collage; And doubtless in this manner especially by the first were the Bones of Animalls, (being of equall or greater duration) likewise buryed and preserved.

Having thus given you my Thoughts concerning the forming of the Earth, and how the Shell=Fishes and other Animalls, and Vegetables, were produced therefrom, and involued and preserved therein, I now come to Speake a word or two concerning the ***DELUGE***[138] of Water that was brought upon the Earth, in the Dayes of *Noah*; And herein you may observe, that I have wholly excluded, that Flood, from haveing any share, in bringing the said shells into, or upon the Earth; and that notwithstanding the Opinion of many learned, and otherwise ingenuous persons to the contrary; who I perceive finding the shells in and upon the Earth; and haveing been told, either by *Philosophers* or common Fame; that the Said Deluge brought them thereupon; have therefore taken the same for Truth: And to Reconcile their observations to the said Report, or to their own Opinions; have Rack'd their Braines, and as it were unhinged Nature; to make the said Flood the naturall Cause thereof: But if because there are shells found in, and upon the Earth; and only because common report tells us, that the Flood brought them thereupon; when the *Sacred* Writings, are silent therein; and *Nature*, and *Reason*, will not admitt thereof: I say if we must believe it, only because it is soe reported; we may as well be imposed upon to beleive the fabulous Stories of a Generation of *Faries*, and their circular Danceings: For as we have shells found in and upon the Earth; soe we have likewise green Circles, frequently found in the [p. 122] Grass, which common Report, tells us were made by the Foot Steps of that pretended Generation. Whereas if we examine into the Cause thereof, we shall finde (If it were but only by cutting up a Turf, in the said Circle) that their originall, is not from the footsteps of those or any other Creatures. And not only from thence but inasmuch as the Cause thereof has been otherwise fully accounted for, by *D^r. Plott*[139] and some others, we may therefore reasonably conclude, That the very being and pretended footsteeps of such a Generation, was at first, only a Poeticall or Fabulous Invention; and perhaps designedly continued, by the popish Priests, before the Reformation (for since tis not generally believed, tho' the Circles are as common as before;) to amuse the Vulgar; That thereby, they might carry on their Cheats with the greater security: fforasmuch therefore as this common saying, was Certainly Entertained, through Ignorance, and too much credulity; soe the opinion of the Antient, and modern Philosophers, concerning the *time* when the shells were incorporated, did in like manner proceed from a like credulity; or at least, from the want of a due Examination into the Reason of their being posited, as before Described. But tho' I disallow the Flood to bring the shells &c. into the Rocks, and the very being of such a people; Yet I would not have it thence inferr'd, that I disbelieve the being of such a Deluge, as might Destroy the Inhabitants of the Earth; it being not my Intention to disallow thereof, or to intermedle therein: What I chiefly contend for is this, (viz^t) That the waters of the Deluge, if they were what we now call waters, could not naturally, (for we pursue no other means) at that Time, nor at any other, dissolve the Rocks and Mountains of the Earth, and mingle and immass the shells thereinto, as we now finde them; notwithstanding it is so generally allowed by others, and that [p. 123] for these further Reasons following, amongst others that may be offered.

First, **Because** if so, The water must then, be much stronger, and more Corrosive in its nature, than *Aqua fortis* or any other Liquor, of what nature or kinde soever,; For otherwise it could not have such an Effect, as to dissolve the Rocks & Mountains as is Vulgarly Supposed.[140]

Secondly, If the waters at the Deluge, were of such a nature, Then the whole *Species* of Fishes, how large soever, must unavoidably have been thereby totally destroyed: And forasmuch as no *Whales*, nor other Fishes, were preserved in the *Ark*; There must have been, If not a new Creation of them, at least a new plastick Nature, or forming power, infused into the waters; or otherwise it could not have produced the Variety of Fishes that we now Finde living in the Ocean, and

Thirdly If the waters did then so dissolve the Rocks and Mountains; there could have been no Mountain standing at the Deluge, for the Ark to rest upon; as we finde there was, even whilest the waters were upon the Earth: see Gene: 8th V. 4.[141] and

Fourthly, It may be thus argued;

1st Either it *was*, in the nature of Water,
or
2dly It was *not* in the nature of Water,
} to dissolve the Rocks and mountains of the Earth.

If the *first*, then tis no less than a Miracle, that they were not dissolved a Thousand years before the Floud: or else some Thousand years since: As also that they are not *so* dissolved, at this very Instant, and,

If the *second*, Then tis as great a *Miracle*, That they should (as is pretended) be thereby Dissolved, at the time of the [p. 124] Deluge. But that they were not Dissolved, *before* the Floud: Nor at any Time *Since*; Is not, nor cannot be denyed. And That they were not Dissolved, *in* the Floud is Evident from the third Proposition beforegoeing.

Wherefore the said Rocks, and Mountains; have not, either Naturally or Miracuously, been Dissolved, ever since they were first hardened *in*, *at*, and *after* the Creation.[142] And therefore the shells could not be admitted thereinto, at the Deluge, or at any other time, But only *before* the Earth was hardened, as is before described and Asserted: I shall not further enlarge hereupon, other than Appeal to the impartiall Reader, Whether from what is contained in the foregoeing Lines, it be not more Reasonable, and Naturall, to conclude, That the Earth was Generated from an Aquous fluid matter, and thence hardened, into Rocks, sand, Cley, &c; and the mountaines raised after it was soe hardened: And That the shells were immassed or incorporated in the Rocks, *at the Geneating* of the Earth, when the matter was soft and tender; and no Mountains raised; as is before Asserted: Than it is to allow it to be done after the Earth was hardened (to wit) at the time of the *Deluge*; which must leade us into so many improbable Consequences, and unavoidable Absurdities.

Having thus shewn, how the Earth was from a fluid matter formed, and converted into a *Living Animall*; and how the shells were brought thereupon, and immassed therein; as also hinted at the naturall Cause, of the Ebbing and Flowing of the ocean, *How* and *when*, the Mountaines were raised, &c. I shall at present conclude, with this one *Theologicall* Use, drawn from the premises (viz.t)

There are, as in times past, many who say, (at least,) in their Hearts, *There is no God*; Psa: 14 V. 1.,[143] That the Earth, was not Created, nor had any beginning; but was ever the same as it now is, and will soe [p. 125] continue, even to all Eternity.[144]

Now altho what is before delivered is sufficient to prove, That the Earth had a beginning, and is Therefore not eternall; yet for the further Confirmation thereof, I will endeavor to prove the same, by putting my Argument, into this *Syllogisme*.

Whatsoever was, or is, from *Eternity*, or had no beginning; was or is, *eternally the same*, without the least Variableness, or changing whatsoever; either in *Nature*, *forme*, or *substance*.

But the Earth was once, a *smooth*, *soft fluid matter*; and is now converted or changed; into *hard Rocks*, *stones*, *sand*, *Mountains*, *Hills*, *&c.*

Ergo; the Earth was not from *Eternity*.

The Major, being undeniable, and the *Minor*, demonstrable; even to *visibility*, (from the fish=shells &c. being immassed in the Rocks as aforesaid,) *The Conclusion* must be unavoidably granted.

Wherefore, to that Eternall Existence, that Created, commanded, or brought forth *Matter*, out of *nothing*; and also infused thereinto its *plastick*, or self=forming power; and thereby Generated or made, not only this *Globe* of Earth, but even the whole *Universe*, and all Things therein contained; be Glory, Honour, and Adoration, for ever and ever. *Amen*.//

Finis:

(1) [126]

A Postscript

Shewing the two places where the Tydes are originaly moved, and where they meet: as also the mañer of their Flowing.

'Tis almost ten years Since I composed what is generaly contained in the foregoing Treatise;[145] and although I was well assured from observations and reason, before I entred thereupon, y^t y^e waters in y^e Ocean were made to Ebb & Flow, by being lifted up, in some certain place or places thereof, as is before Asserted, & not by any *Lunar* Attraction or Pressure Whatsoever: yet when I came to treat of the Said places [*where*] they might be So moved; I then found, That that Discovery could not be attained, unless a Generall Account of the Setting of the Tides, in the Severall parts of the Ocean, could be procured; w^ch I then dispaired of; & therefore proceeded to y^e other Sections: Leaving y^e sd place or places, where y^e waters were moved undetermined, and y^e whole, in that respect, Imperfect: Tho' since I have Conformed it, as Occasion required, to y^e following Discovery. But notwithstanding I then, as is said, thought it Unattainable; yet I frequently wished & Endeavoured, for Such a *Register*: And y^e rather, because during all this Intervale I could never see any *Phænomena* in y^e Tides; Nor any Character imprinted by nature in y^e earth; but w^t Ecco'd to & Confirmed, w^t I had conceived thereof, & is before delivered: Now haveing, I say, thus Endeavoured, I accordingly, Some few months Since, met w^th a large Folio, entitled y^e Lightning Collumne or Sea Mirour: Printed [p. 127] at Amsterdam Anno Dom̄: 1701.[146] In which I found a full account of the Setting of the Tides, for almost all the Sea Coasts, in the Westren or Atlantick ocean and North Sea, plainly entreed and Recorded: Which Volumn you will find to be industriously compiled, from the Observations and Experince of Divers Mariners; (especially of the Dutch,) as they had in many Ages, in their Severall Voyages entred the Same. But when I came to read these Various Accounts: I still found a great Difficulty in this Enquiry; For although they were plain and perfect; Yet were they so numerous and promiscuously placed, as that it was imposible to forme or concive, any Canonical or Regular Idea, of their *General* Setting, by the bare reading Thereof: Because as fast as we Read of their Setting on one Coast, those of the others, would be either forgotten; or at Least become confused. Whereupon after some thought and Reasonings on these Difficulties, I conceived there might be some Device to Supply the Said Defects; and in Order thereunto, I prepared a Large Mapp of the World,[147] of which this annexed is a Compendium, whose By=Section I made under the Meridan of Natal in Africa; and placed the Continents, in respect of Longitude, according to M: *Mol's*[148] and others, late Discoveries; as conceiving Such a By=Section most proper for Exhibiting the *Marine* parts of the Earth: And when I had thus done, I look the said Volumn, and what was incerted therein, Relating to the Course or Setting of the Tides, I forthwith Delineated, and entred into the said Mapp, by only placing the Characters of small Arrows, with their heads pointing which way, and on what point of the Compass the Flouds do sett, on the Several Coasts, as fast as I read them: Whereupon I had by means of the said Arrows, at one View, or cast of the Eye [p. 128] whatsoever was contained in the whole Volumn, relating as aforesaid, plainly represented and Described. And haveing thus Succesfully obtained, So Compendious a contraction, and made such an instantanious Representation, of what was So Volumniously Treated of, and So many Ages in Collecting; I resolved to prosecute the same in other parts of the world: And accordingly I procured other Lightning Sea Columns, and Severall other Volumns of Navigation, as M.r Sellers,[149] and other, English Pilots: M.r Thornton's[150] Oriental Navigation in Folio, M.r Dampiers,[151] M.r Roger's[152]—and other Voyages round the World; and after I had in Like manner entred the Characters, according to what was recorded in those Volumns: I Visibly perceived; by the pointing of the Said Arrows, that the waters in the North Hemisphere; do generaly Set or Flow towards the South: And on the other hand, those of the South Hemisphere; do in like manner, Generally flow towards the north: From which Visible and undeniable Phænomina (with a kinde of admiring Speculation,) I plainly discovered, *That the watters of the Ocean, are orginally moved at the Two Poles of the world: And do ultimately meet, in or near the Æquinoctiall Line.*[153] Now that this is the genuine and Natural motion thereof, is, in Some measure, confirmed, from the very shape in which the Earth was originally formed. (Viz.t) in that the two grand Continents of Land, and the two great Oceans of water, do all of them, range a long with the meridians, from North to South; which was doubtless, by nature, So designed, on purpose to admitt, and further the Said Motion: For if they Should have trended, from East to West; it would have interupted, or wholy prevented the Same. And what dos further Confirm this Doctrine, is, In that the many great mountains, or Island=like sholes of Ice, that are annually found Swiming in the North part of the Atlantick Ocean, are always observed to Soar along, and make their way good, as 'tis called, from the North to [p. 129] the Southward; even till the heat of the Sun has totally dissolved the same; as the mariners, treading to those parts, do generally testifie: And doubtless, the like Sholes would be found, coming from the South Pole, towards the North, if our Navigation did lead us there, to make the like observations. Another Instance which confirms the Said Doctrine is, in that the Tydes, do generally run much Swifter, and rise much higher, in these and the more Nothern parts of the world, than they do between the Tropicks, and near y.e Æquinoctial Line:[154] Now that this dos prove the Said Proposition is evidenced by the Experiment of the water in the Sute; mentioned in Sect: **III**, whereby it appears, That water will naturaly Run Swifter and rise Higher, at, and near the place where it is first Sett in Motion, than it will at a greater distance: From whence it is evident, That as the knowledge of the place where it is first moved, dos now show us the *Cause* of the Said Phænomena, to wit, of its rising highest in the Nothern parts; So the said Phænomena, dos as plainly demonstrate, That that must be y^e^ place where the Tydes are first moved in the Nothern (and, doubtless, in the Southern) Hemispheres: By all which it is manifest that the motion of the water is such as is herein before and after described.

But if notwithstanding what has been Said, any person (through their affection to the immaginary and medly Influence of the Sun and Moon,) shall object, That I might be partial, and not Sincere, in those deliniations; and consequently, disbelieve the truth of this discovery; my Answer to such is, That I refer to the Said Vollumns for my Iustification; with this confidence, as to challenge all the Philosophers & Mathematicians in Europe, to Confute the Said Doctrine; either by the Vollumns before mentioned, or by any other, (if such there be,) of like nature. And as for the Sincerity of the Mariners, that recorded those observations, it being done in So many Ages; and by Such Variety of persons, it would be absur'd to Suggest, that they should be fraudulent therein; as not knowing [p. 130] What they had entred, would ever be used, to produce or warrant Such a Discovery: And therefore, if it should be Suppos'd, that I have been Misled in any particular, it must proceed from their taking a Trade=wind=Current, or the like, for a Natural Tide; & not from the Partiality or designe of the Said Authors, or my Selfe. And as for the Objection that may arise, on account of the waters Setting with the Trade=Winds, Monsoons, &c: I shall briefly Answere, That that Motion, is only on the Surface of the Ocean; and that under its Surface, the Tydes have their natural Course, as before described: and accordingly M^r^ Dampier[155] has told us, That he found, under the Surface, a different motion therein, (by his observations) when under the Clymet, where the said winds prevail. Inasmuch therefore, as the Vollumns before mentioned are impartially compiled, and the Delianiations in the Mapps, accordingly Drawn; and consequently the aforesaid Proposition, thence arising, fully confirmed: I shall now pass on to the further Explication thereof. And as for that part of the Mapps which relates to the general Setting of the Tides; it is So visible, That 'tis need less to Say more, than only acquaint; That as the Arrows heads, do shew which way the Water flows, 'tis but naturall to conceive, That it generaly Ebbs, on the opposite point of the Compas: And where you See them pointing one against another, as on the East of Ireland, and on the SouthEast of England; there the Tides do accordingly meet each other. And as we know, there is no concussion at their meeting, in these, and other like places; So wee may be assured that there is none, at their returnings or meetings under the Equinoctial, or at y^e^ Respective Poles of the world; and consequently the waters are there as Navigable, as in other places of [p. 131] y^e^ Ocean: And this I hope may Suffice in brief, for the Original, Course, and Meeting of the Great Waters; as also to Shew by what means I obtained the Discovery thereof: (to wit) From what is Recorded by Mariners, in their Several Observations as aforesaid: And Seeing this Method wherein I proceeded; is the Same by which M^r^ Halley, in his Late Mapps,[156] has delineated the Variation of the

Compass, and the Trade Winds; I See no Reason, why this Should not be equally accepted and approved. I Shall now proceed to Some other Observations, that Succeeded as Corollaries form the frist Discovery; For as in Algebraical and other like operations after the Aquation is discovered and the Solution brought to Light; there frequently ariseth, Such Consectarys and Aphorisms, as before were not expected; and Sometimes Such as could not be preconceived: So when I had discovered the places of the Tides originall, and meeting: I likewise found the *Cause* of the manner of their Flowing; which could not So well be known, or conceived, before this Discouery was made: As will plainly appear by the following Lines.

And in the First place it is to be observed, that almost on all the Sea Coasts, from *Ushant* to Cape S^t: *Vincent*, and thence even to the *Canary* Isles; (as you will find by the Said Register,) a S:W: and a N: East moon, makes, (as tis called,) full Sea, for above a thousand Miles together: And not only So, but tis always full Sea, all along these Coasts, Severall hours (*before*) tis So, further up in the Rivers thereunto belonging; whereas in the English *Channell*, as also in the *Mediterranean Sea* and other like places; where the waters runns (by) the Land, tis in both these respects quite otherwise; for 'tis not only ten or Twelve hours difference, in the time of full Sea, in the space of but 3. or 400. miles, in the Said Channell: But 'tis also full Sea in the Rivers & Ports thereof, Severall hours, [*before*] tis So in the Offin or channell it selfe: all which will plainly appear, by the hours shewing the time of full Sea in figure **III** Plate 3.[157] or if compared with the Register before mentioned.

Now the Reason of this great Difference in the flowing of the Tides, will easily be accounted for by this Doctrine, and by the Delineations in the Said Mapp; For tis there made evident even to inspection, That the Flouds on the Said Coasts of Portugall &c; do generally Sett, or devolve, directly upon and against the Land; as it were at One and the Same Instant; For tis not above a point or two Difference, in the 1000 Miles before Mentioned; Whereas on our Coasts, it runns along [*by*] the Land; and is therefore 10. or 12. hours (i.e.) 14. or 16. Points, before it can run up, from one end of the Channel, to the other; as before Observed. Whence we have this as an Aphorisme, That wheresoever you See the Waters Setting [upon or against] any Coast; and running [by] another; you may certainly Conclude, That the manner, and Difference of time in their Flowing; is such as before described. And this will hold true, even in the midst of the Oceans, as well as else where. The Second *Phænomena* to be Observed, is the Violent Course or Setting of the waters, in the *Gulph of Florida*; Where it runns So Strong to the Northward, for Some hundred miles together, that ther's no Sailing against it, though favoured by the Strongest Winds conducing thereunto: Which has Seemed to Some a *mistery in Nature*; But by this Hypothesis 'twill also be easily Solved, & appear to be only naturall: In order to which it is to be Noted, that That part of the Ocean being Scituate within the compass & energie of the Trades Winds; and they, in those parts more especially, Blowing almost full West, (as appears by M^r: Hally's &

other mapps of the Said Winds;) do, as 'tis naturall, drive the Waters the same way with themselves; And forasmuch as the Naturall Course of the Tides as appears by Plate the 3, Figure I. do there Likewise, Set the Same Way with the Said Current: It is as it were visibly evident, that the force of both these Motions, being thus United together, must violently drive the Watters against the Land; by which it being Stop'd; it forthwith Setts to the North; (as you may See it cannot do otherwise,) with that Rapidity as to cause the Phænomena in the Waters before mentioned: And did not the Said Winds become calme on the East Side of *Asia*, there would [p. 133] be the like Phenomena on that Coast, as on the Coast of *America* now described.

The next thing to be noted from Fig: I. and **II**,[158] Plate the third; Is the great quantity of Water, that meets under the Æqunoctial Line; Between 170 and 270, Degrees of Longitude, (to wit) in the South Sea; compared with the parvity thereof that meets in the opposite part of the Globe; (Viz:) between 20 and 150 Degrees; it being there prevented by the **EURO=AFRI=ASIAN** Continent. Now forasmuch as this inequality in the meeting of the Tydes is Visibly manifest; and Seeing God made nothing in Vain we will therefore propose what Effect this may have upon the Body of the Earth: And in the First place it is to be Noted (as in Sect: III.) That Seeing the Waters are moved at the two Poles of the World, at one and the Same instant and doubtless, to one and the Same heighth or distance from the Center: That motion, being Equall, cannot therefore cause the Earth to Ponderate or devolve, either towards the *north*, or towards the South: But when those Flouds, shall come and meet each other under the Equinoctiall line, for at least 5000 miles together, in that great ocean, and not perhaps the Moiety thereof, on the opposite parts of the Earth, (though it riseth near the Said Line but 2 or 3 foot in heigth:) yet I say, being for So many thousands of miles together, it must of necessity bring the Earth out of its Æquilibrity; and thereby cause it to ponderate, either to the East, or West which being constantly repeated, must unavoidably give it that naturall diurnall Rotation, that has, especially of late years, been justly ascribed thereunto: For it is evident, that if a Wheell or Sphere, be equally poized, and its Superficies equally distanced from its Center, as the Earth was in its aforesaid fluidity; and if after that, any thing be (tho but intermitingly) added to one Side thereof and not to the other; yet if that addition, be perpetually repeated, it must of necesity cause it in like manner, constantly to move round upon its center: And the same may be understood of the Earth, from the causes before [p. 134] mentioned: (And doubtless if ever the Perpetual motion be found, it must be in imitation thereof.) Only with this difference, That whatsoever Spherical Body, is suspended in y^e open Æther Unfixed, and therein moved as the Earth is, That primary or centrall Motion, must unavoidably cause it to Seek a new Center; which being likewise, pepetually repeated., must., as Could be easily demonstrated, produce a Secondary, or Orbitall motion; probably, round the Center or place where it first rested, at the Seperation of the Chaos before those Orbs were Vivified; as is Shewn in Sect: **I**, in the preceedent treatice[159]

Having Solved Some of the Phænomena's in the Ocean; and also Shewn that the Disparity, in the Meeting of the Waters in the Æquinoctiall is the Cause of the Earths Rotation; I now come to Explain the Lines P, Æ, P, and P, N, P; Wherein it is to be understood; That forasmuch as the places of the Originall Rising and ultimate Meeting of y^e^ Tides, are 5400. Miles asunder; it cannot reasonably be supos'd, That the Flouds made at either of the Poles, do runn from thence directly to the Said Line, without any Ebbing, in any place, 'till thereunto arrived: I shall therefore, not only Shew, That they do not So pass; but also propose, How many Several Flouds and Ebbs, may, according to the Phænomena's in the Tydes, be at all times existing between the Said places, as they pass on in the open Ocean; And to guide us herein we have these two things that are certainly known.

> First, That the Distance from the respective Poles, to the Æquinoctial, is, as is Said 5400. Miles.
>
> Secondly, That the certain *Mean* time, for one Ebbing, and once Flowing of the Tydes; is alwayes but 12 Hours and 24 Minuits; (though the difference of Spring & Neap=Tydes is alwayes more or less as by the Tyde Table in Sect: II, appeareth.)

Now forasmuch as one halfe of this time is almost in all places of the World, taken up for the Floud; and [p. 135] the other half for the Ebb; it will evidently follow, that when it has flowed 6. *hours* & 12. *minutes*; it must, as Experience confirmeth, begin to ebb again wheresoever it was then full Sea; though perhaps, in that time it has not run above 6. or 700. miles forward from the place where it was first moved; not in Some places half So much; Whence 'tis plain, from these known truths, that as the flouds do pass from the Poles, to the Line; there must unavoidably, be Severall Flowings and ebbings, following each other, at Some certain Distance, before it can Run the 5400. Miles before Mentioned: Nevertheless tis the *first* Floud, by pushing forward the Ocean, that causeth it to flow on, till 'tis Stop'd either by the Waters meeting each other in the *Line*, or by the land on the respective Coasts; as in the foregoing Treatice is more fully Shewn: And therefore Supposing, as it is but reasonable, that at about every 700. miles Distance, there is an *Ebb* as well as a *Floud*; we may justly represent the Severall Ebbings, & Flowings, as you see them described by the Lines P. Æ. P., & P. N. P, before mentioned; in w^ch^ yō^u^ may conceive the waters in one Latitude, Ebbing towards P, P; And at the Same time in another Latitude Flowing towards Æ, & N: For as Soon as it has flow'd the Said 6. hours & 12. Minutes in any Latitude; it thereupon generally Ebbs, or returns again towards the Poles, or place from whence it came: Or to speak more properly, to the next place where it is become Low water; So that if it be full Sea under the Poles, or in any other Latitude, at noon; In about 6 hours and 12 Minutes after, it will be Low water, in all the Same places; as by comparing the hours, in y^e^ Said two weaving Lines with any Tide=tables will more fully appear.

Now to prove that these things are not groundless Notions nor Speculative Assertions, but agreeable to Truth & Experience; I have annexed a Compendium of the Flowing of the Tydes, in the English Channel, in Fig: III, Plate 3;[160] by which it appears, That between the *Lands=End* and *Ushant*, it is full Sea at 6 of the Clock (e.g.) in the Morning: But between *Flanders* and the *Downs*, (which is but 300 Miles from the place first mentioned,) 'tis not So, 'till 3 in the Afternoon; the Difference of which time, being 9 Hours; It must (and Experience testifies the Same,) have been Low=water at the first place, and the Tyde returning thither again with halfe=Floud, by Such time as it is full Sea in the *Downs*: Which fully proves, [p. 136] That there must be Several Ebbings and Flowings, before the flouds can pass from the respective poles to the Equinoctiall, because of the great Distances before mentioned; and that the said Compendium is impartially drawn, I refer to the common Tide=tables; as also to *M: Hally's* accurate map of the English chañel;[161] where you'll find it undeniably verified. Another instance to the same purpose, is what my self observed, when I kept the foregoing Register (Viz^{t}) That in the *Lake* or *Lagune* Lying between y^{e} Isle of *Portland*, and the town of *Abbottsbury*;[162] I found it to be full Sea; at the mouth or Inlett of the said Lake, at Least three hours before it was So, at the other end thereof: As by the Said Register appeareth; For the full=sea at the *Inn=lett* is very near the same as at *Weymouth*, th'o the said Lake is not 7 miles in Length in the Whole. Now the reason of this great Difference, in So Short a space; is partly owing, to the winding about of the water, round the said *Island*; but cheifly to the narrowness of the Inlett: that Leasds into the Said Lake: It being not above 4. or 5. perches broad. Forasmuch therefore as it apeareth that the Tides are hastened or retarded in their Course; in Some Proportion according the narrowness of wideness of their Inlets (For we finde that in the first Instance, where the mouth of the Chanel is large, they run about 300 miles in 9 hours which is above ten times faster than in the said Lake.) I therefore reasonably concluded, that in the wide ocean where its Course is not interupted by winding about or otherwise; it might there Flow, 6 or 700 miles in 6 hours and 12 minuts; and ebb as much in the Same time: Which is the reason that induced me to asigne So many miles, for one ebbing and one flowing in the great ocean. From which Instances, together with divers other appearances in Nature, we may reasonably conclude, that in all probability, there is not less than nine or ten Flouds, and as many Ebbs, alwayes Existing between the respective Poles, and Place of meeting; and accordingly we have represented the Same, by y^{e} weaving Lines before mentioned: And tho we cannot pretend fully to demonstrate, their certain number; yet wee can further prove that there are severall [p. 137] of them So Existing, by what we further Experience, in th English Chanel before Mentioned, For you See at the *Entrance* thereof in Fig: III, Plate 3,[163] 'Tis full sea at **XII** a Clock, (e.g.) at Noon; But between *Calis*, and Dover, (by the coming up of that Floud, as the Hours between the said places do manifest,) it is not So, till **XII** at night: Yet at that very **XII** at night, there is another full Sea again, at the said entrance of the channel, which is made by the Floud coming from the *West*; and the Ebb returning from the *East*: And according to this manner of Ebbing and Flowing the Waters are there, and elsewhere, agitated from one full Sea to another; Whence 'tis evident, That there is constantly no less than two ffloudss existing, at one and the Same Instant, in the Said Channel, within the Space of 500 Miles; and therefore there must be many more within the distance of 5400 Miles, as was before Asserted.

The next thing intimated by the Said Weaving=Lines, is, That the Tydes or Flouds do loose their Energie; and gradualy diminish their Heighth, and Swiftness in Runing; and also the distance in their approaches to each other, according to the distance, as well in respect of *Time*, as of the *Place*; when and where they are first moved. From whence we may plainly discover the *Cause* why the Waters do generally Flow So faint and inconsiderable, between the Tropicks and near the Æquinoctial; to what they do near the Poles, where they are first moved: Which Faintness M^r Dampier,[164] and others, have well observed and entred, in their respective Voyages. For although 'tis Observed, That where the Tydes of floud do pass through any narrow Streight or In=lett, to Supply any large Bay or Lagune; the Flouds at Such In=letts, do comonly Run very Swift, and rise very high; and also flow longer, than what is usual elsewhere: Yet nevertheless at the bottome, or further end of Such Bayes, the Motion is in all these respects quite otherwise: For in *Baffins* and *Hudsons* Bayes, in Lat: 70 deg: North; Where it runs So Swift at [p. 138] the In=lett, as that it riseth 50 Foot parpendicular; and Flows about 9 Hours, and Ebbs three, (both making the mean time before mentioned; as it dos likewise at the Port of *Weymouth*, where 'tis 4 Hours Floud, 4 ho: Ebb, and the remainder dead Water;) Yet I Say, notwithstanding this great Swiftness, and rising at the In=lett, we finde that at the farther end of those Bayes, especially where it Runs to a great distance, as in the Mediterranean Sea, and other places; the Motion becomes So faint and Languid, as that it riseth not above one or two foot in heighth; and in Some places, as in the latter, the motion becomes So Slow, as to be Scarce discernable: The time in Flowing, and Swiftness in Runing, being also diminished accordingly. From whence, as also from the *Logarithmetical* Motion, which I discovered in the Tydes, mentioned in Sect: III, I was taught to make the Weaving Lines P, Æ, P, and P, N, P; [Decreasing] in heighth, and distance from each Floud; as they [increased] in distance, from the time, and place; when, and where, they were first moved: And according to this Weaving forme or Motion, we ought to conceive, all the Waters in the Ocean generally to Flow, or to be alwayes agitated; as before declared.

And it is further to be observed, That if any of these, though but faint Flouds, do flow against, or before the Mouth of any, considerable Rivers It will So Stop their Course as to cause great Risings in Such Rivers though the Waters in the Bays do rise but very little; As appears by the Flowing 15. Foot at Port Nelson on the S:W: of Hudsons Bay, (and divers other Rivers), tho' the Flouds are there So faint as before Observed.

And here it must be also remembred, That none of these Occasionall, or particular great Risings, or Long flowings: Ought to be regarded, or had in competition, with the true genuine or naturall Motion of the Tides, in the wide Ocean: For although, (even towards the Æquinoctial,) there are almost [p. 139] Such Flowings, at Such In=letts: as at the Lagune of *Trist* in the Bay of Campeche[165] Lat: 17 deg: North: where it riseth 6 or 7 ffoot: And at S^t.^ *Michael*,[166] on the West Side of America Lat: 5 Deg: North; where it riseth 20 Foot: As also at the Streights between *Nova Holandia*, and the *Malucca Isles*, Lat 15 Deg: South; where it riseth 30 Foot: Yet I Say, notwith=standing these great Risings, at the Entrance into Such Bayes, at a Smal distance from them in the wide Ocean, especially near the Line, it riseth but 2, 3, 4, or 5 Foot; as the Authors before mentioned, and divers Mariners have observed & Recorded: So that we may be well assured; That the natural and general Rising of the Tydes, in the wide Ocean, even near the places where they are *first moved* is not more than about 7 or 8 Foot; and so down to 3 or 4 Foot as they approach the Æquinoctal Line: as will doubtless more fully appear if observations be further made, at Some distance from Small Islands in the midst of the ocean; being the properest places for that purpose.

Nor is the time of full Sea to be truly reckoned, without having respect to the *generall* Currant or Setting of the tides as you see them Delineated in the said mapp: For suppose a S. S. West and N. N. East Moon Should, as is pretended, make Full Sea at one of the Isles of *Azores*; Latitude 40, Deg: No:^th^ and alike S. S. West; and N. N. East Moon, Should also make Full Sea at the Isle S^t.^ *Antonio*,[167] in the Lat: 19 degrees North: Yet you see, by the course or setting of the Tides, as they are described in the said Mapps, That it must be Full=sea at the Isles of *Azores*, (If it was full=sea at such moons,) 12 Hours and 24 Minuts; or perhaps 24 ho: 48 before it can be So, [*by that Floud*] at the Isle S^t^: Antonio: And So more or less, in all other places; as you therein See, the nature of their Flowing will produce them.

I might here proceed to other *Phanomena's*, as well relating to the trade=winds, as to the Marine parts of the Earth (for I find none, if *generall*, but what may be accounted for by the precedent Doctrine:) But I Shall at present only Shew, That the [p. 140] Waters, by their thus meeting in the *Line*, do fully confute the Old Notion, of their being Governed by the Moon.

And herein Let us Suppose, That they are Moved by the Moon's pretended ***Attraction.***

Then it will appear, from the two first Mapps, That whensoever the Moon comes into the Sign Cancer, (as She dos once in less than every 8. and twenty days,) That Quantity or moiety of water, which belongs to the South Hemisphere, to wit, from the South pole to the Equinoctiall; would be drawn 40. or 50. degrees, Further Northward; by which means, all the Waters between the South Pole and the Æquinoctiall would not only be greatly attenuated and diminished in its Debth; but also at the Same time, the other moiety belonging to our North Hemisphere, to wit, from the Æquinoctiall, to the North pole; would, on the contrary, be as much accumulated, and increased in height: From whence it would necessarily follow, that once every Moneth, whether the moon was at full or change, at first or last Quarter; it would make the Tides 2. or 3. times higher, than when, on the contrary, they were drawn to the Tropick of Capricorne; which would be as frequent as the former: Near both which places, it would alternatly remain in that position, for 6. or 8. days together. But inasmuch as this Phænomena, nor any thing like it, is ever found; We may Justly infer, and Assert, that as there is noe Such Effects, there can be no Such Cause; Therefore the moon dos not Attract &c:

Nor is this all the Consequences, that would attend Such a Supposition; For Seeing the dayly Rotation of the Earth as has been Shewn, is caused by the Excess, or inequallity of the waters meeting in the Æquinoctiall, compared with the parvity thereof meeting on the opposite part of the Said Line; It will as naturally follow, That if they Should, in like manner, be made unequall, by being, as is [p. 141] Said, drawn from one Pole towards the other; and made to meet in the Tropicks, as aforesaid, instead of the Æquinoctiall; they would unavoidably bring the Earth out of Æquilibrity in respect of its Poles and thereby, cause, it, alternatly, to turn from North to South, and so from South to North again. The absurdity of both which Suppositions, every Moneths Experience, dos visibly testify.

Wherefore the Waters are not drawn
by the Moon, as aforesaid.

And what is here Said of its attractions, may be also understood, Mutatis Mutandis, of its Supposed Pressure.

From both which, observations, being So fully confirmed by Experience, 'tis Sufficiently evident, That tho there is, as has been Said, Some Conformity in respect of [*Time*] between the Motion of the Moon, and that of y^e^ Tides; Yet I Say notwithstanding this; The Moon has no power or Influence to draw or Attract; nor by pressure, to Repel or drive back, the least drop or part of y^e^ Ocean, in any manner whatsoever. For although a thousand Clocks, and as many Watches, may in like manner agree with each other, as is Said, in respect of *time*; Yet we all know, That neither of them is the *Cause* of the others Motion.

For a Conclusion therefore, Seeing it appears by the I, and II, Fig: Plate 3;[168] (Or at least by the Volumns from whence they were derived,) That the Tydes do Originaly proceed from the two Poles of the World: And that the mean Time for one Floud, and one Ebb, jointly taken, is but 12 ho: and 24 Minuts: And Seeing [p. 142] also the Tydes do certainly require a constant Resusitation or lifting up, to continue their Motion of Ebbing and Flowing: What may we Infer from these and many other appearances in Nature: (for the very invisible things of God, are manifest, by the things that are made and do appear,) but that the Waters are at first, by a kinde of Systolation, and

Diastolation, gradualy thrust up or put in Motion *at* and *round about* the two Poles of the World, as we have before Asserted.

Secondly, That the Semi=Diameter of the Quantity of Water that is there first moved, before it begins to Subside again, is Somewhat more than the aforesaid Distance of its flowing in the Ocean, when it comes under our Latitude (Viz:^{t}) above 700 Miles; because it runs faster & farther at the places and times, of its frist Moving than it does afterwards: Nevertheless the Semidiameter of the Musculous parts of the Earth that gives Motion thereunto, are not respectively, perhaps one fifth or one tenth of that Measure.

Thirdly That the time Spent in its frist Raising up, is not only less than the mean time of 6 ho: and $12:^{Min}$ But also less than – – – 6 ho: and $7:^{Min}$ Because you may See in the frist table beforegoing; the Distance in flowing at Spring=tides; is but 28^{Min} in 24. hours which is for two flouds and two Ebbings; and therefore it can be but one fourth part thereof (Viz^{t}) 6 ho: and $7:^{Min}$ for the bare flowing or raiseing up of one floud – – – when it comes on our Coast: and Consequently, it must be less than that [p. 143] where it is frist moved; as the nature of their Flowing dos Demonstrate.

Fourth, that the *like time* is Spent in its Sinking down again.

Fifthly that this motion is constantly repeated or renewed, at the End of every 29 Ebbings and as many Flowings there being no more in the 15 Days that are comonly reckoned from one Spring=tide to another.

Sixthly that the time when this Lifting up is first begun, is about 31. Hours before they begin to lift; (as 'tis rightly called) here; (which the Hours in the first Weaving Line at our Latitude do plainly intimate;) Namely, When the *Moon* is about 8. Dayes & $\frac{1}{2}$. and 23. Dayes and $\frac{1}{2}$ Old.

Lastly, that by and from these two first Flouds, and the Energie thereof; All the Ebbings and Flowings in y^{e} Oceans, are Constantly agitated and produced, and thereunto Justly conformed Assimulated and continued.

Finis.

Notes and references

My practice in these notes has been first and foremost to identify proper names, places, and references to works cited by Hobbs. To some degree the notes contain a commentary on the more geological aspects of Hobbs's thought. I have thought this worthwhile because discussion of the crust of the Earth is the central subject of Hobbs's tract, and is the most intellectually interesting feature of his work. I have not attempted an analytical commentary on Hobbs's broader astronomical and cosmic speculations.

The recto of the first blank sheet of the MS before the title page carries the following note in ink

> J. Bailey
> August 1825
> I bought this MS in the borough of Southwark. Shortly after I had made the purchase mention was made of it, The Title quoted partially &c, in the Times newspaper.
> J.B.

Also on this page in ink there is the jotting

> Parkinson's Organic Remains of a former world, 3 vols.
> Sowerby's Conchology 4 vols

and in pencil

> The Earth Generated
> *Britscha* nearly new, complete & for ready use. Is only to be seen at 93 Long Acre opposite Bow St Times Sept 19 1825

I have not been able to ascertain with certainty the identity of John Bailey. James Parkinson's *Organic remains* was published in three volumes between 1804 and 1811 (London). James Sowerby's *The mineral conchology of Great Britain* appeared in seven volumes between 1812 and 1846. A Britscha is an open-air carriage.

TITLE PAGE
The five words which constitute the main title are on a slip of paper pasted over the original title, which is

> 'The Generating & Anatomizing the Earth'

1 The complete verse—in the King James version—of Isaiah 5: 12 runs: 'And the harp, and the viol, the tabret, and pipe, and wine, are in their feasts: but they regard not the work of the Lord, neither consider the operation of his hands'.

The complete verse of Romans 1: 20 is: 'For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they are without excuse'.

The complete verse of Wisdom 7: 17 is: 'For he hath given me certain knowledge of the things that are, namely, to know how the world was made, and the operation of the elements'.

Hobbs seems to have used the King James Bible, but does not always quote completely accurately.

2 It is worth noting that Hobbs nowhere gives a technical name to the science he is pursuing.

3 It is unclear which counties. The only ones mentioned by name are Dorset, Devon and Cornwall. Hobbs's experience of strata seems to have been chiefly of sedimentary rocks, from which one can assume chiefly a familiarity with the geology of the more southerly and easterly parts of the British Isles.

4 Figures 1, 3, 4, 8, are all missing. They are here conjecturally reconstructed at the end of this edition.

5 Hobbs's remark is perceptive, though it is strange that he says he has met it nowhere, since it is a dictum of John Woodward, with whose *Essay towards a natural history of the earth* (London, 1695) Hobbs was obviously familiar.

6 Note that Hobbs has no technical, generic term for 'fossils'. He never uses terms such as 'extraneous fossil' or 'formed stones'.

7 Hobbs is here most likely referring to the coastline between Weymouth and Poole. *Cf.* G. M. Davies, *The Dorset coast; a geological guide* (London, 1935); A. W. Rowe, *The white chalk of the Dorset coast* (London, 1901); W. J. Arkell, *The geology of the country around Weymouth, Swanage, Corfe and Lulworth* (Geological Survey Memoir) (London, 1947).

8 Figure 2 is lost, and has been reconstructed.

9 This is typical of the homely, popular metaphors which Hobbs uses throughout. It also embodies his overall alchemical interest in processes such as fermentation and baking.

10 Hobbs here summarizes Genesis 1.

11 Note the omission of any mention of Man. The entire tract is remarkable in respect of how little it discusses the history and functions of the Earth in terms of Man.

12 Genesis 2: 4 reads: 'These are the generations of the heavens and of the earth, when they were created, in the day that the Lord God made the earth and the heavens'.

Hobbs's philosophy of generation fused together two main currents of seventeenth century scientific thought. On the one hand there was a tradition of analysis of living bodies, which would include William Harvey's *Exercitationes de generatione animalium* (London, 1651); Sir Kenelm Digby's *Two treatises, of bodies* (London, 1650, see especially pp. 201–65, 290–302); N. Highmore, *The history of generation* (London, 1651). For commentary on these see Joseph Needham, *A history of embryology* (second edition, Cambridge, 1959), pp. 120–39; Philip C. Ritterbush, *Overtures to biology* (New Haven and London, 1964); Elizabeth B. Gasking, *Investigations into generation 1651–1828* (London, 1967, especially pp. 56–65); T. S. Hall, *Ideas of life and matter*, vol. 1 (Chicago and London, 1970).

At the same time, there was also a tradition of comprehensive alchemical philosophy, which interpreted Nature in terms of processes such as generation, organization, distillation, fermentation, corruption and putrefaction. For some guidance to seventeenth century works in this tradition see B. J. T. Dobbs, *The foundations of Newton's alchemy* (Cambridge, 1975, especially pp. 44–60 and bibliography); Allen G. Debus, *The English Paracelsians* (London, 1965); Owen Hannaway, *The Chemists and the Word* (Baltimore and London, 1975); Walter Pagel, *The religious and philosophical aspects of van Helmont's science and medicine* (Supplement to the *Bulletin of the history of medicine*, no. 2, Baltimore, 1944).

Here, as elsewhere, it is very difficult to grasp how widely Hobbs had read in these traditions. He occasionally quotes directly (*e.g.*, from Digby and Basil Valentine), but his overall philosophy is an eclectic amalgam, not directly or totally dependent on any one source. As a former excise officer, Hobbs must have had considerable first-hand experience of brewing, distilling and refining. This might help to account for his chemical philosophy of the world.

13 This kind of interest in God's creativity is characteristic of seventeenth century exponents of alchemical philosophy such as Robert Fludd and Gabriel Plattes. *Cf.* the works by Debus and Hannaway cited in the previous note, and Debus's 'Gabriel Plattes and his chemical theory of the formation of the earth's crust', *Ambix* **9** 1961: 162–5.

14 In other words, Hobbs was claiming that, as in the formation of a foetus all parts generate and grow simultaneously, so likewise the formation of different features of the Earth is a synchronous process. The 'days' of Creation are not successive stages in time, but rather different aspects of an organic, synchronic whole, 'a common Coagulation, and General Graduation'.

This is a radical solution to the issue of the order of the Mosaic days. Not only does it forestall the problems which arise from treating the days literally as periods of twenty-four hours. It also avoids the difficulties which ensue from the Biblical order of creation, in which for instance land and sea are supposed separated before the creation of life, thus making it obscure for many naturalists to explain how fossils had become embodied in the rocks.

15 Note Hobbs's stress on the fecundity of Nature. Here as elsewhere Hobbs stressed that it was Nature which brought forth creatures, not God directly and miraculously. Hobbs strenuously defended spontaneous generation. For late seventeenth century debates on the validity of spontaneous generation see John Farley, 'The spontaneous generation controversy (1700–1860): the origin of parasitic worms', *Journal of the history of biology* **5** 1972: 95–125; E. Mendelsohn, 'Philosophical biology *vs* experimental biology: spontaneous generation in the seventeenth century', *Actes du XII^e Congrès Internationale d'Histoire des Sciences* **1** 1968: 201–26; Edward J. Foote, 'Harvey: spontaneous generation and the egg', *Annals of science* **25** 1969: 139–63; F. J. Cole, *Early theories of sexual generation* (Oxford, 1930). For a contemporary discussion see Matthew Hale, *The primitive origination of mankind* (London, 1677, section iii, ch. iv, 266f.).

Hobbs's belief that it was part of the essential nature of matter to be productive of life was contrary to the trend of the mechanical philosophy of his day—which he clearly opposed. *Cf.* M. C. Jacob, *The Newtonians and the English revolution 1689–1720* (Hassocks, Sussex, 1976); R. L. Colie, *Light and Enlightenment* (Cambridge, 1957).

16 Psalm 33: 6. 'By the word of the Lord, were the heavens made; and all the host of them by the breath of his mouth'.

17 The passage from 'As to the fact' down to 'the Judicious Reader' has been deleted in the MS. The two undeciphered words do *not* appear to be 'Thomas Hobbes'. Presumably Hobbs means 'neighbour' both in the sense of geographical vicinity—Thomas Hobbes hailed from Malmesbury in Wiltshire—and also in the sense of the similarity of names. William Hobbs's disclaimer of any relation with Thomas Hobbes shows the continuing reputation of the latter as a bogey-man. The deleted passage reflects Hobbs's deep awareness that he was an unknown provincial scholar.

18 In his letter to the Royal Society (read 11th May 1709), Hobbs admitted his deficiency in learning in languages. In the present work he cites a few Latin tags. There is no conclusive evidence whether he could read Latin fluently and extensively.

19 From 'know in musick' to 'never played' is deleted.

20 The 47th problem is Pythagoras's theorem.

21 Hobbs was probably here thinking of Bishop Virgil of Salzburg (710–84), whose unorthodox views about the Earth (*'quod alius mundus et alii homines sub terra sunt'*) have often been construed in this sense. It is not clear exactly what the bishop had in mind. For his views he was upbraided, but neither deposed nor put to death. *Cf.* G. Sarton, *Introduction to the history of science*, vol. i (Baltimore, 1927: 516).

22 For Archimedes's work on water displacement and specific gravity see E. J. Dijksterhuis, *Archimedes* (Copenhagen, 1956: 18). The story of Archimedes running through the streets without his clothes was passed down in Vitruvius's *De architectura*, book ix.

23 John Napier, 1550–1617, inventor of logarithms.

24 Hobbs seems here to overestimate his own originality in matters relating to the strata, in which the work of Woodward—with which he was familiar—and Steno had certainly paved the way. This remark may perhaps indicate Hobbs's relative lack of familiarity with scientific treatises on the Earth already published.

25 William Lilly, 1602–81, was the most famous and prolific astrologer of his day, for whom see D. Parker, *Familiar to all: William Lilly and astrology in the seventeenth century* (London, 1975). It is not clear precisely to which of his treatises Hobbs was here referring. Astrology still had many supporters amongst naturalists in England in the latter part of the seventeenth century, such as Hobbs's fellow Dorset man, Joshua Childrey (see the Preface to his *Britannia Baconica* (London, 1661)) and John Aubrey (*cf.* Michael Hunter, *John Aubrey and the realm of learning* (London, 1975: 117–30, 140–6). For attacks on astrology see K. Thomas, *Religion and the decline of magic* (London, 1971) and John Redwood, *Reason, ridicule and religion* (London, 1976: ch. 6).

26 Hobbs's attack on astrology is consonant with his opposition to all forms of action at a distance, as being occult and lacking foundation in Nature.

27 'There are as many opinions as there are men.'

28 The words 'Weymouth' and 'William Hobbs', and the '15' of 1715 have been scratched out.

29 This head calls us back to the original title of the work.

30 Hobbs's opinion that Scripture was not to teach natural philosophy was a more liberal view than was common amongst such contemporaries as John Woodward and John Keill (1671–1721).

31 In his letter to the Royal Society (read 11th May 1709) Hobbs specifically stated 'above thirty years'.

32 Hobbs cited rather few authors by name. He seems to have had a general knowledge of currents and natural philosophy in the second half of the seventeenth century, lacking, perhaps, a sharp and critical intellect, particularly in his discussions of the more mathematical sciences.

33 'Fossils' here means rocks or minerals in general.

34 In suggesting that coal contains no organic remains Hobbs seems to show he was ignorant of the work of John Beaumont, whose papers had pointed to the presence of plant fossils in coal. *Cf.* 'On rock plants, and their growth', *Phil. trans R. Soc. Lond.* **9** 1676: 724–42; *idem*, 'A further account of some rock plants of Mendip Hills', *Phil. trans R. Soc. Lond.* **13** 1683: 276–9. Hobbs's deep interest in the transformation of sea-bed into solid land was obviously strengthened by his actual observations of processes occurring on the Dorset coasts.

35 Hobbs was presumably highly familiar with the Portland quarries, for which see F. H. Edmunds and R. J. Schaffer, 'Portland stone, its geology and properties as a building stone', *Proceedings of the Geologists Association* **43** 1932: 225–40: A. M. Wallis, 'The Portland Stone Quarries', *Proceedings of the Dorset Natural History and Archaeological Society* **12** 1891: 187–94; W. J. Arkell, *The geology of the country around Weymouth, Swanage, Corfe and Lulworth* (London, 1947); J. C. Mansell-Pleydell, 'Geological notes on the Isle of Portland', *Proceedings of the Dorset Natural History and Archaeological Society* **6** 1884: 58–65; W. J. Arkell, 'The Names of the strata in the Purbeck and Portland stone quarries', *Proceedings of the Dorset Natural History and Archaeological Society* **66** 1944: 158–68. Sir Christopher Wren was highly familiar with the Portland stone quarries—much of the rebuilding of London after the Great Fire of 1666 was accomplished using Portland stone, which Wren championed. Wren became M.P. for Melcombe Regis in 1701. It is interesting to speculate whether Hobbs may have met Wren. See B. Little, *Sir Christopher Wren, A historical biography* (London, 1975: especially pp. 199–232).

36 Proverbs 8: 24, 25: 'When there were no depths, I was brought forth; when there were no fountains abounding with water. Before the mountains were settled, before the hills was I brought forth'.

37 Figure 1 has been lost, and is here reconstructed.

38 Figure 3 is lost, and is here reconstructed. Hobbs's observation that there is a conformity between relief and the angle of the strata is one presumably stimulated by the scenery of east Dorset, and perhaps especially its cliffs.

39 Figure 4 is lost, and is here reconstructed.

40 This passage is a little obscure, perhaps largely because of the loss of the original diagrams. Hobbs's main point seems to be that wherever there are hills, there has been *elevation*; and elevation entails that at certain points—*e.g.*, the exposed scarp edges of hills—the strata have been visibly fractured. He was denying the possibility of what is pictured in Figure 5, *i.e.*, the line of strata everywhere perfectly following the contours of the countryside.

41 Figure 5 is lost, and is here reconstructed.

42 Figure 2 is lost, and is here reconstructed.

43 In 1709 Hobbs sent some 'models' to the Royal Society. These included a map of the Isle of Portland. It is now lost. For the properties of Portland stone see J. Smeaton, *A narrative of the building of and a description of the construction of the Eddystone lighthouse with stone* (London, 1791).

44 Hobbs recognized that no ordinary deluge of water could conceivably raise marine shells and deposit them deeply within already existing consolidated strata. Nor could the Biblical Deluge have had that effect, since it could have no power to soften or dissolve the rocks and admit the fossils. Hobbs's statement is almost certainly an attack on John Woodward's *An essay towards a natural history of the earth* (London, 1695).

45 This is not a commonplace contemporary perception. For example there is no mention of this device in J. C., *The compleat collier* (London, 1708). Hobbs's point is however made in considerable detail in George Sinclair, *The hydrostaticks* (Edinburgh, 1672: esp. 258–80).

46 The division of matter into these three principles is an essential part of the Paracelsian tradition of chemistry and alchemy. *Cf.* A. G. Debus, *The English Paracelsians* (London, 1965). For a roughly comparable attempt to integrate an alchemical philosphy of organic creation harmoniously with the Bible cosmogony see the work of Thomas Robinson (d. 1719): *The anatomy of the earth* (London, 1694), and *An essay towards a natural history of Westmorland and Cumberland* (London, 1709).

47 The Bible quotation is from Genesis 1: 2: 'And the Spirit of God moved upon the face of the waters'; v. 7: 'And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament; and it was so'. For alchemical interpretations of Genesis, *cf.* note 46.

48 For the works of the so-called Basil Valentine see the article (*sub* VALENTINE) by A. G. Debus in the *Dictionary of scientific biography* **13** 1976: 558–60. Basil Valentine's work is a compendium of sixteenth century and seventeenth century alchemical ideas. Hobbs is quoting from *The last will and testament of Basil Valentine* (London, 1670). The quotation is accurate, except for minor errors of punctuation, etc. Part of this work is readily accessible in *The Hermetic Museum restored and enlarged*, ed. A. E. Waite, 2 vols (London, 1893 **1**: 330–45).

49 Job 10: 10: 'Hast thou not poured me out as milk, and curdled me like cheese'.
The epitome is of course Man.

50 Proverbs 8: 24, 25; here quoted for a second time.

51 The quotation is from Sir Kenelm Digby, *Two treatises, in the one of which the nature of Bodies; in the other, the nature of mans soule; is looked into, in way of discovery of the immortality of reasonable souls* (London, 1645: 275). The quotation is substantially accurate. Many of Hobbs's ideas bear a quite close resemblance to Digby's beliefs about the chemistry of bodies, as set out in this work. For an account of Digby's life and work see R. T. Petersson, *Sir Kenelm Digby, the ornament of England, 1603–1665* (London, 1956). For interpretation of Digby's experiments, see Needham, *op. cit.* (note 12) pp. 124–7, 135–40.

52 *I.e.*, *The works of the Hon. Robert Boyle, Esq., Epitomiz'd by Richard Boulton* (3 vols, London, 1699–1700, **1**: 73). Hobbs's quotation is substantially accurate.

53 This is certainly a jellyfish, most probably *Aurelia aurita*. The whiter parts are probably the sex organs. The dilations and contractions are its mode of propulsion. I have not come across any other usage of the local term 'Bulls'. Hobbs sent a drawing of 'Bulls' to the Royal Society in 1709. It has been lost.

54 Figure 6 is lost, and is here reconstructed.

55 The Euclid reference can be found in *Euclid's Elements of geometry* published by John Leeke and George Serle (London, 1661), 110 thus: 'If in a circle ABC, two right lines AB and CD divide one another (in the point E), the Rectangle contained under the two parts of the one AE and EB is equal to the Rectangle contemed under the two parts CE and ED of the other'.

56 For histories of spontaneous generation, see above, note 12.

57 This represents a clear attack on the beliefs of John Woodward as set out in his *Essay towards a natural history of the earth* (London, 1695). Woodward's belief that strata were arranged in order of their specific gravity met almost uniform opposition. It is not clear what Hobbs has in mind a little lower down when he asserts that beds of chalk etc. are found under mines or beds of lead, tin, silver, etc.

58 This is an important juncture of Hobbs's philosophy of the Earth. Most writers who accepted the organic analogy of micro- and macrocosm attributed to the Earth, as to other living bodies, hair, veins, bones, warts, a mouth, an anus, etc.—as in particular did Hobbs's contemporary Thomas Robinson in his *The anatomy of the earth* (London, 1694). Hobbs perceptively rejected this one-to-one equivalency of physical and physiological attributes. For Hobbs, the organic analogy served chiefly to guarantee the belief that the Earth's economy was an integrated system, with each part functional to the sustenance of the whole. Generally on such analogies see G. L. Davies, *The earth in decay* (London 1969: ch. i). For Robinson, see F. J. North, 'The Anatomy of the earth—a seventeenth century cosmology', *Geological magazine* **71** 1934: 541–7.

59 Job, 26: 7: 'the Lord hath stretched out the North over the empty places, and hanged the Earth upon Nothing'.

Hobbs's conviction that the Earth was a perfect, self-contained economy—a belief he carried even to the length of asserting that the Earth's intrinsic heat was far more important than the Sun's heat in the generation and sustenance of terrestrial life—was unusual for this period. Far more common was the view either that the Earth was senescent and in decay, or that it had been in some way flawed by the Universal Deluge. Most contemporaries of Hobbs believed that the Earth would in time fall into an uninhabitable condition. Hobbs on the other hand stressed the perfect organic adaptation of the Earth, a view which was hardly found till James Hutton's vision of the Earth as a scene of 'life, death and circulation'.

60 *I.e.*, the great whale or sea monster referred to in Job 41: 1; Psalm 74: 14; Psalm 104: 26; Isaiah, 27: 1.

61 One of Hobbs's rare references to the place of man on the scale of existence and in the scheme of history. Hobbs was almost silent on human destiny, or on the relation of Man to the rest of Creation as set out in the Bible.

62 Job 42: 7: 'And it was so, that after the Lord had spoken these words unto Job, the Lord said to Eliphaz, the Temanite, My wrath is kindled against thee, and against they two friends, for ye have not spoken to me the thing that is right, as my servant Job hath'.

63 For theories as to how the Earth generates minerals, see F. D. Adams *The birth and development of the geological sciences* (reprint, New York, 1954: chs iv, v, vi, ix). Hobbs's ideas here somewhat resemble those of Gabriel Plattes's *A discovery of subterraneall treasure* (London, 1639) (for which see A. G. Debus, 'Gabriel Plattes and his chemical theory of the formation of the earth's crust', *Ambix* **9** 1961: 162–5), and Thomas Robinson, *The anatomy of the earth* (London, 1694).

64 For a guide to contemporary lunar theory, see I. B. Cohen, *Isaac Newton's "Theory of the Moon's Motion" with a biographical historical introduction* (Dawson's, Folkestone, 1975).

65 Figure 10 survives.

66 'Magnetic' theories of the pull of the Moon on the tides were quite common up to the late part of the seventeenth century, being associated with such writers as William Gilbert, Simon Steven, Johannes Kepler and Joshua Childrey. For a contemporary survey of theories of the tides (and an important contribution in its own right) see John Wallis, 'An essay exhibiting the hypothesis about the flux and reflux of the sea', *Phil. trans R. Soc. Lond.* **1** 1666: 263–89. For modern assessments of the range of tidal theories available see M. Deacon, *Scientists and the sea* (London, 1971: 93–116), and E. J. Aiton, 'Galileo's theory of the tides', *Annals of science* **10** 1954: 44–57; and also the article by John D. North on Childrey in the *Dictionary of scientific biography* **3** 1971: 248. Childrey lived at Upwey, half a dozen miles from Weymouth; but since he died in 1670 it is unlikely that he knew Hobbs personally, unless Hobbs was very old when he wrote his treatise. For Childrey's comments on the unusual tides of the Weymouth area see A. R. and M. B. Hall, eds, *The correspondence of Henry Oldenburg*, **5** 1668–9 (Madison, 1968: 384–6 and (on tide theory) 455–6).

The Royal Society's *Philosophical transactions* carried an important debate on tidal theory during Hobbs's lifetime, as well as publishing tide tables. Newton's theory of the tides was made most easily available by Halley in 'The true theory of the tides', *Phil. trans R. Soc. Lond.* **19** 1697: 445–57. Whether or not Hobbs read such articles actually in the *Philosophical transactions*, we do know—from his citation in his 'Essay concerning Motion'—that he had read the 1705 edition of Halley's *Miscellanea curiosa*, in which many of these papers were reprinted.

67 It is unclear here whether Hobbs was here specifically attacking Newton, or campaigning generally against all forms of action at a distance envisaged as quasi-astrological.

68 For Halley's views on the Atmosphere, see the following articles in the *Phil. trans R. Soc. Lond.*: 'An historical account of the trade-winds and monsoons', **16** 1686: 153–68; *idem*, 'An account of the circulation of the watery vapours of the sea', **16** 1687: 468–73; 'An account of Dr. R. Hook's invention of the marine barometer, with its description and uses', **22** 1701: 791–4; and see A. Armitage, *Edmond Halley* (London, 1966: 75–83). See also the informative article, 'Atmosphere', in John Harris's *Lexicon technicum*, 2 vols (London, 1708–10). Halley's computations of the height of the 'sublimations' of the Earth (45 miles) are to be found in his 'A discourse of the rule of the decrease of the hight of the mercury in the barometer', *Phil. trans R. Soc. Lond.* **16** 1686: 104–16. For a further discussion of Hobbs's use of Halley's ideas on the atmosphere, see below note 92.

69 For Huygens see A. E. Bell, *Christiaan Huygens and the development of science in the seventeenth century* (London, 1947: 161–4), and the article by H. J. M. Bos in the *Dictionary of scientific biography*, **6** 1972: 610. It is almost certain that Hobbs obtained his information about Huygens by reading the English translation of his *Cosmotheoros*, i.e., *The celestial worlds discover'd* (London, 1698: *cf.* p. 131 ff).

70 Further evidence that Hobbs saw all forms of action at a distance as instances of phoney astrological powers.

71 *I.e.*, Saturn, Jupiter and Mars.

72 Almanacs carrying tables of tides appeared annually in Hobbs's lifetime. Flamsteed published a good many in the *Phil. trans.*

73 Hobbs's register of the tides is one of the most impressive surviving provincial records of the tides of its time, for by the early eighteenth century the enthusiastic wave of tide recording which had followed on the founding of the Royal Society had abated somewhat (see M. Deacon, *Scientists and the sea* (London, 1971: ch. v). It fully justifies Derham's comment to the Royal Society: 'Particularly I think his Observations of the Tydes may well Deserve the Cognisance of the Society, he having Observed them strictly for two years, and no doubt will if desired proceed with Delight in further Observing them if it be thought necessary'. The form in which Hobbs kept his register is standard enough. The gaps in the record might be explained by prolonged visits which Hobbs had to make on his Excise business. The purpose for which Hobbs kept the register was to demonstrate empirically that the retardation of the time of high tide was not by a fixed number of minutes per day after full moon, but rather by a progressively increasing interval. He sought thereby to show that the intervals of the tides were not governed by the moon, but were governed by wave motions set up by the pulse of the 'heart' of the Earth every fifteen days, motions that gradually diminished in speed and intensity. In fact, tide patterns in the part of the English Channel around Weymouth are so complex as to render any general deductions from Hobbs's record meaningless.

74 *I.e.*, the River Wey. For a brief account of the geography of the area see R. Good, *Weyland: the story of Weymouth and its countryside* (Dorchester, 1945).

75 In other words, Hobbs reversed the normal causal arrow, and suggested that the rotation of the Moon was governed by the motion of the tides, not *vice versa*.

76 *I.e.*, Thomas Burnet, *Telluris theoria sacra* (London, 1681 and 1689; English translation, 1684 and 1690).

77 Hobbs was here developing a view of the relation of the Moon to the Earth which depends ultimately on a Cartesian vortex theory. The theory as set out by Hobbs, however, certainly is not Descartes's. See E. J. Aiton, *The vortex theory of planetary motions* (London, 1972).

78 *I.e.*, Kepler's second so-called law.

79 For contemporary theories of winds see E. Halley, 'An historical account of the trade-winds and monsoons', *Phil. trans R. Soc. Lond.* **16** 1686: 153–68; E. G. R. Taylor, *The haven-finding art* (London, 1971: 239–40); A. Armitage, *Edmond Halley* (London, 1966: 83–6), and C. A. Ronan, *Edmond Halley, genius in eclipse* (London, 1969: 79–80). Hobbs's notion that winds are a product of the combination of the Earth's rotation with terrestrial obstacles is quite similar to Galileo's theory, and distinct from those of Hooke and Halley, who attributed winds much more to differentials in density and temperature.

This passage is a good example of the transformation of Hobbs's thought between the time of the papers submitted to the Royal Society and this present treatise. In the former, his thoughts on trade winds, etc., were presented as a relatively self-contained speculation. Here they have been organized and subordinated within a more comprehensive and digested view of the relationship of the surface of the Earth to the Moon and the tides.

80 Hobbs's views on madness once again convey his hostility to all kinds of astrology. For the following popular superstitions regarding the Moon see J. Brand, *Observations on popular antiquities, with the additions of Sir Henry Ellis* (new imp., London, 1913: 657–63); Keith Thomas, *Religion and the decline of magic* (London, 1971: 239, 296–7, 333–5, 610, 620, 649); R. Hunter and I. Macalpine, *Three hundred years of psychiatry, 1535–1860* (London, 1963: 285, 459, 480); and C. Plinius Secundus, *The historie of the world*, translated by Philemon Holland (London, 1635, **1**: 163, 488–9; 44: **2**: 397). Such beliefs had recently been satirized in Samuel Butler's *Hudibras*.

For a contemporary survey of theories of the cause of menstruation in women see J. Freind, *Emmenologia* (London, 1729; first, Latin, ed., Oxford, 1703: ch. ii, pp. 4–13).

81 For magnetic theories of the tides, see note 66.

82 A reference to the Cartesian theory of the tides, for which see M. Deacon, *Scientists and the sea* (London, 1971: 50, 52).

83 Figure 11 is lost, and has been reconstructed.

84 For Torricelli's (1608–47) experiment see the article by Mario Gliozzi in the *Dictionary of scientific biography* **12** 1976: 438.

85 Hooke and Boyle were both involved in experiments of this kind. *Cf. The works of the hon. Robert Boyle* epitomiz'd by Robert Boulton (London, 1709, **1**: 384–5), and E. Mendelsohn, *Heat and life* (London 1964: 52–3). It is very likely that Hobbs's source here was J. Drake, 'A discourse concerning some influence of respiration on the motion of the heart hitherto unobserved', which he would have read in Halley's *Miscellanea curiosa* (3 vols, London, 1705, **1**: 173–204, 187–90.)

86 For a contemporary example of a diving bell, see the work of Halley, especially 'The art of living under water: or a discourse concerning the means of furnishing air at the bottom of the sea, in any ordinary depths', *Phil. trans R. Soc. Lond.* **29** 1716: 492–9. Hobbs is of course mistaken in believing that contemporary diving-bells cut off the pressure of the atmospheric column.

87 I have not been able to trace Hobbs's 'Monsiur'. For the development of the barometer, see W. E. Knowles Middleton, *The history of the barometer* (Baltimore, 1964).

88 Measuring chains had been standardized in seventeenth century England. The most famous was Gunter's chain which was made of hard wire, and was four poles in length, consisting of a hundred links. It was used for surveying. The provision of a count-wheel device for a coach to measure distance travelled has a long history, being traceable back to Vitruvius. See A. W. Richardson, *English land measuring to 1800; instruments and practices* (Cambridge, Mass., and London, 1966: 109) and, for a contemporary account, James Moxon and Thomas Tuttell, *A mathematical dictionary* (London, 1700), which is an appendix to Joseph Moxon, *Mathematics made easie* (3rd ed., London, 1700).

89 *I.e.*, Figure 10.

90 Dr N. may be Dr William Nicholls, D.D. (1664–1712), a prolific theological writer in the deist disputes of the late seventeenth century, who discusses most of the problems of contemporary theories of the earth in his *A conference with a Theist, wherein are shewn the absurdities in the pretended Eternity of the World 2. The Difficulties in the Mosaick Creation are cleared 3. The Lapse of mankind is defended, against the Objections of Archaeologiae Philosophicae, The oracles of Reason, etc.* (London, 1696). This work however, does not contain references to rainbows.

It is much more likely, however, that Hobbs intends Sir Isaac Newton, though Hobbs had called Newton 'Sir Isaac' in his earlier letter to the Royal Society. Newton was never 'Dr' (Hobbs's usage *may* be ironic), and it is not clear what Hobbs means in calling Newton a 'reconciling Naturillist'. Hobbs's close association of gravity and the rainbow strongly suggests Newton (whose *Opticks* had appeared in 1704). Hobbs cannot have been unaware that his ideas differed markedly from those of Newton, and he may have felt some animus against Newton on account of his slighting treatment by the Royal Society. Hobbs may well have read 'A letter of Mr Isaac Newton, Professor of the Mathematicks in the University of Cambridge, containing his new theory about light and colours' in Halley's *Miscellanea curiosa* (London, 1705, **1**: 97–117), where rainbows are mentioned p. 109.

91 The idea that the changing distance of the Moon from the Earth (as between the apogee and perigee) significantly altered the power of the tides is largely connected with Joshua Childrey. *Cf.* M. Deacon *Scientists and the sea* (London, 1971: 103–4) and Childrey's *Syzgiasticon instauratum* (London, 1653) and his *Britannia Baconica* (London, 1661: 96–8). Newton elaborated the idea (Deacon note 109). Notwithstanding Hobbs's ignorance and misapprehensions about the philosophy of the tides, he is of course justified in pointing out that the harmonies of the tides in any particular location in fact bear little close and immediate relation to the phases of the moon. For contemporary lunar theory see E. G. Forbes, *Greenwich Observatory*, 3 vols (London, 1975), vol. i, *Origins and early history*, 1675–1835; and *idem*, ed., *The Gresham Lectures of John Flamsteed* (London, 1975).

92 Figure 12 survives. For an experiment which may have suggested Hobbs's feather experiment see Sir Kenelm Digby, *Two treatises* (London, 1645 ch. viii, 74–6). The suppositions in the following paragraphs concerning atmospheric pressure and the density of the aether are somewhat arbitrary and difficult to follow. Many of the data on which they depend are to be found in E. Halley, 'A discourse of the rule of the decrease of the hight of the mercury in the barometer', *Phil. trans R. Soc. Lond.* **16** 1686: 104–16. Hobbs seeks to use Halley's work to support his claim that air pressure would be utterly feeble at the edge of the atmosphere. His argument is that water is 840 times denser than the air at the surface of the earth. A column of *this* air 45 miles high would contain 840 × 6700 gallons; so the air at 45 miles high is 6700 times less dense than water. But water is incompressible, whereas air is very compressible, and aether must be even less dense than air. Hence the air at 45 miles is very feeble indeed.

93 Figure 11 survives.

94 See note 91.

95 Figure 9 has survived.

96 The seventeenth century saw, of course, a massive debate on the place of the heart in the organism. *Cf.* for example W. Pagel, *William Harvey's biological ideas* (Basel, 1967); G. Whitteridge, *William Harvey and the circulation of the blood* (London, 1971); E. Mendelsohn, *Heat and life* (London, 1964), and for a fundamental discussion of seventeenth century theories of life and generation which serves as a background to this entire section, H. B. Adelmann, *Marcello Malpighi and the evolution of embryology* (5 vols, Ithaca, 1966: especially vol. ii, pp. 752–81).

97 The orbis minor is a sea urchin probably *Echinus esculentis*. Note how the very name echoes the macrocosm microcosm analogies which are central to Hobbs's thought. For a contemporary account see N. Grew, *Musaeum Regalis Societatis* (London, 1681: 106–7). Hobbs's description is clear and accurate. It is surprising, however, that it should live several days out of water.

98 Figure 8 is lost and has been reconstructed.

99 The shallowness of the English Channel was well-known from soundings and would have been elementary knowledge to one living in a harbour town such as Weymouth. Hobbs uses this information to argue for the general shallowness of the sea, taken as a fraction of the radius of the Earth. He wishes to establish that the Earth has a thin crust, to demonstrate that the crust around the poles is flexible and 'muscular' rather than rigid.

For admirable discussions of contemporary knowledge of the depth of the English Channel see A. H. W. Robinson, *Marine cartography in Britain: A history of the sea chart to 1855* (Leicester, 1962: especially pp. 28–31); and Norman J. W. Thrower, 'Edmond Halley and thematic geo-cartography' in N. J. W. Thrower and C. J. Glacken, *The terraqueous globe* (Los Angeles, 1969). Thrower points out how liberally Halley sprinkled his 1702 'Chart of the tides in the Channell' (reproduced in this edition) with fathom markings.

100 Hobbs's speculations as to the internal composition of the Earth are distinctive, but speculations on that subject were commonplace. For Halley's, see 'An account of the cause of the change of the variation of the magnetic needle: with an hypothesis of the structure of the internal parts of the earth', *Phil. trans R. Soc. Lond.* **16** 1691: 563–78, and A. Armitage, *Edmond Halley* (London, 1966: 72–4).

101 Figure 8 has been lost and reconstructed.

102 Genesis 1: 20, 21, 22:

'Let the waters bring forth abundantly fish, fowls, the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven. And God created great whales, and every living creature that moveth which the waters brought forth abundantly after their kind and every winged fowl after his kind and God saw that it was good.

And God blessed them, saying, Be fruitful and multiply and fill the waters in the seas, and let fowl multiply in the earth'.

103 Figures 1 and 8 have been lost and reconstructed.

104 Figures 1, 2, and 3 have been lost and reconstructed.

105 Figure 2 has been lost and reconstructed.

106 Figure 7 has been lost and reconstructed.

107 Hobbs's theory of the origin of strata on the sea bed as a result of natural processes bears some relation to Hooke's theory as set out in his *Posthumous works* (ed. R. Waller, London, 1705).

108 The Royal Exchange was built of Portland Stone. See T. F. Reddaway, *The rebuilding of London after the Great Fire* (London, 1951: 124–7, 266–77). It was designed by Edward Jarman, built 1667–9, and destroyed by fire in 1838. It is possible that Hobbs took particular notice of the Exchange while visiting the adjacent Gresham College.

109 *Cf.* the map of Weymouth and district which I have appended. Hobbs's remark about the pebbles formed from lumps of clay fallen from the cliffs is observant and accurate. The clay in question is very probably Oxford Clay.

110 Whitenore Fort most likely refers to the Nothe Fort, or The Knoll, or North Point, at the end of Weymouth Harbour, where fortifications had existed at least since Elizabethan times. It is unlikely that Hobbs is referring to the White Nose, or White Nothe, which is a head almost equidistant between Weymouth and Lulworth, and hence about seven miles away from Weymouth.

111 Genesis 1: 9: 'And God said Let the waters under the heaven be gathered together into one place, and let the dry land appear, and it was so'.

2 Peter 3: 5: 'For this they willingly are ignorant of, that by the word of God the heavens were of old, and the earth standing out of the water and in the water'.

112 A reference to Purbeck Marble.

113 2 Peter 3: 5 quoted once more.

114 For contemporary debates on spontaneous generation see note 12.

115 Genesis 1: 24.

116 About here there is a marginal note in a later hand: 'Stowes Annals'. The reference is to John Stow, *Annales of England* (London, 1592), probably referring to p. 1219. For the late seventeenth century debate on spontaneous generation, see note 12.

117 Many writers who asserted spontaneous generation believed that the Earth was more fertile for bringing forth creatures in its earlier days, and that the first species were larger than current ones. Similar beliefs are present throughout Buffon's *Histoire naturelle* (Paris, 1749–1804).

118 The worthy__ is almost certainly William Harvey, who has a passage similar to this at the end of Exercise 3 of his *Exercitationes de generatione animalium* (London, 1651). For explication *cf.* K. D. Keele, *William Harvey, the man, the physician and the scientist* (London, 1965: 192f.). It is very likely that Hobbs obtained much of his knowledge about contemporary generation theory from Dr George Garden 'A discourse concerning the modern theory of generation' which he would have read in Halley's *Miscellanea curiosa* (London, 1705, **1**: 142–54).

119 Hans in Kelder: Dutch for 'Jack in the cellar', *i.e.*, colloquial for an unborn child. Hobbs is of course utterly opposed to preformationism. His discussion of doctrines of generation seems to echo Dr G. Garden, 'A discourse concerning the modern theory of generation', reprinted in Halley's *Miscellanea curiosa* (London, 1705, **1**: 142–54).

120 *Cf.* P. C. Ritterbush, *Overtures to biology* (New Haven and London, 1964: 88–99), and N. E. Nordenskiöld, *The history of biology* (New York, 1929: 197).

121 Leffas: not identified. For the debate about the nutrition of plants and spontaneous generation see J. Woodward, 'Some thoughts and experiments concerning vegetation', which Hobbs would have read in Halley's *Miscellanea curiosa* (London, 1705, **1**: 205–44).

122 Hobbs had evidently not seen the letter on this subject to William Cole printed at the end of Robert Hooke's *Lampas, or description of some mechanical improvements of lamps and waterpoises* (London, 1677). Cole's letter was entitled 'An observation about the seed of moss'. His reference to ferns is pp. 47–48.

123 Figures 1 and 8 are missing and have been reconstructed.

124 One of many indications that Hobbs does not accept the short time-scale entailed by a literal reading of the Bible.

125 An obvious attack on Thomas Burnet's *Telluris theoria sacra* (London, 1681 and 1689; English translation, 1684 and 1690). For the problem of the function of mountains in the system of nature as understood in the late seventeenth century see G. L. Davies, *The earth in decay* (London, 1969: chs i and ii); M. H. Nicolson, *Mountain gloom and mountain glory* (Ithaca, New York, 1959: chs i–iii). Yi-fu Tuan, *The hydrologic cycle and the wisdom of God* (Toronto, 1968).

126 For the great comet of 1680, see C. A. Ronan, *Edmond Halley: genius in eclipse* (London, 1969: 59f.). For Halley's views of comets as possible agents of geological destruction, see E. F. MacPike, *The correspondence and papers of Edmond Halley* (London, 1932: 234), and for W. Whiston's similar ideas, see his *New theory of the earth* (London, 1696).

127 Malachi 4: 1: 'For behold, the day cometh, that shall burn as an oven'.

128 For contemporary debate about the likely end of the earth see E. L. Tuveson, *Millennium and utopia* (Berkeley, 1949).

129 Note again the implication of a high time scale.

130 For contemporary debate on the problem of the origins of rivers see A. K. Biswas, *History of hydrology* (Amsterdam, 1972); G. L. Davies, *The earth in decay* (London, 1969: chs i–ii; and for a contemporary account see above all R. Plot's *De origine fontium* (Oxford, 1685).

131 For contemporary debate on the problem of the age of the Earth see S. E. Toulmin and J. Goodfield, *The discovery of time* (Harmondsworth, 1967: chs iii and iv); H. Meyer, *The age of* *the world* (Allentown, Pa, 1951); F. Haber, *The age of the world: Moses to Darwin* (Baltimore, 1959: chs i–iii).

132 2 Peter 3: 8.

133 Genesis 1: 16: 'And God made the two great lights; the greater light to rule the day, and the lesser light to rule the night; he made the stars also'.

134 Hooke had employed similar arguments from fossils to press for a high antiquity for the Earth. See his *Posthumous works* (ed. R. Waller, London, 1705).

135 Figure 3 is missing and has been reconstructed.

136 Shaston is Shaftesbury. In fact the trees were presumably not petrified, but rather dated from historical times. For although fragments of lignite would be found in the Kimmeridge Clay near Shaftesbury (which is often carbonaceous), trunks of trees of the size quoted by Hobbs would not be found in the rock beds themselves. Joshua Childrey and John Aubrey had visited in 1668 a hill near Shaftesbury which contained plenty of Cocklestones. See A. R. and M. B. Hall, eds, *The correspondence of Henry Oldenburg* (Madison, 1968, **5**: 456).

137 It is not clear whether Hobbs had visited the repository of Gresham College (*i.e.*, the Royal Society), or had merely seen Nehemiah Grew's *Musaeum Regalis Societatis* (London, 1681) where petrified wood is mentioned on pp. 265–74.

138 For background to the problem of the Deluge, see D. C. Allen, 'The legend of Noah', *University of Illinois studies in language and literature* **33** 1949. Hobbs's almost total dismissal of discussion of the Deluge is most unusual for its time.

139 Robert Plot's discussion of Fairy Rings is in his *Natural history of Stafford-shire* (Oxford, 1686: 9–20). John Aubrey's *Natural history of Wiltshire* (ed. J. Britton, London, 1857: 37) contains a similar discussion.

140 The chief theorist of the view that all rocks were dissolved at the Deluge was John Woodward in his *An essay towards a natural history of the earth* (London, 1695).

141 Genesis 8: 4: 'And the Ark rested in the seventh month on the seventeenth day of the month, upon the mountains of Ararat'.

142 This is a slightly surprising statement, for till now Hobbs has expressly been confining himself to what is *naturally* possible. Now he seems also to rule out the possibility that the Deluge could ever miraculously have had the effects which Woodward and others supposed.

143 Psalm 14: 1. 'The fool hath said in his heart, There is no God. They are corrupt, they have done abominable works, there is none that doeth good'.

144 For the extensive contemporary argument over the supposed rise of 'atheism' *cf.* R. L. Colie, *Light and Enlightenment* (Cambridge, 1957); M. C. Jacob, *The Newtonians and the English Revolution, 1689–1720* (Hassocks, Sussex, 1976); J. Redwood, *Reason, ridicule and religion* (London, 1976).

145 For discussion of the possible date of composition of the Postcript, see p.31.

146 A very large number of maritime manuals were produced in Dutch with the title *De Lichtende Colomne ofte Zee-Spiegel* throughout the seventeenth century. The first I have been able to trace in England (*The lightning colomne or sea-mirrour*) was printed in 1654 at Amsterdam (there is a copy at the National Maritime Museum at Greenwich: I am particularly grateful to Miss Margaret Deacon for her help in locating and describing this). Thereafter *Lightning columns* appeared regularly in English, every few years, and it is perhaps surprising that Hobbs had not seen one earlier. For a listing of English *Lightning columns* see the definitive work of I. C. Koeman, *Atlantes neerlandici* (Amsterdam, 1970, **4**: xxv–xxxviii). Koeman has not been able to trace, however, a copy surviving of the 1701 edition. The title page of a 1692 edition is eloquent of the contents:

> The / Lightning Columne, / or / Sea-Mirrour, / containing the / Sea Coasts of the Northern and Eastern / Navigation: Setting forth in divers necessaire Sea-Cards, all the Ports, / rivers, bayes, roads, depths and sands, very curiously placed on its / due Polus height furnished. With the discoveris of the chief countries / and on what cours and distance they lay one from another. Never / theretofore so clearly laid open, and here and there very diligently / bettered and augmented for the use of all seamen. / As alsoo the / situation of the northernly countries, as islands, the Strate Davids, the isle of Jan Maven, Bears Island, / old Greenland, Spitsbergen and Nova Zembla: adorneth with many sea-cards and discoveries. / Where unto is added a brief instruction of the art of navigation, together with / new tables of the suns declination, with an new almanach. / Gathered out of the experience and practice of divers pilots and lovers of the famous art of navigation. / At Amsterdam, Printed by Casparus Loots-man, Bookseller in the Loots-man, upon the Water. Anno 1692. With Privilege for Fiftheen Jears. (see Koeman **4**: 254).

For a good discussion of the evolution of the sea atlas see A. H. W. Robinson, *Marine cartography in Britain* (Leicester, 1962: ch. ii).

147 Hobbs's map of the world is, unfortunately, lost, and his descriptions of it hardly enable one to make a hypothetical reconstruction. Presumably it looked something like a hybrid between Halley's map of the trade-winds and his 'Chart of the tides in the Channel'. For the later development of the attempt to plot the times of tides across the globe, and to understand their regularities and laws, *cf.* W. Whewell, *Essay towards a first approximation to a map of cotidal lines* (London, 1833)—see pp. 226–7 for the irregularities of the tides at Weymouth.

148 Herman Moll (d. 1732) was a Dutch geographer, working mainly in Britain, who engraved maps for a large number of early eighteenth century geographical works, above all *The compleat geographer*, 3rd ed. (London, 1709), and *A view of the Coasts, Countries and Islands within the limits of the South Sea Company* (London, 1711).

149 John Seller was the author of several works dealing with the coastal geography of Britain, above all the *Atlas maritimus* (London, 1675) and *The coasting pilot* (London, 1673). See A. H. W. Robinson, *Marine cartography in England* (Leicester, 1962: 38–42 and Appendix J).

150 John Thornton was a geographical and navigational author. His works include the *Atlas maritimus novus* (London, 1708); and *A correct table of the latitude and longitude of the most noteable capes* (London, 1706).

151 William Dampier (1652–1715), bucaneer, pirate, navy captain and circumnavigator, and the most popular writer of naval voyages of his age; author in particular of *A new voyage round the world* (London, 1697).

152 Woodes Rogers (d. 1732), sea captain and governor of the Bahamas. Author above all of *A cruising voyage around the world* (London, 1712).

153 This is of course not true: the motions of the tides are infinitely more complex, and still today hardly understood.

154 See Captain William Dampier, *Voyages and descriptions in three parts*. Pt. III. *A discourse of trade winds, breezes, storms, seasons of the year, tides and currents of the Torrid Zone throughout the world; with an account of Natal in Africk, its products, negro's etc.* (London, 1699: 90ff.).

155 *Ibid.*

156 Halley's 'maps' referred to here would be his 'Chart of the tides in the Channell' (London, 1702); 'An historical account of the trade winds and monsoons', *Phil. trans R. Soc. Lond.* **16** 1686: 153–68; his 'Isogonic Map of the Atlantic' (London, 1701); his 'Isogonic Map of the World' (London, 1702). There is an excellent discussion of the theoretical importance of Halley's maps in Norman J. W. Thrower, 'Edmond Halley and thematic geo-cartography', in N. J. W. Thrower and C. Glacken, *The terraqueous globe* (Los Angeles, 1969), which also contains an admirable bibliography on Halley. Halley's chart of the English channel is reproduced and discussed in Derek Howse and Michael Sanderson, *The sea chart* (Newton Abbot, 1972: 80–1).

157 Figure III, Plate 3, is lost, and I have not felt confident to reconstruct it.

158 Figures I and II, Plate 3, are lost and I have not been able to reconstruct them.

159 This is necessarily rather obscure in the absence of Hobbs's maps.

160 See note 157.

161 See note 156.

162 The tides around Weymouth are notoriously complex, partly due to Chesil Bank.

163 See note 157.

164 See note 154.

165 In the Gulf of Mexico.

166 San Miguel in the Gulf of Panama.

167 In the Cape Verde Islands.

168 See notes 157 and 158.

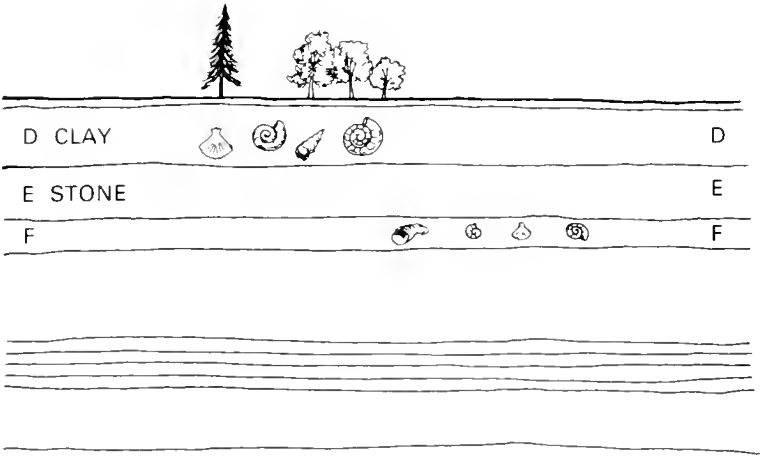


FIGURE 1 Mentioned in Hobbs's manuscript on page 1 (in this edition: page 39), 15 (48) 16 (49), 91 (97), and 111 (107).

The original diagram is lost and has here been reconstructed. It does not seem to refer to any specific location. Its chief aim is to demonstrate that strata are found parallel to each other and generally parallel to the horizon. In connection with this diagram, Hobbs mentions (MS 91; this edition, 97) that fossils of 'Oysters, Wrincles, Cockles &c' are found within the strata.

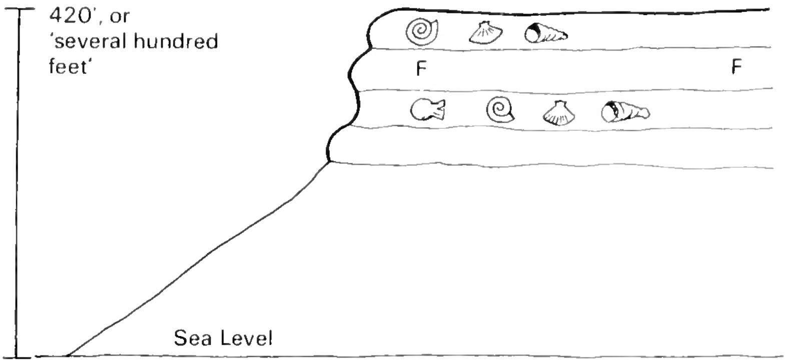


FIGURE 2 Mentioned in Hobbs's Manuscript on pages 2 (this edition: 39), 16 (49), 17 (50), 91 (97), and 93 (97).

The diagram is lost and has been reconstructed. Hobbs is expressly referring to the cliff scenery of the Isle of Portland, 'soe many hundred feet higher than the Ocean', his most precise estimate being 420′. Hobbs notes that the strata to which he is referring extend downwards from the surface for between 60′ and 100′. He is clearly describing Portland stone, and points out that it is highly fossiliferous. It is underlain by Portland sand and Kimmeridge clay, neither of which is well exposed—partly because rubble from the quarries was doubtless obscuring the lower strata. Landslips caused by the failure of the lower soft beds, thereby bringing down blocks of Portland stone, were also significant in this effect. The barren bed F.F.F. might refer to a number of beds within the Portland stone such as the Whit bed (7–15′ thick) which is a limestone largely composed of tiny shell fragments that might have escaped notice. Identification of the bed F.F.F. as the Whit bed is not certain, and there are other possibilities, though the Whit is considered an excellent freestone and Hobbs would probably have had many opportunities for observing it.

At the depth of 60–100′ which Hobbs mentions, he is undoubtedly referring mostly to the Portland stone, but as the Purbeck beds overlie the Portland stone on the Bill, there is little doubt that Hobbs included them in his estimate.

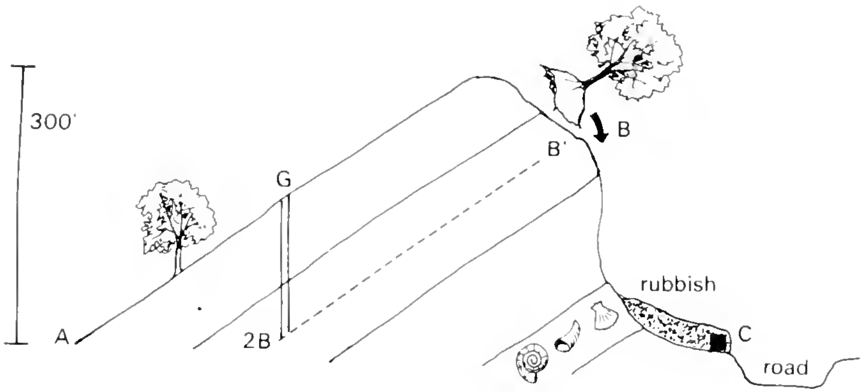


FIGURE 3 Mentioned in Hobbs's Manuscript on pages 1 (39), 15 (48), 16 (49), 17 (50), 18 (50), 91 (97), 119 (112).

This diagram is lost and has been reconstructed. It is designed to show that strata are generally found parallel to each other, and in hilly country parallel to the line of the hills. Hobbs notes how strata run unbroken, at an angle of perhaps 20 or 40° along one side of the hill (*i.e.*, dip slope) but are broken off sharply along the other side (*i.e.* scarp face). He notes how materials (including trees) become detached from near the top of the scarp face and tumble down to form mounds of rubbish.

Presumably this diagram illustrates his discussion on p. 120 (112) of finding tree trunks having tumbled down from a high hill near Shaston (= Shaftesbury). In the Shaftesbury area there are several beds which Hobbs might have had in mind when referring to his hill. The detachment of bed A suggests that it was a competent (geologically speaking) bed such as limestone underlain by a softer sand or clay. There seems to be no definite way of discovering which hill and strata Hobbs had in mind.

In his discussion of how a knowledge of the geometry of stratification can help discovery of mines, etc., Hobbs argues that if a seam is found at 2B, 130′ down from G, one can predict that the same seam will be found at B1, three or four feet down from B (by which he presumably means under the top-soil).

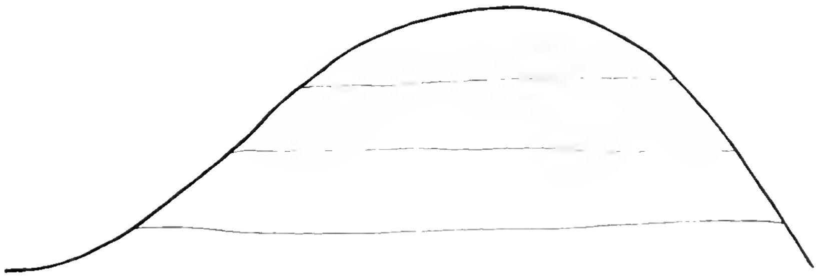


FIGURE 4 Mentioned in Hobbs's manuscript on pages 1 (39), 16 (49), 93 (98). This diagram has been lost and is here reconstructed.

Hobbs uses this diagram to illustrate his contention that strata are basically found parallel to each other and to the horizon, and that this can be the case even with land considerably elevated above sea level. I assume that he particularly has in mind the topography of cliffs. Hobbs does not make it clear what relation he imagines the elevated land to bear to the surrounding terrain. Whether Hobbs considered that the elevated portion achieved its position by the action of faults or the removal of surrounding rocks is uncertain

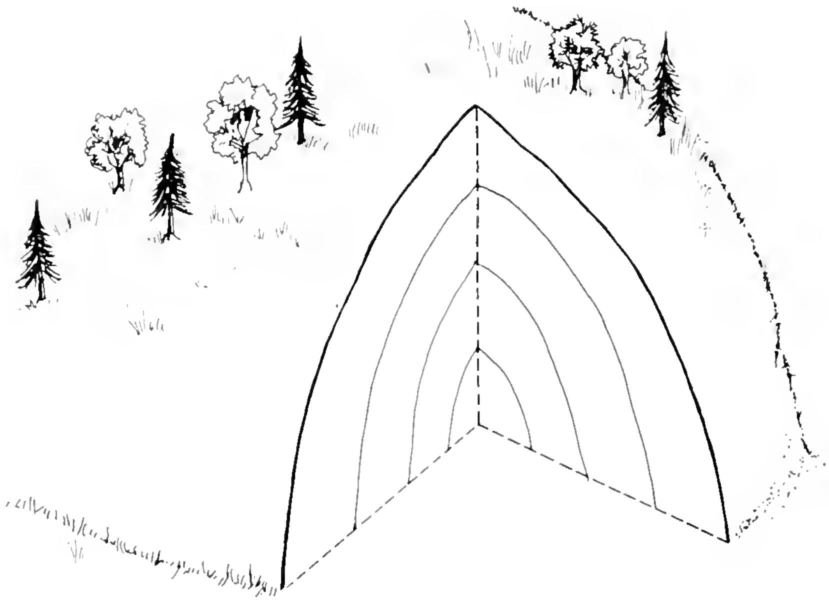


FIGURE 5 Mentioned in Hobbs's manuscript on page 16 (49). This diagram has been lost and is here reconstructed.

In it Hobbs embodies his denial that in hilly country the strata ever run completely parallel to the three-dimensional topography. He argues that the structure of hills is always as found in diagrams 3 and 4. This serves to illustrate his conviction that hills have been created by elevation from below, rather than by any kind of precipitation from above. Elevation from below, Hobbs believes, must necessarily result in upland areas possessing at least one jagged end and broken face (as in a cliff).

Hobbs's denial of this possibility shows that he had no real awareness of the anticlines of Dorset.

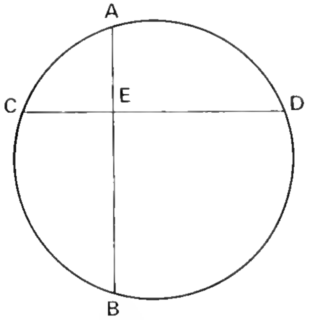


FIGURE 6 Mentioned in Hobbs's manuscript on page 25 (55). This diagram has been lost and is here reconstructed.

It illustrates Euclid li. 3, pro. 35. For explanation see footnote 55.

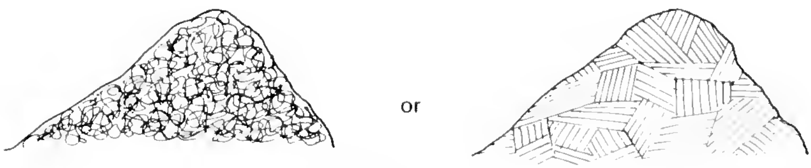


FIGURE 7 Mentioned in Hobbs's manuscript on pages 16 (49) and 92 (97). This diagram is lost and has been reconstructed.

It is intended by Hobbs to demonstrate an impossibility in Nature—*i.e.*, the strata found in no order whatever. It is not clear whether Hobbs had in mind a situation in which small particles of different rock types would be accumulated chaotically, or whether he was thinking of small wedges of strata abutting against each other at random angles. His aim is to show that strata are not the product of any kind of chemical precipitation, or the remains of the Deluge, or the remnant of some other disordering force in Nature, but rather have been gradually formed on the sea-bed, and subsequently regularly and gently uplifted.

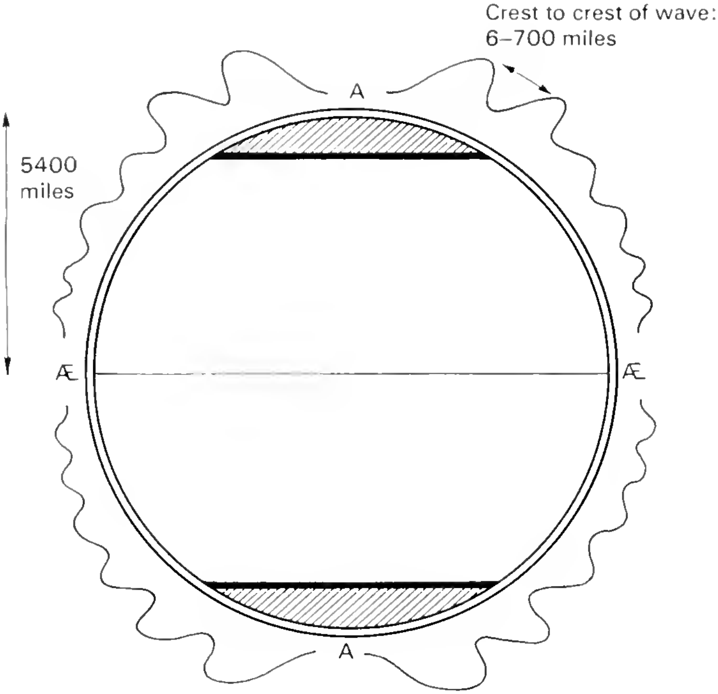


FIGURE 8 Mentioned in Hobbs's manuscript on pages 2 (39), 81 (91), 83 (92), 91 (97), 111 (107). This diagram has been lost and is here reconstructed.

In his text Hobbs refers both to a Figure 8 and to a Figure VIII. I have assumed that he had in mind the same diagram, and have here combined the information which relates to both of them. Hobbs is chiefly concerned in this figure to demonstrate two points:

(*a*) that the shell, or crust, of the globe is very thin indeed as a fraction of the diameter of the globe itself. His estimate is the—reasonably accurate—one of ten or twelve miles, which, as he says, can only properly be represented on his diagram by the thickness of the stroke of a pen. He is concerned to show that strata within this shell are horizontal. He infers the thinness of the shell from the shallowness of the sea in the English Channel, and by analogy with the *orbis minor*.

(*b*) that at the two poles of the globe are to be found musculous, cordious areas, whose pulse creates the motion of the tides.

On pages 134–8 of the manuscript (in this edition, pages 120–123) Hobbs discusses the wave motion by which this pulse of the tides is communicated from the poles to the equator (being conveyed some 600–700 miles per tide, and diminishing towards the equator). He seems to have illustrated this by his map, which I have not endeavoured to reconstruct. I have however inserted an indication of such a wave motion emanating from the poles as an indication of what Hobbs may have had in mind.

PLATES

Please note that Plate I is a facsimile of Hobb's Title Page and is to be found on page 36 opposite the transcription.

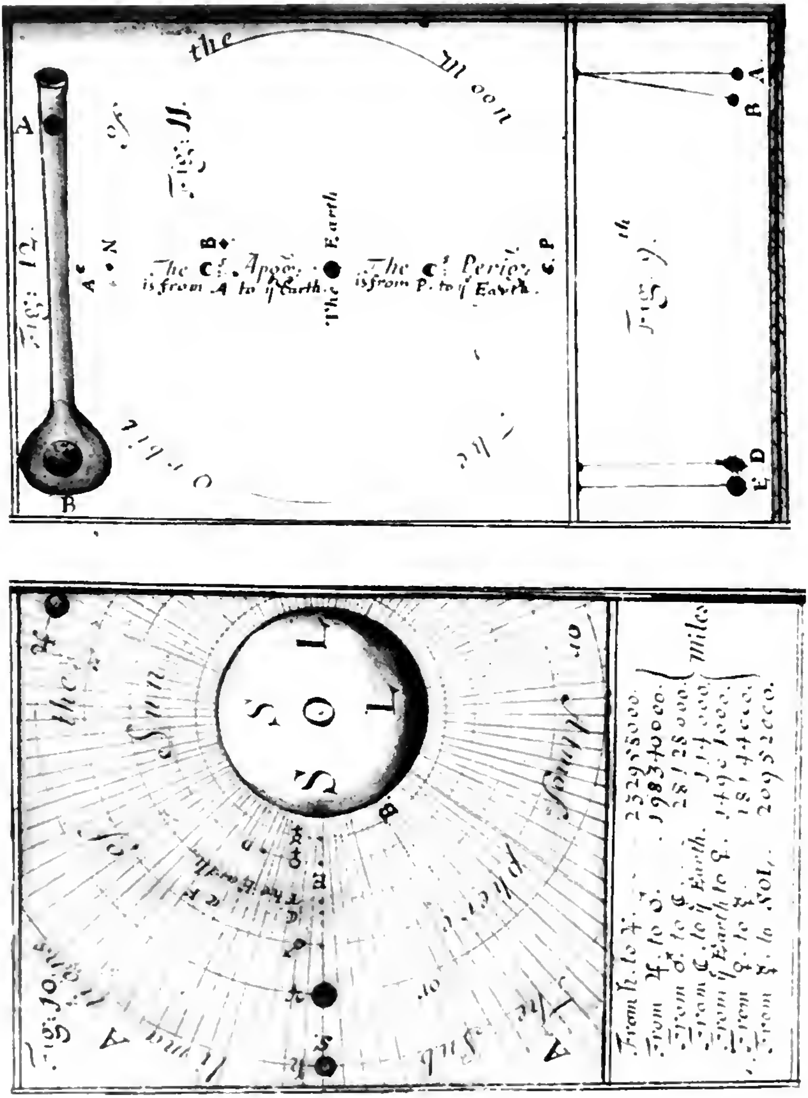


PLATE II This plate reproduces the one surviving page of figures drawn by Hobbs himself (figures 9, 10, 11 and 12). It exists as a loose sheet in the treatise. The meaning of the figures is fully explained by Hobbs in his text.

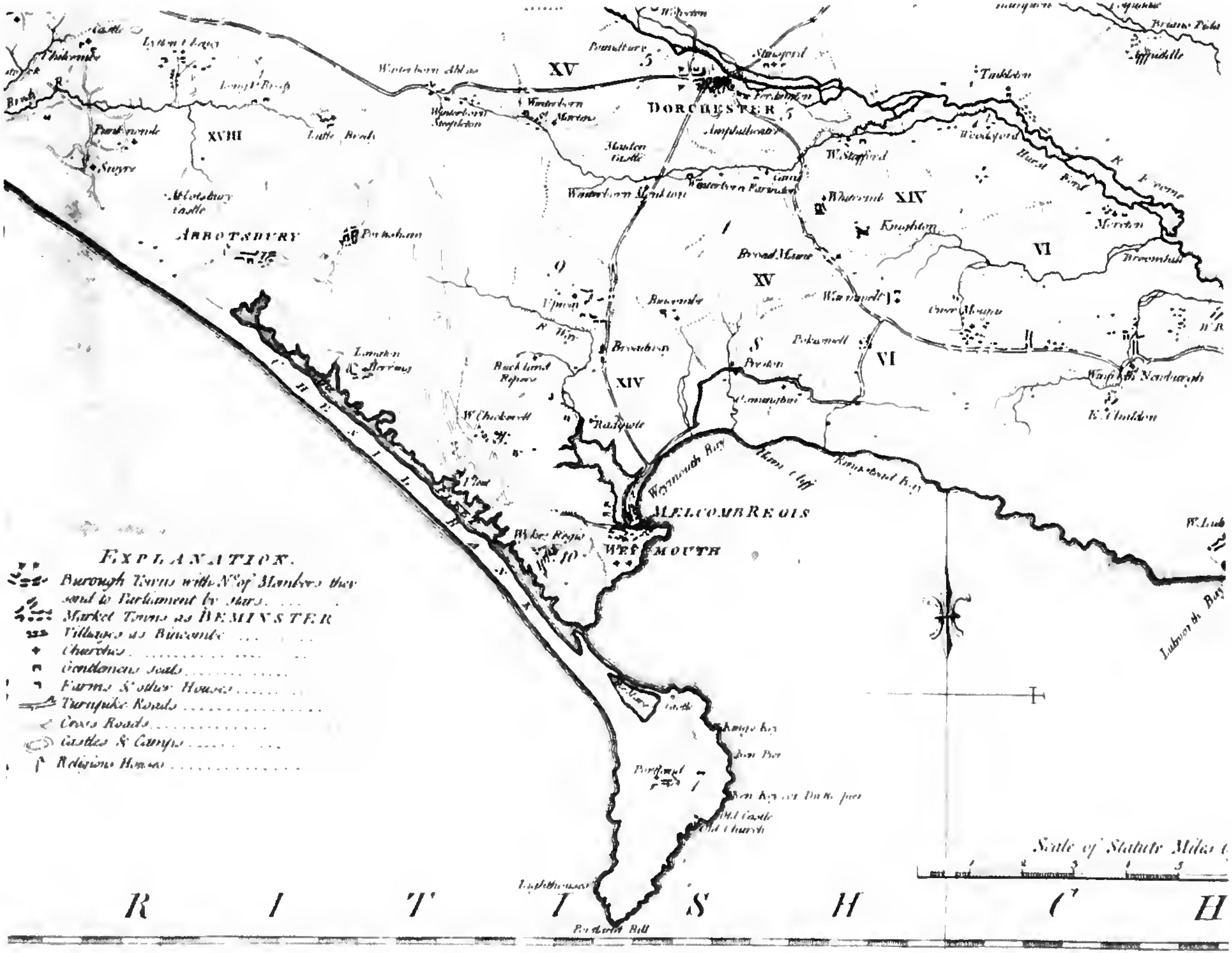


PLATE III Part of South Dorset, including Weymouth and Portland. Taken from 'A Map of Dorsetshire from Actual Surveys and Records of the Country' by J. Bayly, 1773 (also printed in Hutchins's *History of Dorset* (1774)). Its scale is $69\frac{1}{2}$ statute miles to a degree.

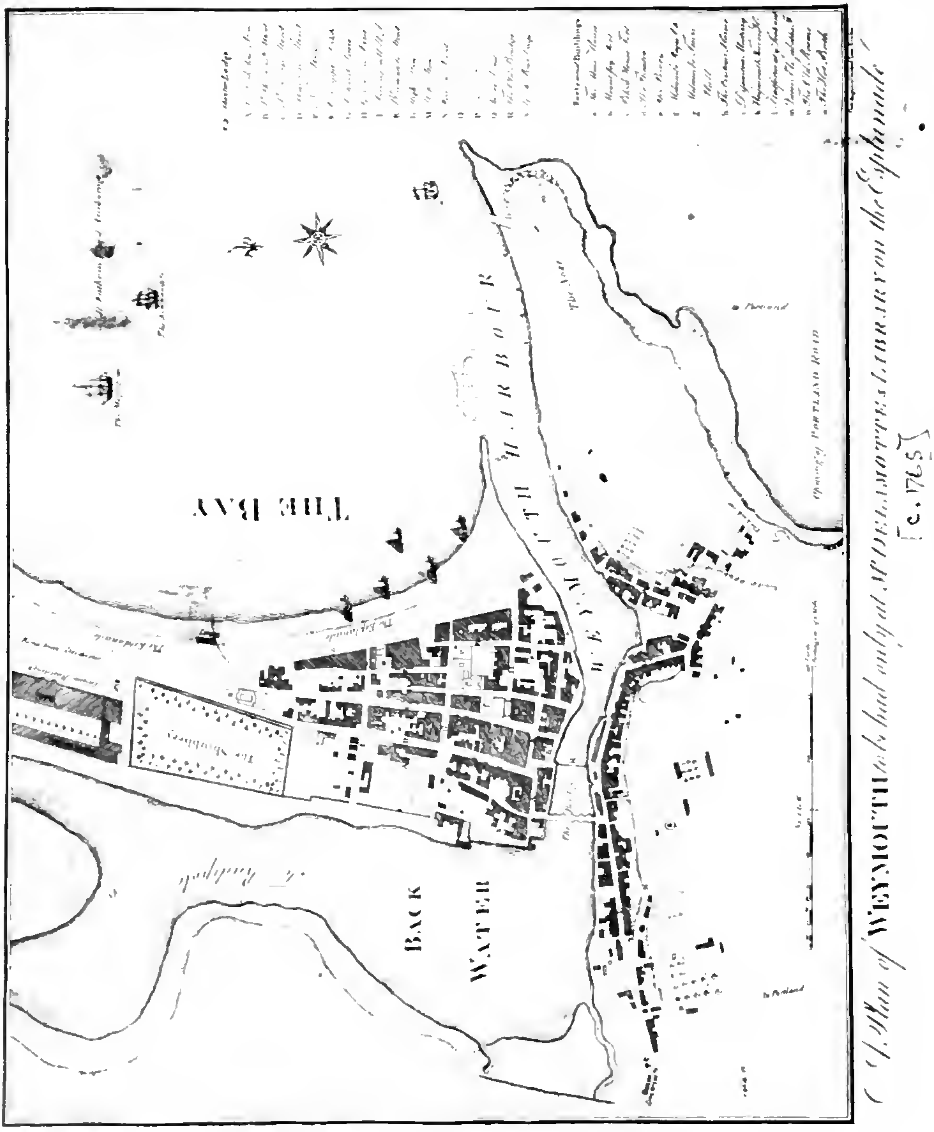
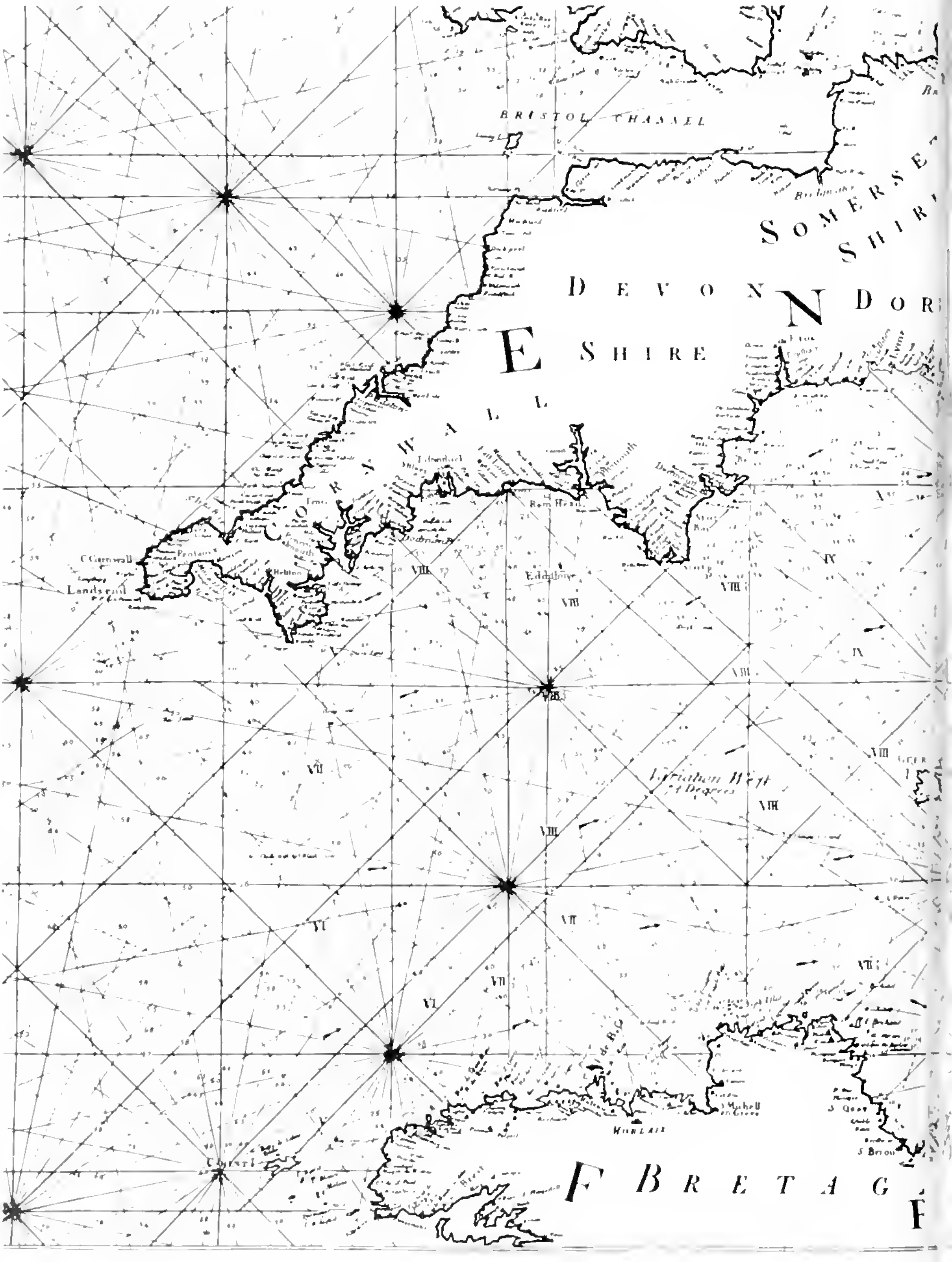


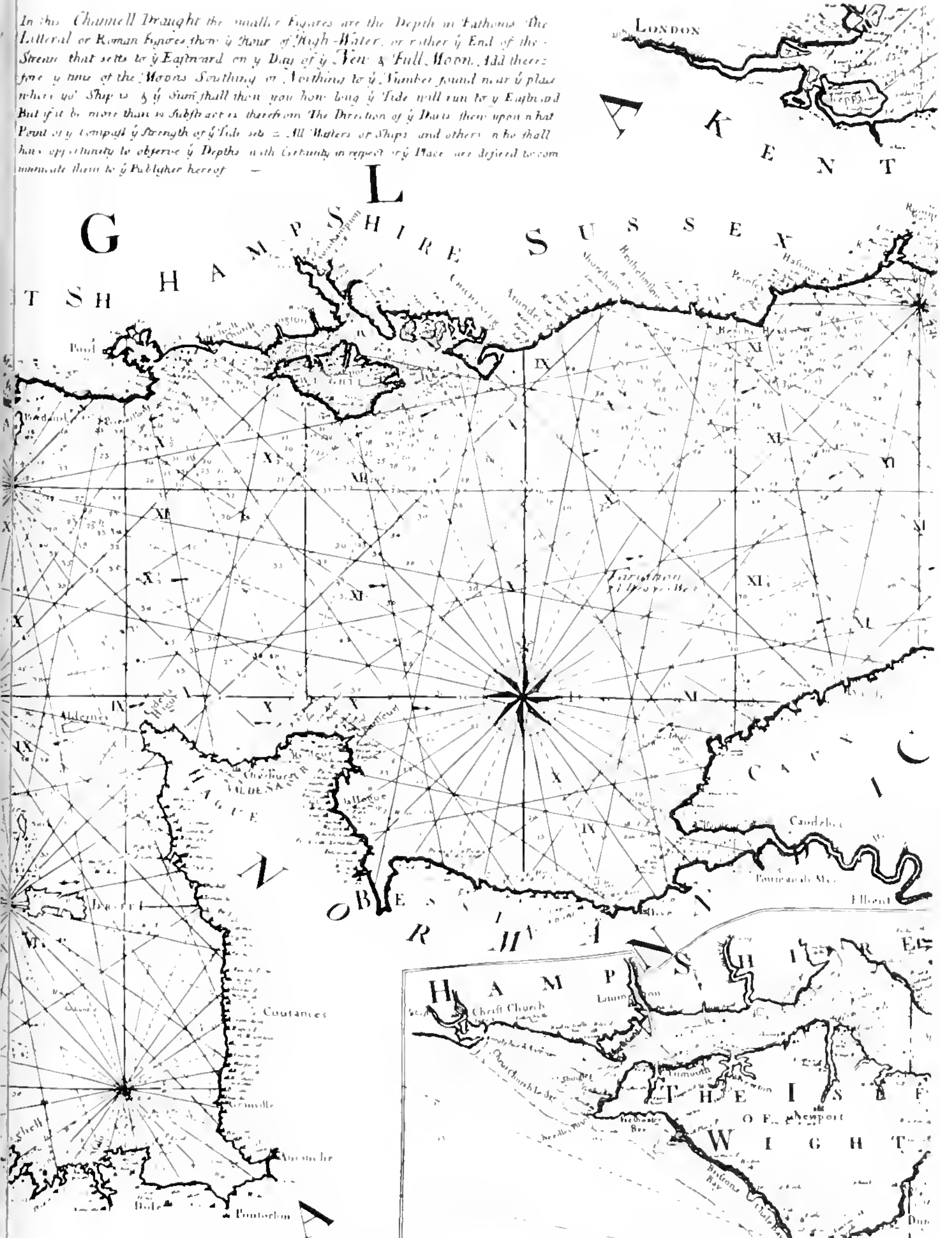
PLATE IV Weymouth c. 1765. Taken from 'A Plan of WEYMOUTH to be had only at Mr DELAMOTH's LIBRARY on the Esplanade'. About this time Weymouth was first beginning to develop as a resort.

PLATE V 'A New and Correct Chart of the Channel between England and France with considerable Improvements not extant in any Draughts hitherto publish'd, shewing the Sands, Shaols, depths of Water and Anchorage, with y^{e} flowing of the Tydes, and setting of the Current as observ'd by the learned D^{r} Halley: sold by Mount and Page on Tower Hill' [1702].

Halley's Chart of the Channel was undoubtedly much used by Hobbs, for it recorded both the times of the tides, and also the depths of the Channel. The legend reads:

> In this Channell Draught, the smaller Figures are the Depth in Fathoms, The Litteral or Roman Figures shew y^{e} Hour of High-Water, or rather y^{e} End of the Stream that setts to y^{e} Eastward on y^{e} Day of y^{e} New and Full Moon. Add therefore y^{e} time of the Moons Southing or Northing to y^{e} Number found near y^{e} place where yo^{r} Ship is, & y^{e} Sum shall show you how long y^{e} Tide will run to y^{e} Eastward. But if it be more than 12 subtract 12 therefrom. The Direction of y^{e} Darts shew upon what Point of y^{e} Compass y^{e} Strength of y^{e} Tide sets = All Masters of Ships, and others, who shall have opportunity to observe y^{e} Depths, with Certainty in respect of y^{e} Place, are desired to communicate them to y^{e} Publisher hereof.


BRISTOL CHANNEL
DEVON
SHIRE
SOMERSET
SHIRE
CORNWALL
C Cornwall
Landsend
Edddstone
Ram Head
Variation West
Morlaix
BRETAG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LONDON
KENT
SUSSEX
HAMPSHIRE
ENGLAND
NORMANDIE
Alderney
Coutances
Candebec
Pontorson
Dole
HAMPSHIRE
Christ Church
THE ISLE OF WIGHT
Newport
Scale of Miles

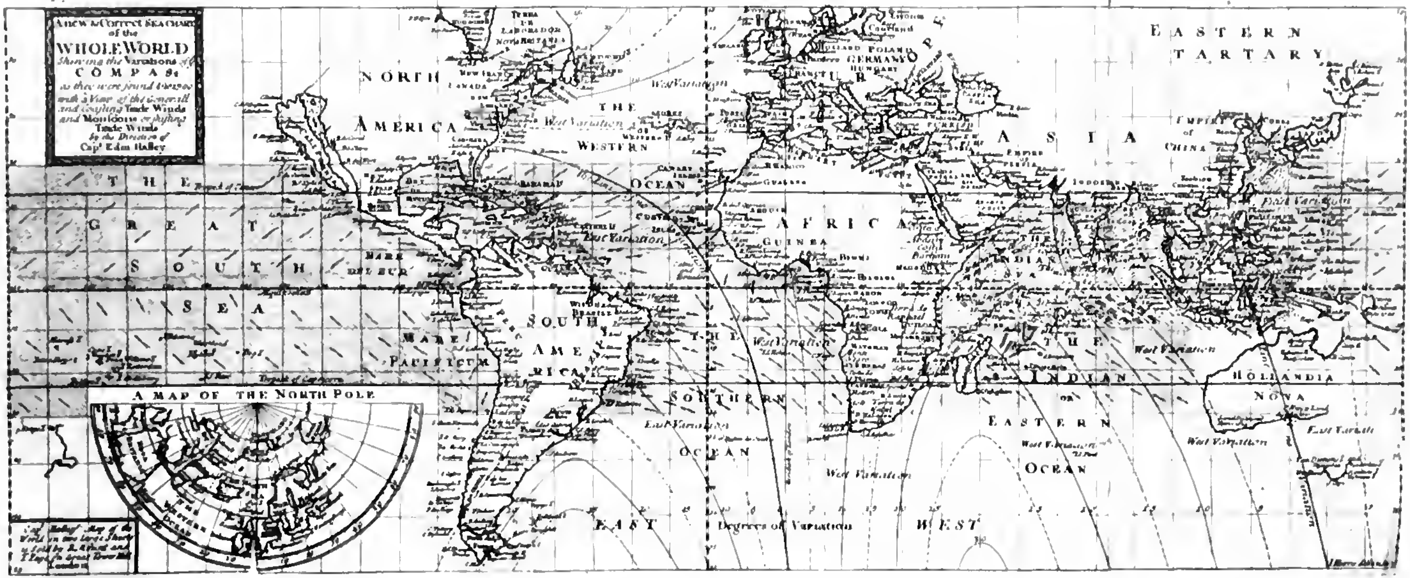

PLATE VI Edmond Halley's 'A New Correct Sea Chart of the WHOLE WORLD, shewing the Variations of the COMPASS, as they were found ano 1700, with a View of the Generall and Coasting Trade Winds and Monsoons or Shifting Trade Winds by the Direction of Capt Edm. Halley', here reproduced from Halley's *Miscellanea curiosa* (London, 1705, 1: facing p. 81).

Hobbs made extensive use of this map. I assume that his lost world map of the times and directions of the tides incorporated features of this map, together with some taken from Halley's *Chart of the Channel*.

Bulletin of the British Museum (Natural History)

The Journal of Peter Good

Gardener on Matthew Flinders Voyage to Terra Australis 1801–03

Phyllis I. Edwards (Editor)

Historical series Vol 9 30 July 1981

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ISSN 0068-2306

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Historical series
Vol 9: 1-213 (Complete)
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British Museum
(Natural History)
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Bulletin of The British Museum (Natural History)
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Printed in Great Britain by Spottiswoode Ballantyne Ltd., Colchester and London

Contents

Foreword

The Peter Good *Journal* came into the possession of the British Museum with the manuscripts of Robert Brown (1773–1858), first Keeper of the Department of Botany (initially named the Banksian Department). It was transferred, in 1881, to the newly established British Museum (Natural History) at South Kensington. Associated with the *Journal* are copies of the seed lists Good sent to Sir Joseph Banks (1743–1820) and a slightly different version of part of his *Journal*. Although the Good *Journal* is mentioned by J. Britten and G. S. Boulger in their *A biographical index of deceased British and Irish botanists* (2nd ed., 1931), I have found no other reference to it. From reading only a few pages of the Good *Journal* it is evident that it is of both scientific and historical importance and a valuable supplement to Matthew Flinders own published account *A Voyage to Terra Australis*, 1814.

I wish to thank the National Trust of Australia for allowing me to use a photograph of their portrait of Matthew Flinders; R. T. Sexton to use his artist's impression of H.M.S. *Investigator*; H. K. Austin to reproduce two official plans of the ship and P. S. Green, Keeper of the Herbarium, to reproduce the records at the Royal Gardens (Royal Botanic Gardens), Kew and the Society for the Bibliography of Natural History to reproduce the map. I wish to acknowledge the valuable assistance of J. Mahoney, Department of Geology and Geophysics, University of Sydney; Dr R. W. Johnson, Director, R. Henderson and N. Byrnes, Queensland Herbarium, Indooroopilly, Brisbane; K. N. Kenneally, Western Australian Herbarium, Perth; Dr J. H. Calaby, Department of Wildlife Studies, C.S.I.R.O., Canberra; J. Laycock, Australian Institute of Aboriginal Research, Canberra; J. R. Rourke, National Botanic Gardens of S. Africa, Cape Town; M. Deacon and C. Terrell, National Maritime Museum; H. J. Bilcliffe, Royal Geographical Society; Captain Wemyss, Wemyss Castle, Fife and Dr C. Nelson, National Botanic Gardens, Glasnevin. I am also much indebted to the following members of the staff of the British Museum (Natural History): A. Wheeler, D. Goodwin and I. C. T. Galbraith, Department of Zoology; M. J. Rowlands, Head, Department of Library Services, and the staffs of the Zoological and Botanical Libraries.

Goodia latifolia. Goodia, a genus described in honour of Peter Good by R. A. Salisbury, and illustrated as Plate 41 in his *Paradisus Londonensis*, 1805–08

Introduction

In the seventeenth century various Dutch navigators had touched the west and north-west coasts of Australia. Luis Vaez de Torres (d. 1613) had sailed through the strait which bears his name. Abel Janszen Tasman (c. 1602–59) had discovered southern Tasmania. Then as a result of a Royal Society expedition the real discovery of Australia began when Captain James Cook (1729–79) on his first voyage sailed along the east coast from Point Hicks to Cape York.

In February 1768, the Royal Society addressed a Memorial to King George III requesting facilities to enable them to observe the transit of the planet Venus on the 3 June the following year. This phenomenon can only be observed twice in a century, at an interval of eight years, and the observations made in 1761 had not been successful. The Society stressed that accurate observations would greatly contribute to the improvement of astronomy on which navigation so much depended. California was the Society's first choice from which to make their observations but the Court of Spain would not grant the necessary passport to allow a ship and the scientists to go there. The island of Tahiti, discovered by Samuel Wallis in H.M.S. *Dolphin*, in 1767, was their second choice. On the 25 August, 1768 H.M.S. *Endeavour* sailed from Plymouth with Captain Cook in command. The Admiralty gave Cook secret orders, only to be opened after the observations of the transit of Venus had been completed. These instructions were to sail southward, to latitude 40°S, in search of Alexander Dalrymple's great southern continent.

This Terra Australis Incognita was believed to exist to counterbalance the land masses in the northern hemisphere. England was not alone in its endeavour to locate this southern continent, for when Cook arrived at the Cape, he learnt of the French expedition under the command of Louis Antoine de Bougainville (1728–1811) in *La Boudeuse*, which had just left to sail south on what proved to be another famous voyage of circumnavigation during which Tahiti, the New Hebrides and the Solomons were visited. The expedition, however, failed to find the southern continent.

Cook and de Bougainville were fortunate in that new aids to navigation were being developed. The refined sextant used by de Bougainville's astronomer Pierre Antoine Véron enabled the immense size of the Pacific Ocean, east to west, to be reliably estimated. Although the *Nautical Almanac*, first published in 1767 and containing tables of lunar distances for every three hours of Greenwich time, was of assistance in determining longitude, it was John Harrison's chronometer, first used by Cook on his second voyage, which enabled the precise determination of longitude and meant that the explorer venturing into the Pacific Ocean need no

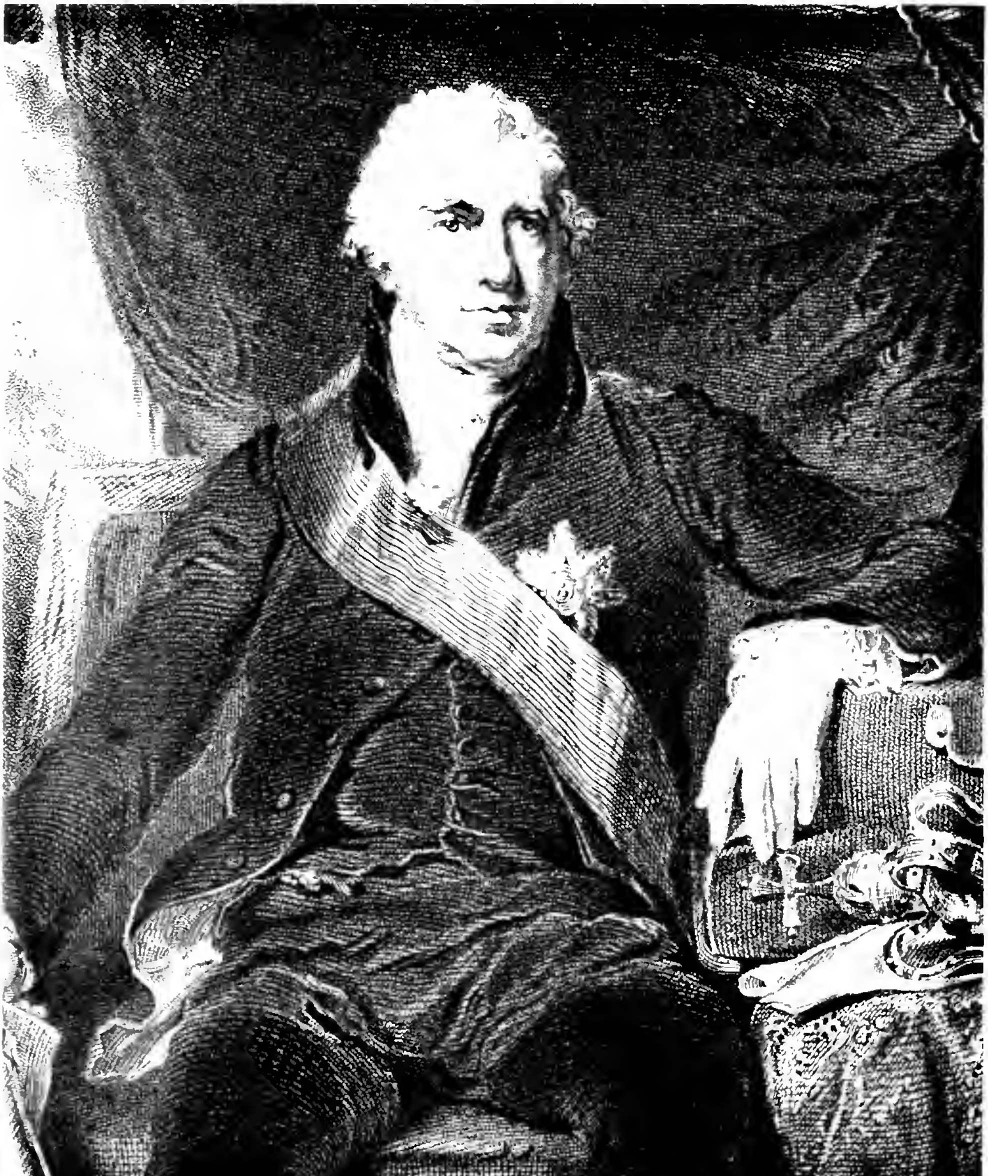


Plate I. An engraving of a portrait of Sir Joseph Banks by Sir Thomas Lawrence, P.R.A. in the British Museum longer be lost. He could know where he was, where he had been and could chart the most complicated of voyages.

In April 1766, the Royal Society elected as a Fellow, a young man of 23, who was to play a most important role in the years ahead, in the discovery and economic development of newly discovered territories in the Pacific. His name was Joseph (later Sir Joseph) Banks (1743–1820). While at Oxford University Banks studied botany, then through 1766 flexed his naturalist wings on an expedition to Newfoundland and Labrador aboard H.M.S. *Niger*, a fishery protection vessel under the command of an old Etonian friend Captain Constantine John Phipps (1744–92). Banks returned to England bounding with enthusiasm for further such adventures; not for him the Grand Tour of Europe, fashionable among men of his social position. On the 15 February, 1767 he attended his first Royal Society meeting and perhaps heard, for the first time, of the projected voyage to observe the transit of Venus. In 1764, Banks had come into his inheritance with estates which brought him in a yearly income of £6000. With such an income he no doubt began to dream of some grand natural history expedition to lands as yet unknown. When the Royal Society finally chose Tahiti as the site for their observations his dreams became clothed in reality and definite and detailed plans to participate in the voyage were obviously discussed, for in June 1768 the Society not only requested the Admiralty to have its observers conveyed to Tahiti but also to allow Mr Banks and his suite of seven on board the ship under the command of Captain Cook. His suite included Sydney Parkinson (1745–71) as natural history painter and Daniel Carl Solander (1733–82), a brilliant pupil of the famous Swedish naturalist Carl Linnaeus (1707–78), as naturalist.

The voyages of Cook and de Bougainville were something new in that they were both voyages of geographical and scientific exploration. The collections brought back on the *Endeavour* were the most extensive of any expedition up to that date and had tremendous scientific impact. Although Phillibert Commerson (1727–73), the naturalist on board de Bougainville's *Boudeuse*, was extremely diligent he was single handed; further the expedition had far fewer landfalls than those provided for Banks and Solander on Cook's first voyage so that Commerson had much less opportunity to collect.

Although the overall scientific results of de Bougainville's expedition were less important, it is hard to explain their comparative neglect. The plant specimens were studied by Antoine Laurent de Jussieu (1748–1836) for his famous *Genera plantarum* 1789 but have been largely ignored by those scientists involved in the history of cultivated plants in the Pacific area. The scientific impact made by this first Cook voyage was without doubt largely due to the dynamic personality of the young Joseph Banks, the increasingly important herbarium in his London home, 32 Soho Square, and his membership and later Presidency of the Royal Society.

Banks had grandiose ideas for the publication, in folio size, of superbly illustrated floras of the areas visited. On the voyage Solander described the living specimens, in Latin, and according to the Linnean Method, and Parkinson made a rough sketch from which a finished drawing was later prepared. Herman

Diedrich Spöring (b. 1730), Banksian amanuensis on the voyage, began the transcription of Solander's descriptions arranging these in Linnean order to form floras of the areas visited. After the voyage other amanuenses completed the task. These floras would have formed the basis for the text. During the early part of the voyage Parkinson made two hundred and eighty finished drawings. The extensive collection of plant material in New Zealand and Australia did not allow him to continue to do so. As he died on the return journey Banks had to employ five artists, over a period extending to 1785, to make some six hundred and sixty finished drawings from Parkinson's sketches. Banks then had some 742 engravings made of the finished drawings. I have discussed elsewhere (Edwards, 1978) why I consider these volumes never materialised. Naturally for Solander it was a tragedy. After his sudden death in 1782 others were able to consult and use his manuscripts and not always with due acknowledgement. Botanical science, so richly enhanced by the collection of some one thousand three hundred new species and one hundred and ten genera, was debarred the final fruits of Solander's painstaking labour.

Captain Cook's second voyage, 1772–75, was designed to prove, one way or the other, the existence of the supposed Terra Australis. To this end Cook circumnavigated the globe as far south as human endurance would permit. In his two sweeps of the Pacific he discovered new islands and for the first time charted the exact locality of many others. In fact, on Cook's charts were recorded nearly every anchorage that could be of strategic use to the Admiralty. Further he demolished every shred of evidence for the existence of the great southern continent.

The natural history exploration associated with this voyage was, in the end, financed by the Admiralty. Banks, who had engaged an even larger suite of assistants withdrew at the last moment as the more commodious accommodation he had demanded on H.M.S. *Resolution* had to be removed because it made the vessel totally unseaworthy. The Admiralty, on the Royal Society's recommendation, appointed as naturalist John Reinhold Forster (1729–98) who took his eighteen-year-old son George Adam (1754–94) with him as assistant. When they reached the Cape they decided to engage Anders Sparmann (1748–1820), a Linnean pupil, who had travelled to China with the Swedish East India Company in 1765–67 and who was an able botanist. The botanical collections made on the voyage were not as extensive as on Cook's first voyage mainly because there were far fewer landfalls. Sparmann and George Forster were largely responsible for recording the botanical results, and J. R. Forster the zoological and ethnographical ones.

A brief stay, in January 1777, was made in Adventure Bay, Van Diemen's Land (Tasmania) on Captain Cook's third voyage. Dr William Anderson (1750–78) the surgeon on the *Resolution* was an enthusiastic and competent naturalist. He made descriptions, in Latin, of animals and plants that he considered new to science. The four new plant genera were later described as *Eucalyptus*, *Goodia*, *Correa* and *Bauera*. The other vessel, the H.M.S. *Discovery*, had on board a young man knowledgeable about the plants growing in the London nursery gardens, David

Nelson (d. 1789), who Banks employed to collect herbarium specimens and seeds for the Royal Gardens. It is interesting to note that Charles Louis L'Heritier de Brutelle (1746–1800) described the genus *Eucalyptus* from a tree brought back by Anderson and grown on at the Royal Gardens, Kew and a dried specimen collected by Nelson. Nelson visited Adventure Bay again in 1789 as the gardener aboard the ill-fated *Bounty* expedition of Captain William Bligh (1754–1817). Anderson's specimens unlike those of Nelson were not incorporated into the Banksian herbarium and suffered neglect before the worthwhile remnants were rescued by James Britten (1846–1924).

In 1791 Captain George Vancouver (1758–98), after leaving the Cape of Good Hope on his voyage in the *Discovery* to north-west America from 1791–95 sailed along the southern shore of New Holland (Australia) and named King George III's Sound. His surgeon, Archibald Menzies (1754–1842), an able naturalist, made the first collection of plants from that area. In the following year Admiral Joseph Antoine Bruni d'Entrecasteaux (1739–93) set sail in the *La Recherche* in search of the French expedition, which left France in 1785, under the command of Jean François de Jalaup La Perouse and likewise made the south-west corner of Australia and followed the coast of the Great Australian Bight for some hundreds of miles. Jacques Julien de Labillardière (1755–1834) the botanist on board the *La Recherche* made collections, on two separate occasions, in Van Diemen's Land.

There were two accounts of the Australian flora published prior to the Matthew Flinders voyage. *A specimen of the botany of New Holland* by James Edward Smith (1759–1828) published in 1793–95 was an account of the specimens and water colour drawings sent to him by John White (d. 1831?), Surgeon General in Botany Bay, from 1788–95. In some instances he was able to supplement the data obtained from the herbarium specimens by consulting living specimens growing in a number of private gardens. In fact this volume was intended for those gardeners already cultivating Australian plants. The other work was the *Nova Hollandiae plantarum specimen* of Labillardière, published in two volumes, 1804–6, and based both on his own collections and those of David Nelson which had already been described.

Through the late 1790s Sir Joseph Banks had discussions with the Admiralty regarding their plan to send a further expedition to New Holland. On 15 May, 1798 Banks wrote to Under Secretary King

> We have now possessed the country of New South Wales more than ten years, and so much has the discovery of the interior been neglected that not one article has hitherto been discovered by the importation of which the mother country can receive any degree of return for the cost of founding and hitherto maintaining the colony. It is impossible to conceive that such a body of land, as large as all Europe, does not produce vast rivers, capable of being navigated into the heart of the interior; or, if properly investigated, that such a country, situate in a most fruitful climate, should not produce some native raw material of importance to a manufacturing country as England is. Mr Mungo Park—lately returned from a journey in Africa, where he penetrated farther into the

> inland than any European before has done by several hundred miles, and discovered an immense navigable river running westward, which offers the means of penetrating into the interior of the vast continent . . .—offers himself as a volunteer to be employed in exploring the interior of New Holland, by its rivers or otherwise as may in the event be found most expedient . . . He knows geography enough to construct a map of the countries he may visit, draws a little, has a competent knowledge of botany and zoology, and has been educated in the medical line. (*Historical Records New South Wales* 3 1895: 382–383.)

On 10 July, 1799 Governor John Hunter (1738–1821), of Sydney wrote to the Duke of Portland, Home Secretary

> Permit me, my Lord, to observe that altho' a thorough knowledge of the interior of this country is much to be desired, the gentleman designed to explore it would have found difficulties to surmount which I fear his experience in the interior of Africa could have given but little acquaintance with. The idea suggested by Sir Joseph Banks is in my judgment the only practical means of gaining an early knowledge of this immense country . . . And I am of the opinion . . . that a knowledge not only of the interior, but of its sea coast, have been considered by me as objects of consequence . . . by entering with a vessel the innumerable appearances of harbours which were observed and carefully marked by . . . Cook, excursions could be made from them, particularly where there may be extensive rivers or arms of the sea. (*Historical Records New South Wales* 3 1895: 693.)

A third suggestion came from Matthew Flinders (1774–1814). Flinders had first arrived in New Holland, on H.M.S. *Reliance*, in 1795. With the Surgeon, George Bass (d. 1812), he began to explore the coastline in the vicinity of Port Jackson. In 1798, Bass, in a whale-boat named *Tom Thumb*, made the epic journey which led to the discovery of the Straits which bear his name. Later that year and into 1799 Flinders and Bass, in the *Norfolk*, sailed right round Van Diemen's Land. On Flinders' return to London he wrote to Sir Joseph Banks on 6 September, 1800, outlining his plans for completing the discovery of the coastline of New Holland or Australia as Flinders eventually named this new continent. 'It cannot be doubted' wrote Flinders, 'but that a very great part of this still extensive country remains either totally unknown, or has been partially examined at a time when navigation was much less advanced than at present. The interests of geography and natural history in general, and of the British nation in particular, seem to require, that this only remaining considerable part of the globe should be thoroughly explored'. Flinders also suggested the importance of exploring the Strait between New Holland and New Guinea and of investigating the mineralogy of the country (Mitchell Library, Sydney, Brabourne Papers **20**: 59 et seq.). By 12 December, 1800 Lord George John Spencer (1758–1834), a member of the Cabinet, agreed the details of such an expedition, to be led by Flinders as suggested by Banks and which was to include the provision of a naturalist,

Plate 2 A portrait of Matthew Flinders by Will Longstaff reproduced by kind permission of the National Trust of Australia

botanical and zoological painter, landscape and figure painter, and a gardener (Mitchell Library, Sydney, Brabourne Papers 11 A: 79–84). Flinders had proved his navigational and hydrographical skills in the expedition in the *Norfolk* and was thus Banks' obvious choice for the command of the expedition.

Mungo Park had a lengthy argument with the Admiralty over pay and outfit allowance. This finally ended in Park withdrawing his offer to go as naturalist. Although he wrote to Banks on the 13 October, 1801 'that he left London down-hearted because his dream of settling in New Holland had disappeared' (*Correspondence of the Rt Hon Sir Joseph Banks Bart.* Copies by the daughters of Dawson Turner, Botany Library, British Museum (Natural History) 12: 265–266), it would appear that he had an undisclosed reason for his action, namely his marriage and a temporary desire to settle down in Scotland.

Robert Brown (1773–1858) an Ensign in the Fifeshire Regiment of Fencibles was chosen by Banks as the substitute for Mungo Park. 'Science is the gainer in this change of man, Mr Brown being a professional naturalist', thus wrote Abbé José Francisco Correia de Serra (1750–1823) to Banks on the 17 October, 1798 (*Correspondence of the Rt Hon Sir Joseph Banks Bart.* Copies by the daughters of Dawson Turner, Botany Library, British Museum (Natural History) 11: 111). Brown who was born in Montrose, Scotland, was educated at Montrose Grammar School, Marischal College, Aberdeen and finally at Edinburgh University where he obtained his medical diploma. When Banks offered Brown the post in December, 1800 he was serving in Ireland, as a Surgeon's mate. In a letter to Jonas Dryander (1748–1810), Curator/Librarian to Sir Joseph Banks, dated the 20 December, 1800, Brown says 'hardly any situation which could have been devised would have so completely met my wishes'. Possibly the factor which most recommended Brown to Banks, was that Brown was an enthusiastic botanist (Edwards, 1976). Ferdinand Lucas Bauer (1760–1826) was appointed natural history draughtsman. He and his brother Franz Andreas Bauer (1758–1840) are considered to be the two finest botanical artists of all time. William Westall (1781–1850) went on the voyage as landscape and figure painter, and Peter Good (d. 1803), who had been a foreman at the Royal Gardens, Kew and who had successfully conveyed a selection of living plants to Kew from the Hon East India Company's garden in Calcutta was chosen as the gardener. John Allen, from Derbyshire, was appointed as the miner, his duty was 'to take specimens of all rocks, and particularly of all mineral veins he meets with and bring them home' (*Historical Records of New South Wales* 4 1876: 290–291).

The following undated Memorandum regarding the appointment of the scientific personnel, their instructions and accommodation was sent to the Admiralty obviously by Sir Joseph Banks. The Memorandum is not in the Admiralty archives as stated by Austin (1974) and the Public Records Office have been unable to trace it, so its current location is unknown.

H.M.S. *Investigator*

Accommodations will be wanted on board the *Investigator* for the following men of science. A naturalist who will have the direction of the Botany, etc.

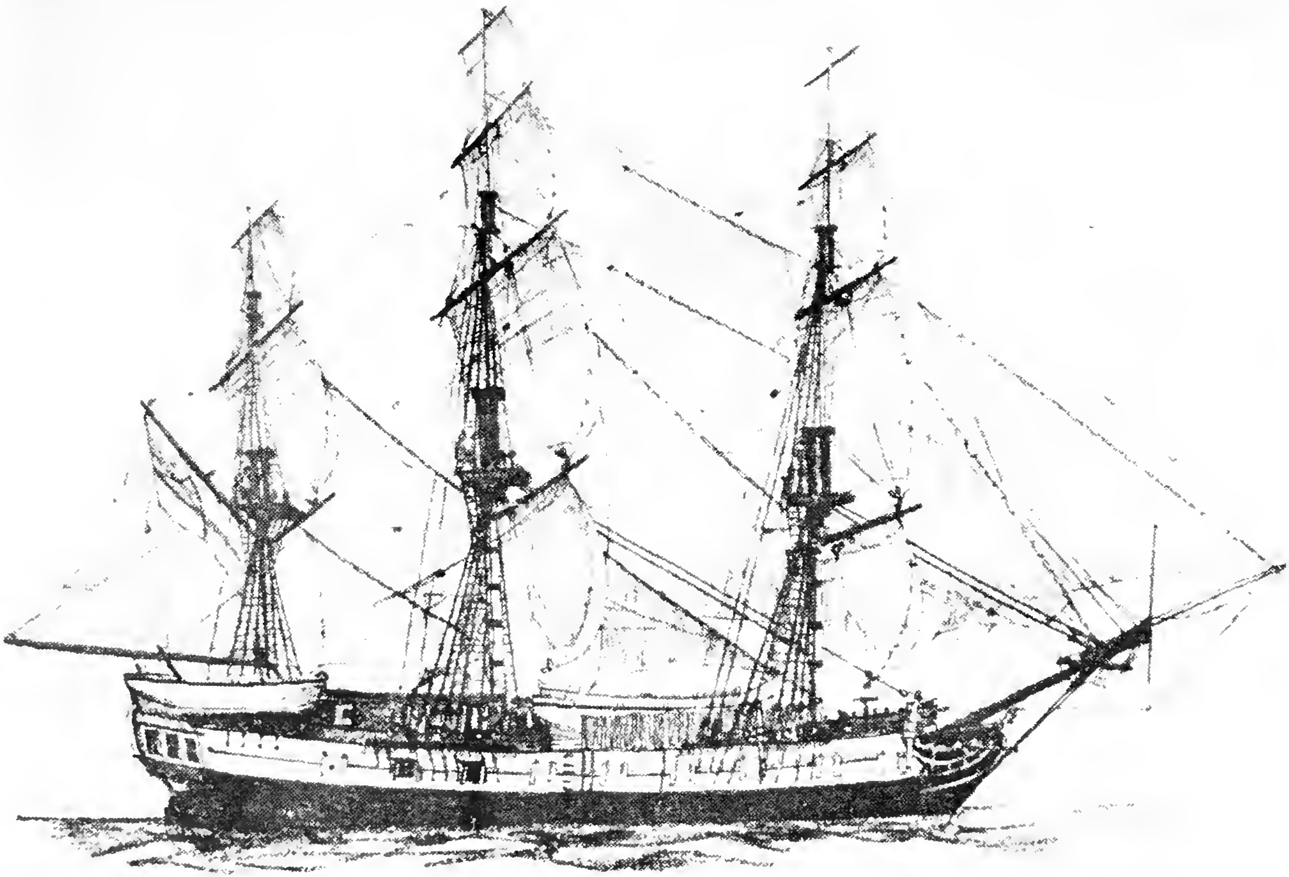


Plate 3 H.M.S. *Investigator* drawn by an artist from data compiled by R. T. Sexton

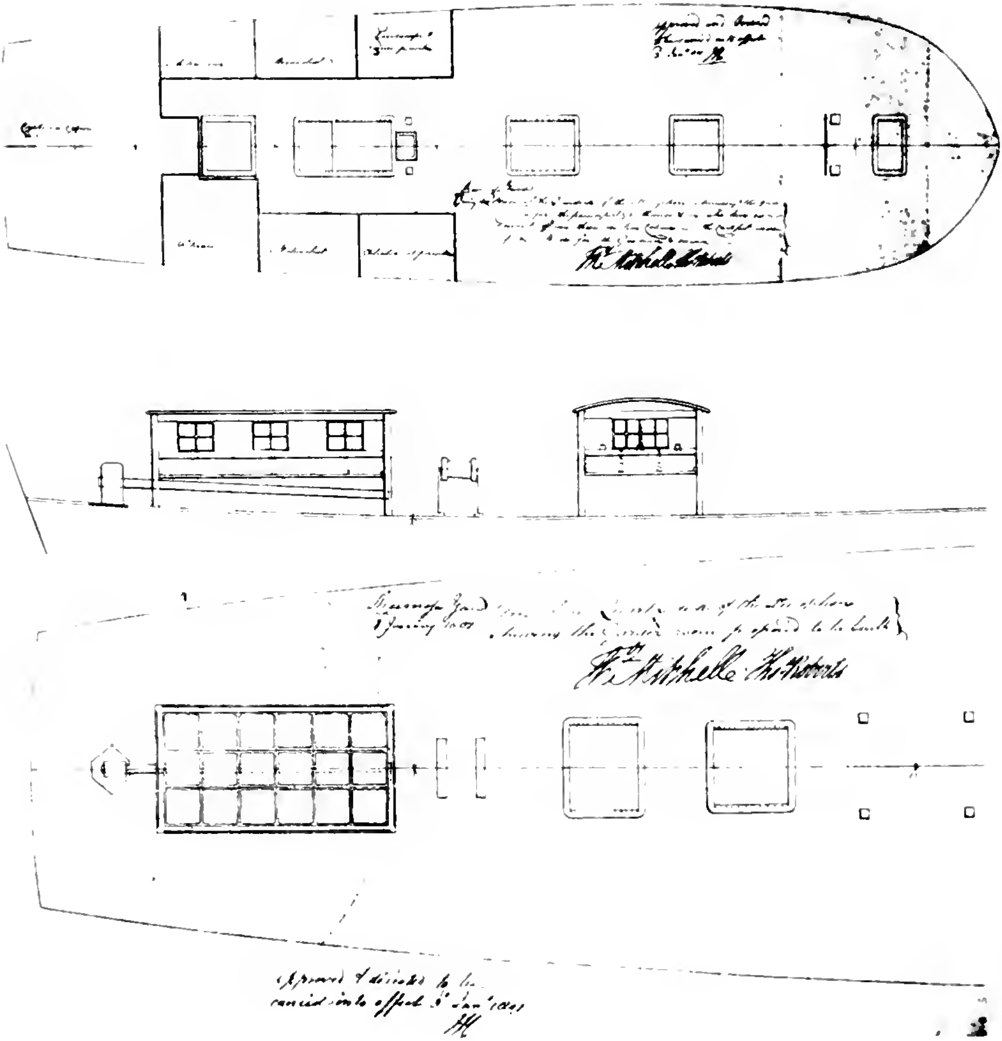


Plate 1 Two official plans of H.M.S. *Investigator* in the National Maritime Museum Draughts collection Admiralty No. 6224. Top: Plan of the Gun deck; Bottom: Plan of the quarter deck, showing the proposed plant cabin. Reproduced from K. A. Austin *Matthew Flinders on the Victorian coast* 1794, p. 17.

A Natural History Painter
A Landscape and figure Painter
A Mineralist
An Astronomer
These gentlemen must be contented with the same proportion of personal accommodation as given to a lieutenant or a master. In point of preference the Naturalist and the Astronomer should be indulged in it. Each of these gentlemen should be allowed a boy to keep their cabins clean, brush their cloths etc.
A gardiner
A practical Miner
These must rough it, they may mess with the warrant officers and be contented with the same kind of accommodation.
If the Commander chooses it the Naturalist and the Astronomer may mess with him.
The rest may, if the Gun Room Mess have no objection, join them.
The Commander will perhaps have no objection to let the process of drawing, etc. be carried out in the Great Cabin, if otherwise, a part of it must be divided off for that purpose.
A plant cabin should be carried out in frame and a sufficient quantity of spare glass. The Plant cabin that was used in the *Porpoise* will serve during the time she is on discovery, but when she returns she ought to have a larger, as large a one indeed as can be placed on the quarter deck without too much incommoding the working of the ship.
If I remember, in the case of the *Porpoise* six feet was left for the people to work in who haul in upon the after braces etc. on each side and astern, the cabin came forward very near the Mizin Mast. If six or seven feet of space is left clear in the *Investigator* on each side and astern of the plant cabin, a space will be left for it fully sufficient to bring home a large collection of plants and such a one as will be honor to His Majestys Botanic Garden. The great plant cabin need not be higher than that of the *Porpoise*.

Commercial support for the voyage was given by the Hon East India Company. They gave Flinders and his companions £1200 'for their table'. The Company's objective being to encourage the scientific persons to discover things for the trade with India and that Flinders would seek new passages for their merchantmen (India Office Library, Court of Directors, Miscellenia No. 41, p. 435). The Company enjoyed exclusive trading rights in all waters surrounding New Holland. French privateers, working in the Indies, were threatening the Company's China trade, therefore they were eager to learn about the seas on the eastern flank of their China run.

The Admiralty was aware of the French expedition to the South Pacific and their possible intention of establishing a settlement in Australia, hence all the haste with the preparations for the voyage. Flinders and H.M.S. *Investigator* sailed on 18 July, 1801, and when he reached the Cape he heard that the French

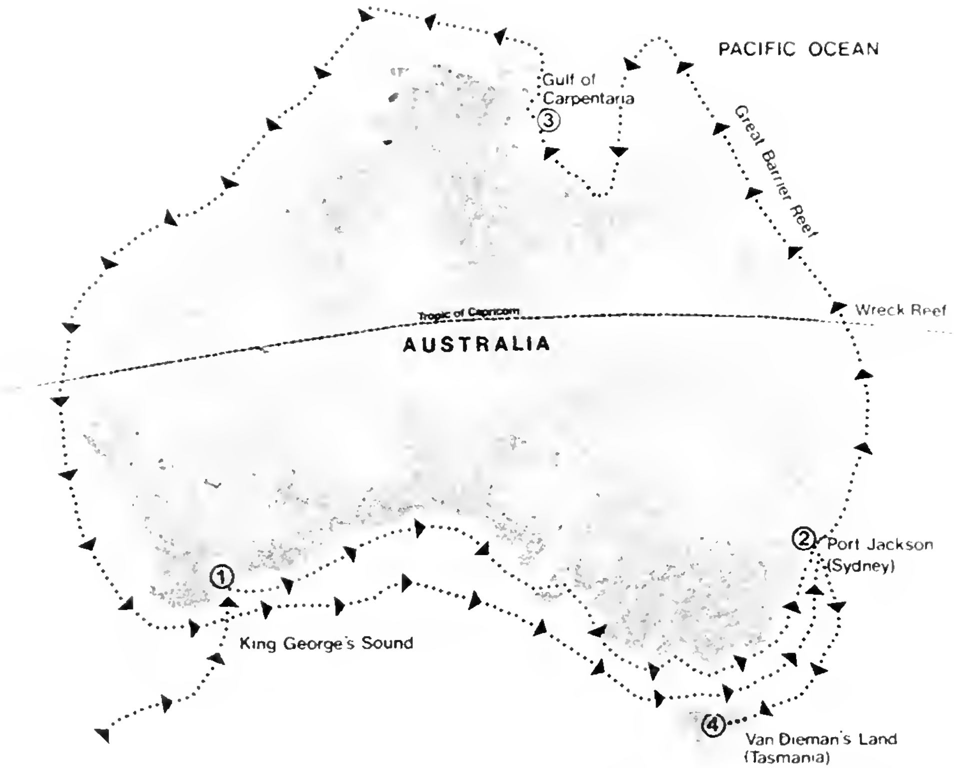


Plate 5 The circumnavigation of 'Terra Australis'. Main collecting areas: 1, King George's Sound, December, 1801–January, 1802; 2, Port Jackson (Sydney), May–July, 1802; June–November, 1803, September–May, 1805; 3, Gulf of Carpentaria, November, 1802–March, 1803; 4, Van Dieman's Land [sic] (Tasmania), January–September 1801. Number of species collected: King George's Sound 500 species; South coast 700 species. East coast 500 species; North coast 500 species; Port Jackson, 1803–05 1000 species. Van Diemen's Land 700 species. Reproduced by kind permission of the Society for the Bibliography of Natural History.

expedition under Commander Baudin had sailed South some three months earlier. Flinders was therefore not surprised to meet the French vessels *Le Naturaliste* and *Le Geographe* off the south west coast of Australia on April 7, 1802 and friendly exchanges ensued. In November, 1802, the French ships put into Port Jackson for repairs and fresh food for their scurvy ridden crew. Although the expeditions' landfalls were comparatively few J. B. L. C.-T. Leschenault de la Tour (1773–1826) made a significant collection of natural history specimens. Living plants and seeds were brought back by the gardener Riedle, to enrich the Jardin des Plantes, in Paris, and other French Gardens. Riedle is known to have complained that he was seldom allowed to go on shore (*Correspondence of the Rt Hon Sir Joseph Banks, Bart.* Copies by the daughters of Dawson-Turner, Botany Library, British Museum (Natural History) **14**: 55–57).

The map (Plate 5) shows the route taken by Flinders in his circumnavigation of Australia. The Peter Good *Journal* shows the very substantial amount of time Flinders allowed the naturalists for collecting specimens and Peter Good for collecting living material and seed.

The disastrous state of the *Investigator* and the ill health of the crew after their stay in Timor, where some repairs to the ship had been made, forced Flinders to abandon the charting of the West coast and to make for Port Jackson where the *Investigator* was considered beyond repair. The only option open to Flinders was to return to England to obtain another ship and so continue the survey. Brown and Bauer decided to remain in Australia to await Flinders return. Flinders left for England 10 August, 1803 in the *Porpoise*. Seven hundred and forty miles N.N.E. of Port Jackson the *Porpoise* was wrecked on a coral reef. Fortunately food and other stores were able to be salvaged but a set of Brown's South coast plant specimens and Good's living material were lost. Flinders, and a small crew, returned to Port Jackson in the large cutter named *Hope*. Flinders boarded the *Cumberland* on 21 September to rescue the survivors on the reef and then proceed to England. The *Cumberland* was forced to put into Mauritius for repairs where Flinders was arrested as a spy by General Charles Decaen. Repeated efforts were made by Sir Joseph Banks to secure his release but this did not occur until July, 1810.

Although the Flinder's voyage achieved most of its objectives, the participants did not receive the acclaim they deserved. Brown and Bauer returned, in 1805, to a London celebrating the Battle of Trafalgar. Sir Joseph Banks in a letter to Sir John Barrow (1764–1848), Secretary to the Admiralty, dated 9 October, 1805 states 'The cases of natural history objects sent home by the naturalists testify to their diligence and industry: there are 38 cases in all including, eleven of drawings by Bauer, twelve of dried plants, the rest being animals, minerals' (British Library Add. Ms. 32439: 185). The Department of Botany, British Museum (Natural History), has two sets of Brown's herbarium specimens, those selected by Dryander and Brown for the British Museum and the set contained in Brown's own herbarium. Brown selected two more or less identical sets of bird skins, one he presented to the British Museum and the other to the Linnean Society of London, which had a museum at that time. In 1863 the Soceity presented their set to the Museum. It was this set that was consulted by C. J. Temminck, for his paper published in 1822 and by N. A. Vigors and T. Horsfield for their paper published in 1827 and thus the one which contains Brown's bird types. The new species of insects collected by Brown were recorded by W. Kirby in 1818. The mineral collection made on the South coast was lost in the ill-fated *Porpoise*. The later collection has recently been sectioned and studied by Professor Thomas Vallance of the University of Sydney and D. T. Moore of the Department of Mineraology, British Museum (Natural History). A paper by them will be published in the *Bulletin of the British Museum (Natural History)*, Historical Series. Earlier papers were published by W. Buckland, in 1821 and W. H. Fitton, in 1827. Edwards (1976) gives further details of the natural history collections made on the Flinders voyage and related manuscripts.

Robert Brown who succeeded Dryander as Curator/Librarian to Sir Joseph Banks, later became the first Keeper of Botany (styled of the Banksian Herbarium) at the British Museum and one of the outstanding botanists of his time. Botanical science was, however, debarred the full fruits of the botanical discoveries made on the Flinders voyage. The Admiralty decreed that Brown should publish a flora and at his own expense! Only twenty-six copies of Volume 1 of his now famous *Prodromus florae Novae Hollandiae et Insulae van Diemen*, published in 1810, were sold. Brown therefore neither completed Volume 2, nor did he write the introduction. Later, however, he supplemented Volume 1 of the *Prodromus* with an important phytogeographical study *General remarks geographical and systematic on the botany of Terra Australis*. This was published as an Appendix to Matthew Flinder's *Voyage to Terra Australis*, 1814. Ferdinand Bauer intended to publish a series of engravings to accompany Brown's *Prodromus*, but for him too the time was inauspicious. The first three parts of his *Illustrationes flora Novae Hollandiae*, 1813 comprising fifteen plates sold only a small number of copies.

In spite of the Napoleonic wars, Sir Joseph Banks succeeded in arranging special facilities for the safe transport of plants. Few vessels left England for New South Wales without supplies of seed, and whenever possible living plants in pots and boxes, to maintain and to augment the horticultural and economic wealth of the new colony. The *Investigator*, was no exception, it carried some cases of seed, and in a greenhouse, a number of berry fruit bushes in pots. Among Peter Good's manuscripts is a 'List of seeds [European vegetables] sown in vacinity of spring and various other situations of the Island on the 2–4 and 5 April, 1802'. The consignment of living plants was under the special care of Good, whose commission was: the collection of seed, the selection and maintenance of a collection of choice Australian plants in pots and boxes and to give assistance to Robert Brown. A prefabricated plant cabin as recommended by Banks in his Memorandum to the Admiralty quoted earlier (p. 17 & Plate 4) was on board for Good's use. On the return journey the type of boxes for storing living plants and for sowing seed, which Brown had made at Port Jackson in 1802, would have been similar to those recommended by J. C. Lettsom in the third edition of his *The Naturalist's and Traveller's companion*, 1799 (Plates 6 & 7). Good's journal indicates that he took every opportunity to botanise and in fact did a considerable

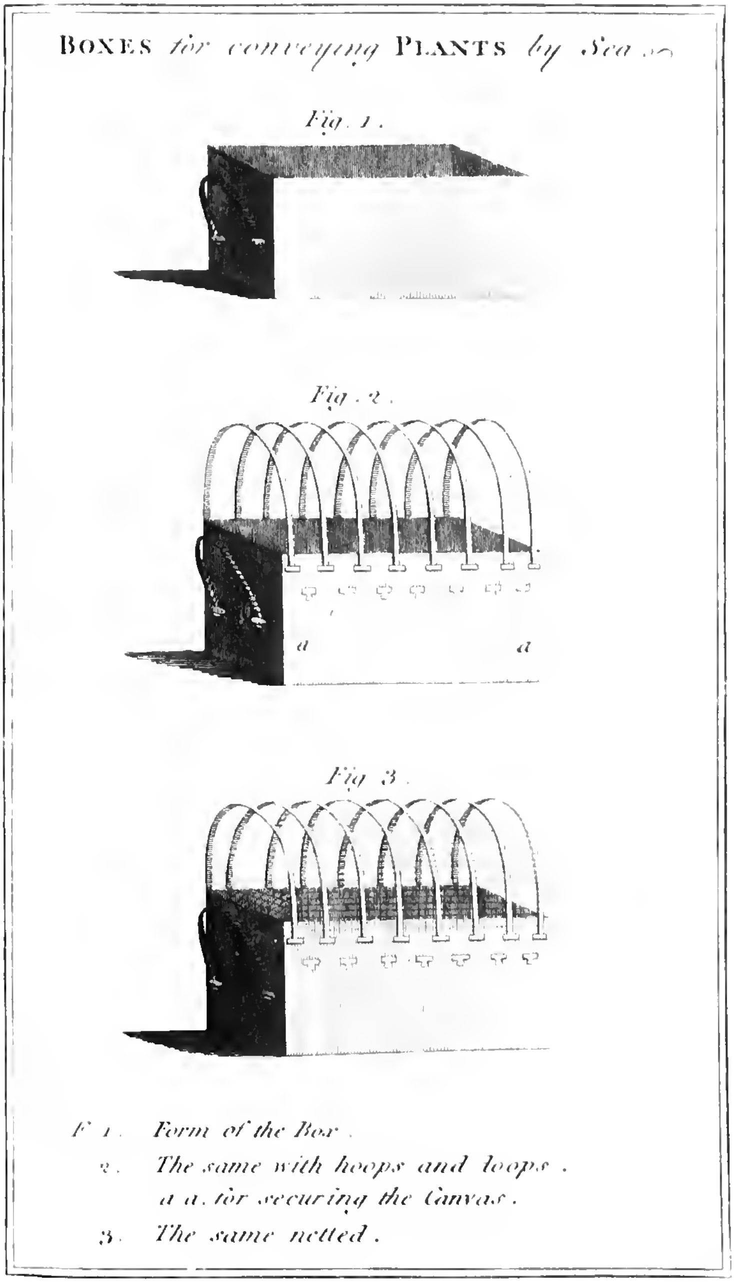


Plate 6 Boxes for conveying plants by sea, plate 3 in J. C. Lettsom *The Naturalist's and Traveller's companion*, 3rd. ed. 1799.

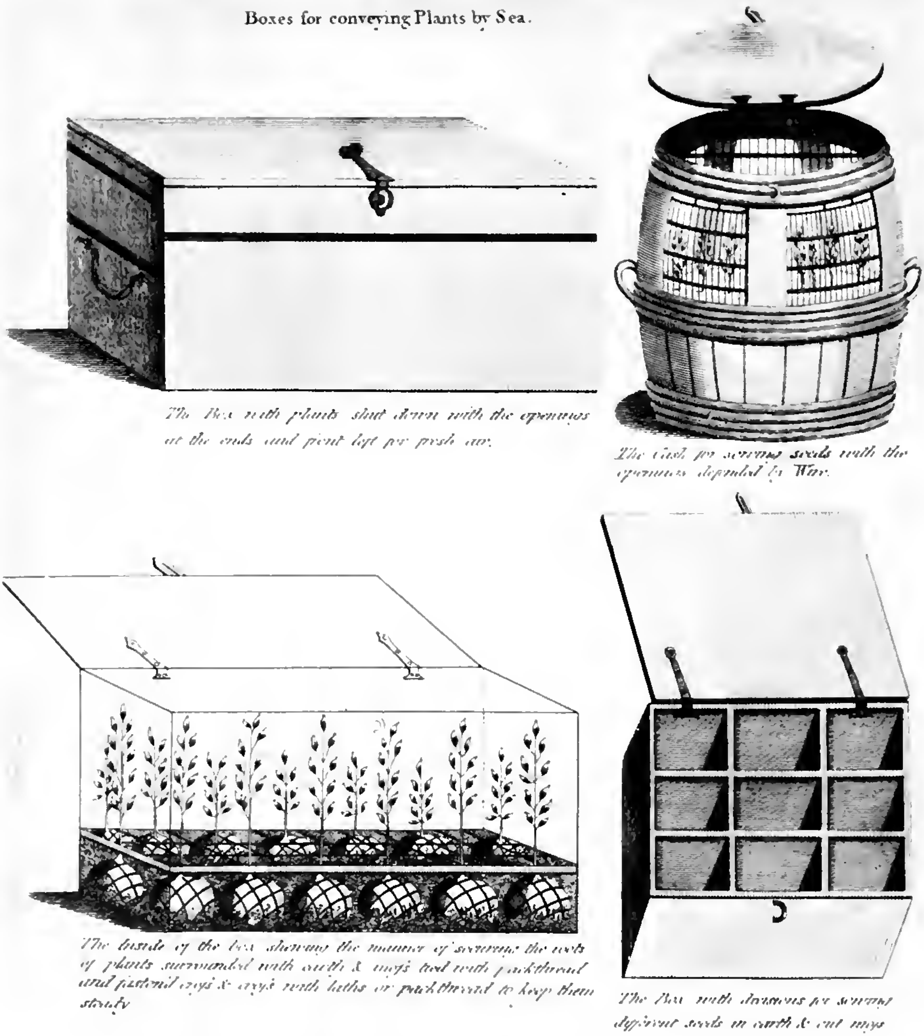


Plate 7 Boxes for conveying plants by sea, a plate opposite page 24 in J. C. Lettsom *The Naturalist's and Traveller's companion*, 3rd. ed. 1799.

amount of the actual collecting thus enabling Brown, as he states in his diary to remain on board describing and arranging the collection. When the specimens were permanently mounted they all carried a label indicating that Brown alone was the collector. Good was thus never given credit for the specimens he collected. Brown, from time to time, 'Directed Mr Good to put in the boxes which with much difficulty I had made on board such plants as I considered would be most interesting and at the same time likely to endure rough usage and occasionally spray of the sea and log line. The plants collected and put into these boxes amounted to nearly 70' (Brown's *Diary*, Botany Library, British Museum (Natural History), Dec. 28th, 1802).

Good sent Sir Joseph consignments of seed at every opportunity. His lists of seed, which are reproduced in facsimile, are in two sequences. An alphabetical list of the seed in a particular consignment and another list in which habit and habitat details are given. The latter list gives the kind of information helpful to William Townsend Aiton (1766–1849), head gardener at the Royal Gardens, Kew. The first Inwards book at the Royal Botanic Gardens, Kew records the arrival of four boxes of seed collected by Good.

> Peter Good collected the following seeds in New South Wales they were brought home in the *Calcutta* man of war and prove to contain the most valuable acquisition of Banksia and other rare genera, items 879–1003: seeds from Peter Good 140 papers exclusive of Banksia's, 1004–1144, Banksia species 1145–1179: The following seeds were collected by Mr Peter Good New South Wales and were part of his great collection, 1803, 1198–2246.

This latter collection of seed although recorded at Kew as being received from New South Wales in 1803 was in fact the result of Good's collecting during the circumnavigation and included material from the East Coast and the Gulf of Carpentaria; the Kew record indicating that the collection was sent from New South Wales. It would have been the collection salvaged from the *Porpoise*. This, however, was not the first collection received by Banks. A selection of seed collected on the south-west coast was sent around, 21 May, 1802 in the whaler, *Speedy*. Banks on 24 April, 1803 informs Brown that 'the seeds he had sent have been planted at Kew and raise high hopes' (*Correspondence of Rt Hon Sir Joseph Banks Bart.* Copies by the daughters of Dawson Turner, Botany Library, British Museum (Natural History) 14: 43–45). Later, 30 August, 1804 Banks adds 'they have produced some curious plants' (*Correspondence of Rt Hon Sir Joseph Banks Bart.* Copies by the daughters of Dawson Turner, Botany Library, British Museum (Natural History) 15: 84–86).

W. T. Aiton in the second edition of his father's *Hortus Kewensis*, 1810 only gives the date 1803 for introductions by Peter Good. Included among the Good manuscripts is a 'List of plants taken on board H.M. Ship *Investigator* during a cruise from Port Jackson from 21 July, 1802' and a 'List of plants in the garden on board the *Investigator* the 22 April, 1803'. Both these lists indicate what plants were selected at the various anchorages. There is a list in Brown's hand of the plants growing in the garden 24 April, 1803 (British Library, Add. MS. 32439: 96–97).

Brown, on 4 March, 1804, listed the Australian plants growing at Kew 'Plantae Novae Hollandiae in Horto Regio Kewensis Crecentes', ff. 4 (Botany Library, British Museum (Natural History)).

Flinders suggested to Banks that seed of European fruit and vegetables could be sown at various anchorages and if successfully established they would be a great advantage to future expeditions. The manuscript list, in Good's hand, of the seed so distributed is reproduced in facsimile.

Brown in a letter to Banks dated 30 May, 1802 states that 'In Mr Peter Good I have a most valuable assistant a more active man in his department could hardly believe have been met with but has not sufficient facilities on board for keeping living plants' (*Correspondence of the Rt Hon Sir Joseph Banks Bart.* Copies by the daughters of Dawson Turner, Botany Library, British Museum (Natural History) 13: 141–146). Good himself mentions in his journal that at a particular anchorage conditions were not suitable for the potting and boxing of living specimens. So Good had problems regarding his commitment to select and maintain a selection of living plants. Brown, on 30 May, 1802, informs Banks that some plants 'have been sent to be taken care of in the Governor's garden' (*Correspondence of the Rt Hon Sir Joseph Banks Bart.* Copies by the daughters of Dawson Turner, Botany Library, British Museum (Natural History) 13: 141–146). Banks in a letter to Brown dated 8 April, 1803 states that great credit is due to Captain Flinders for giving so many opportunities for landing and botanising (British Library, Add. MS. 32439: 95).

Brown when informing Banks of Good's death, in a letter dated the 6 August, 1803 states '... Poor Peter Good, who while he enjoyed health was most idefatigable, and whose exertions in his department were without doubt the cause of his untimely fate, died a few days after our arrival here of dysentry, contracted soon after our departure from Timor' (*Historical Records of New South Wales*, 5: 1897: 181). Banks, had in fact, first heard of Good's death when John Allen, the miner, arrived home (*Correspondence of the Rt Hon Sir Joseph Banks Bart.* Copies by the daughters of Dawson-Turner, Botany Library, British Museum (Natural History) 15: 84–86).

With the Good manuscripts is a notebook in which Brown has recorded the sale of Good's books and other effects to members of the crew. With the Brown correspondence at the British Library is a draft of an undated letter Brown wrote to Banks informing him of this transaction and other matters relating to Good's death.

> Captn. Flinders on whom the task of disposing of his effects and communicating the intelligence to his relations devolved requested me to examine his papers &c. &c. to superintend the sale of such articles as it might be judged expedient to dispose of. This I accordingly did. The papers both those relative to the voyage and those of a private nature are still in my possession. Mr Aiton his executor seeming unwilling to receive them while uncertain whether there might be a will later than that left in his hands by Mr Good on his departure from England. From what I have already stated however it is certain

that Captn. Flinders has no paper of any description in his possession, it is equally so that none of this kind exists among the papers in my hands. The effects consisting of articles of clothing and books were sold on board the *Investigator* chiefly to seamen whose wages were stopped in the ship's books to the amount and the money received at the sale was, at the suggestion of Captn. Flinders, given in small sums to Petty Officers &c. their wages being stopped in the books in like manner. These are probably the only circumstances which you wish to be informed of. (British Library, Add. MS. 32439: 100–107)

The 1793–1809 Record Book in the Archives of the Royal Botanic Gardens, Kew, f. 258, contains a copy of a letter from the Navy Office to the Aitons.

Gentlemen, in answer to your letter of the 6th instant I am directed by the Commissioners of the Navy to acquaint you that they cannot cause a Bill to be made out for the remainder of the salary due to Mr Peter Good for his services as a gardener in the voyage of the *Investigator* without the production of a certificate from the Commander of the *Investigator* of the good conduct in his station and a proof of the day of his death.

After Good's death Brown whenever possible endeavoured to collect seeds and brought a valuable collection from Van Diemen's Land when he returned home in 1805. With the assistance of George Caley (1770–1829), who was a Banksian collector resident at Port Jackson 1799–1810, he made another, though different collection of living specimens for the Royal Gardens at Kew. This collection of plants in pots and boxes was left in Caley's care to be sent to England at the earliest opportunity. In fact, it was sent home by Governor King in the *Sydney* which sailed from Port Jackson on 5 October, 1805 (*Historical Records of New South Wales* 5: 711).

It has been stated that Peter Good was a Scot. I have been unable to prove or disprove this statement. The first authenticated detail regarding his life is that he was a foreman at the Royal Gardens, Kew under William Aiton (1731–93) and his son William Townsend Aiton (1766–1849). Unfortunately the correspondence and records of the Aitons were destroyed by the Aiton family. While serving at the Royal Gardens, Sir Joseph Banks engaged Good to assist Christopher Smith (d. 1808), in 1795, to convey a consignment of plants from the Royal Gardens to the Hon East India Company's garden at Calcutta. Good returned alone with a collection of plants for the Royal Gardens. The 1793–1809 Record Book in the archives of the Royal Botanic Gardens, Kew states

A correct list of plants rec'd by me on board the *Royal Admiral* in Sandar Roads from Mr Christopher Smith taken from the Hon East India Company Gardens at Calcutta—those marked G. were delivered alive to His Majesty's Royal Botanic Garden at Kew by me February 9th 1796 [signed] Peter Good (ff. 157–159).

Immediately prior to the Flinders voyage, Good was working for General William Wemyss who lived at Wemyss Castle, near Kilmarnock, Scotland from

1780–1820, and was not still at Kew as some authors have stated. The following letter from the General dated 1 January, 1801 and sent to William T. Aiton indicates Good was his kitchen gardener.

> I received yours which I delivered to Mr Good and desire him to consider it and give me his answer. He returned it at night and says his obligations to you are such if you desire it, he will go but he is very well satisfied with his present situation and I think he has been very assiduous in endeavouring to get the garden into its present order which from the shamefull neglect of Mr Wilson will cost me a considerable sum of money before he accomplishes it. I have left him quite at liberty on my part as it may be more difficult to find a person for the present government wants than to find a good kitchen gardener. I therefore suppose Mr Good will be directed by your orders. He is giving up a certain settlement for a precarious one. I am much obliged to you for the trouble you have taken on my account.

Peter Good replied to Aiton on 14th January, 1801:

> I have just received your letter and hasten to answer it and to tell you I accept with cheerfulness your liberal offer of going as Gardener and assistant to the Naturalist on the Voyage of discovery and render every assistance in my power to the expedition.—I can at present only offer my sincere and humble thanks to you & Sir Joseph for the very great preference and attention which you give me and assure you that it shall be the business of my life to merit so particular a distinction.
>
> I am very anxious to know when the Ship is expected to sail and what time it will be necessary I should make my appearance at Kew—The General has in the most handsome & liberal manner given me permission to go at any time I please. I showed him your letter and he said he could by no means think of preventing me from accepting such an advantageous offer to myself. He at [the] same time bid me tell you that he hopes you are fully aware of the kind of person he wants as Gardener, that he does not want a Botanist but a thorough good Kitchen Gardener, and if one who had a similar charge and who can conduct extensive plantations and accustomed to the command of a number of workman & who is not likely to change as every change is attended with considerable inconvenience. Such is his wish, but I doubt not but W^m Allen would give satisfaction.—I have only to offer my respectful Compts to all friends & in hopes of hearing from you soon.
>
> I am with the great respect your truly obliged obedt Serv^t
>
> (Mitchell Library, Sydney, Brabourne Papers 11: A 79–4)

He wrote again on the 16th February.

> From Peter Good [to William Townsend Aiton?]
>
> Wemyss 16 February 1801
>
> I have the pleasure of informing you that Mr Bruce is safe arrived at Wemyss Castle and I propose setting out for London tomorrow. As the North and

easterly Winds are prevailent I think I shall come by Sea and hope to be in London at least in a week from this date when I shall have the pleasure of seeing you & personally express my gratitude. Till then believe me with the greatest respect.

your truly obliged obed^t Serv^t...
[P.S.] I write hastily to catch the post
(Mitchell Library, Sydney, Brabourne Papers **11**: A. 79–4)

On the 6 May he wrote to Sir Joseph Banks to have various points clarified:

From Peter Good

Kew 6 May 1801

Your condescending Goodness in telling me that if anything occurred to me of which I wished information respecting my preparations or comforts for the Voyage, I should communicate the same to you in writing has emboldened me to state to you the following remarks which appear to me of considerable importance to myself and which I with candour submit to your consideration.

It is with regret I have to state to you a fact that my memory is not sufficient to retain distinctly all the articles of the appointment which I signed.—Owing to my not fully comprehending from hearing them once read over the extent of their meaning, a matter of considerable uneasiness has risen in my mind. To the best of my recollection one article states that at our return to England every article of our collections of Natural History and curiosity etc. shall be given up to a person or persons appointed by the Lords commissioners of the Admiralty. But with a view to encourage activity and industry in collecting their Lordships declare that after having selected what they think proper for the British Museum &c the remainder shall be returned to the persons who collected them to be disposed of by them at their pleasure. But on reflection I find that either in another of the same articles or by Verbal information from you after having read them The Miner [John Allen] and I were told that we must give up every article of our discovery and collections of every kind to Mr Brown when collected to be by him labeld and stored up &c. So that it appears to me that every article of our industry and collections shall become the immediate property of Mr Brown except only so much as may be selected by the Lords of the Admiralty and also the Seeds and living plants which I understand to be wholly intended for His Majestys collection, and will entirely deprive the Miner and me from being able to present the Lords of the Admiralty with the most trifling Article or deriving any benefit from that article of indulgence. I earnestly wish an explanation on the subject, as also to know whether I will be permitted the honor of being recorded as the introducer of such plants and seeds as I shall be able to collect to introduce.

If on perusal any of the before mentioned remarks appear either trivial or presuming, I must submit to your Goodness for indulgence, and request you will impute it to its true Sourse namely my anxiety to prevent any dispute arising during the Voyage which might tend to prevent a cordial cooperation of prosecuting with success our various researches. I have the honor to be with Duty Humility and Respect

Sir your much obliged
Obedt & Hbl Servant ...
(Mitchell Library, Sydney, Brabourne Papers 11: A 79–4)

The Record book dated 1793–1809 at the Royal Botanic Gardens, Kew mentions plants sent by Good to the Botanic Garden, Edinburgh on 15 October, 1800 (f. 178) so that he could only have worked at Wemyss Castle for a few months before returning to London.

It is unfortunate that it has not been possible to establish any details regarding Peter Good's early life. He had an obvious love of plants and the enthusiasm and dedication with which he performed his duties as a gardener indicated his intension to make a success of his career in that profession. His journal shows his willingness to participate in the prosecution of the numerous objectives of the voyage outside those of his particular commission. Captain Flinders on the occasion of Good's death records in his own journal, 'Peter Good, botanical gardener, a zealous, worthy man, who was regretted by all'. On November, 1802 Flinders named a small island after Good. 'We steered between Hammond's Island and the north-west reef, ... another island appeared beyond Hammonds to the south-west, which as it had no name, I called it Good's Island, after Mr Good the botanical gardener.'

From Good's *Journal* one cannot fail to get the impression that he was a kind, good tempered man and one that got along amicably with his fellows, as Captain Flinders says his death was regretted by all on board. There is also no railing about conditions on board and there must have been numerous occasions when it would have only been reasonable for him to have done so.

His burial is noted in the Records of St Philip, York Street, Sydney '1803 June 13th Mr Peter Good Botanist'. St Philip's now stands where it is believed the main cemetery was located in the early days of the colony and where Good would have been buried (Mrs R. Field, Parish Secretary, *in lett.*). The *New South Wales Advertiser* (Volume I, No. 16 for 19 June, 1803) records 'On Monday last, Mr Good Botanist belonging to his Majesty's ship *Investigator* and who died the preceeding day on board ship, was brought on shore for internment. A number of Officers attended in procession to the place of burial, where after the funeral ceremonies were performed, a party of marines fired three vollies over the grave.'

Peter Good is commemorated by R. A. Salisbury (1761–1829) in the Australian genus *Goodia*, a member of the Leguminoseae, in his *Paradisus Londinensis*, 1805–08.

No one in my opinion, can put in a stronger claim to have his memory perpetuated by a plant being named after him, than the industrious Botanic Gardener, especially when he falls a sacrifice to his exertions in a distant climate. I know nothing more of Peter Good than that he left a very lucrative situation to collect seeds for his Majesty in New South Wales where he died and that all the best and rarest plants from that country, now at Kew, have his name attached to them.

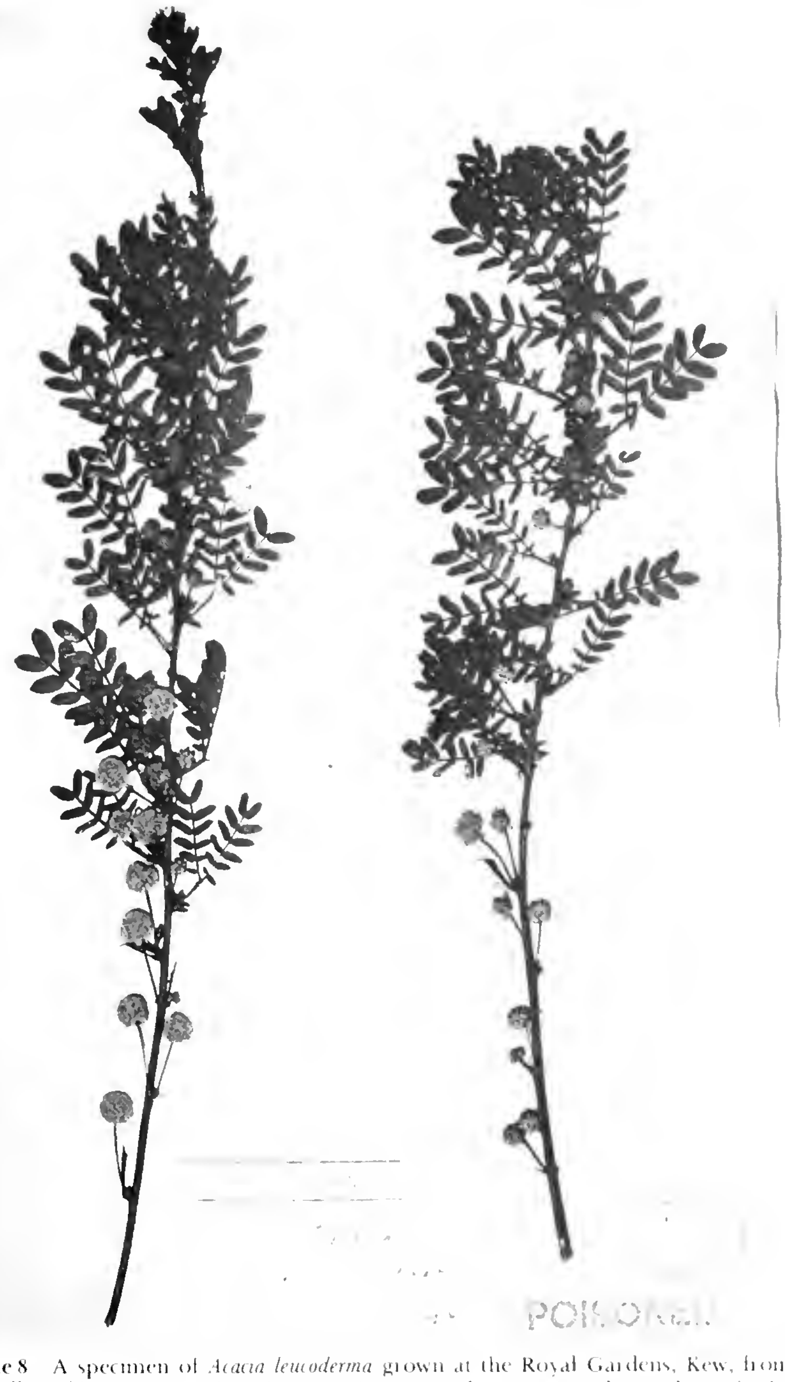


Plate 8 A specimen of *Acacia leucoderma* grown at the Royal Gardens, Kew, from seed collected by Peter Good, and now in the National Botanic Gardens, Glasnevin, Eire.

The one hundred and ten feet long Botany Bay House at Kew was in 1837, crowded with New Holland plants. Sir William J. Hooker (1785–1865), first Director of the Royal Botanic Gardens, stated that 'since the time of his Majesty George III this garden has been emminently rich in New Holland plants and now stands unrivalled in this department.'

Although Good was not the only person to introduce plants from Australia the records at Kew indicate the magnitude of his contribution. The second edition of William Aiton's *Hortus Kewensis*, 1810 lists some one hundred and sixteen Australian species introduced by Good and fourteen from the 'East Indies': the latter were plants he brought from the Hon East India Company's garden, in Calcutta, in 1796.

Textual introduction

The provenance of Peter Good's manuscripts is undisputed. They came into the possession of the British Museum (Natural History) with the manuscripts of Robert Brown, who became Keeper of the Banksian Department in 1827. He bequeathed his herbarium and manuscripts to his successor John Joseph Bennett (1801–76) who kept them in the Department where they could continue to be consulted. Brown's manuscripts were given to the Museum by Mrs Bennett on her husband's death in 1876. The transcript of Peter Good's *Journal* has been made from the most complete version, part of the other variant version is reproduced in facsimile. The *Journal* transcribed is a soft-covered volume of thirty-four folios and size $12\frac{3}{4} \times 7\frac{7}{10}$ ins (32.4 × 19.6 cm). The paper is watermarked F. Hayes 1797. It is inscribed 'Remarks &c. on Board his Majesty's ship *Investigator* during a voyage of Discovery by Peter Good'. The other version, of which the title-page and pages 1, 5, 6, 7 & 8 are reproduced, in facsimile, comprises twenty-three unbound folios, size $6\frac{2}{5} \times 3\frac{3}{4}$ ins (16.3 × 9.5 cm). It is inscribed 'Remarks &c. on Board H.M.S. *Investigator* during a Voyage of Discovery'. This text is preceded by a folio headed officers Names, Stations, Scientific Assistants. There are also three rough drafts covering 13 May 1801 – 24 July (ff 4); 27 October 1801 – 9 December (ff 3) and [19 November–25 December 1802] (ff 3). One of the drafts is on paper watermarked 1795. In the version transcribed Good gives a running head and the date. There is little punctuation in this version in comparison to the one, part of which is reproduced, in facsimile. Like many of his contemporaries Good uses capitals where we would not use them today and the printing of a particular letter as a capital has often been an arbitrary decision and in some instances may not have been intended by Good. Variation in the size of a particular letter, especially of the letters S and M, was the main cause of difficulty. Good often used the ampersand and always &c. rather than etc. All contractions have been extended. Peter Good on a few occasions has repeated a word, these are therefore not printers errors. The receipt of Peter Good's seed at the Royal Gardens, Kew was entered in an *Inwards Book* dated 1805–09. Folios 21, 22, 29, 31, 51, 52, 65 & 66 are reproduced in facsimile. As some of the folios in this book and in the variant journal are not very readable it was decided to reproduce only a selection of folios. The same is true of Good seed lists but their importance necessitated their reproduction in full.

Transcript of Peter Good's main Journal

Remarks &c. on board His Majesty's Ship *Investigator* during a voyage of Discovery by Peter Good

From Portsmouth to Madeira

1801

July	18	Got under way with a light Breeze Wind North at Noon Wind veered to West a moderate Breeze
	19	Wind Eastward light Breeze Stood right before with all Sail set—in Evening saw Coast of France very distinctly Cape la Hog[1] and also England St. Albans head[2]—clear warm & serene
	20	Wind and Course as yesterday—Sailors exercised small Arms—Land in sight to North distance 12 or 15 Leagues
	21	Wind course & weather as yesterday at 4 P.M. came up with a squadron of Ships of War of 98 Guns each and passed under the stern of the Windsor Castle Admiral Mitchel who hailed us & requested for captain to go on Board sent a Boat for him—when our Captain returned we cheered Ship which was returned & stood our course West South West exercised Great Guns and small arms & fired 4 shot & two vollies of small arms.
	22	Nothing remarkable Lat. observed 47.57N Long 7.47W
	23	at 9 A.M. 2 schooners astern distant about a League crowding all sail after us—each fired a shot to Leeward when we turned out all hands, took in stunsails mounted swivels and preparation for action showed English colours and pendant—they showed English colours spoke each other and hauled their wind—We then made all sail & stood on—a Brig[3] appeared on Lee Beam Lat. 46.15 North
	24	A strong Breeze North East sending under foresail and Dubbed reefed Topsails—evening decreasing set Top Galt sails and carried away fore Top Galt mast
	25	Breeze & swell decreasing at 11 P.M. spoke a Brig from Lisbon for Stockholm—Nothing remarkable till 30th—saw land West Wind West

July 31 Becalmed all day very hot & sultry, the Ship having leaked considerably the Gig was lowered & Captain & Carpenter went round the Ship to examine and found that the joints were all loose above the copper & that it could be repaired in harbour by caulking—Captain caught a small Turtle[4] land in sight—hove the lead 240 fathoms line found no bottom

At Madeira

August 1 Madeira, Desertas & Porto Santo all in sight—very light airs and Calms caught a Turtle

2 Becalmed at 10 A.M. Lowered the Cutter and Captain Messrs Brown[5] Bawer[6] & Flinders went ashore at Isle Deserta—I was not permitted to accompany them directly after they left the Ship the Surgeon solicited the gig from Mr Fowler[7] to row round and look for Turtle and Birds & which was granted with two of the Crew I volunteered my service as a rower and was accepted two Midshipman also accompanied as also Mr Westall[8] we rowed about till 1 P.M. when by Signal from the Ship we returned having caught a fine Turtle and killed one Bird—at 4 P.M. a fine Breeze sprung at ½ past 7 put up lanthorns at Mizen top mast head and let of a false light—they answered by firing 2 muskets and proved to be on weather quarter put about Ship and let off another on spritsail yard at ½ past 9 they came along side they had shot 7 Birds and had few articles of Natural History

3 In sight of Funchal in morning and Anchored at 4 P.M. We found here the Argo of 44 Guns some transports and an English Regiment in possession of the Loo Fort and encamped near it

4 Went ashore in morning and Collected many plants in neibourhood of Town—came aboard at night

5 Got up at 4 in morning and went ashore in Company of Messrs Brown, Bawer, Westall, Bell[9] and Allen[10] and Messrs Brown & Westalls servants with intent to go to Peak a Riuvo[11] the highest in the Island and distant 15 or 20 miles, we got a guide in Town—and had a very fatiguing journey over steep hills and deep vallies after having walked several hours without any appearance of cultivation about 4 P.M. arrived at a neat Church and a Priests house where all the accommodations we could find was an empty room & no provisions of any kind, as we were at a loss for the language we understood no houses were to be met with any farther & we agreed to sleep all night in this room, after eating some Bisquits which we had brought with us we sallied

August 5 out in different directions—Mr Brown, Allen and I penetrated down a remarkable steep Bank to a River in search of Natural History, Mr Allen having met with a path got down before us and having followed the Bed of the River some time and then attempted to reach the top of the Bank at another place, he endangered his life having ascended a great way he found himself so situated that he could neither advance nor return, however he at last reached the summit and arrived at the Church before dark in a very ludicrous appearance, all his cloaths being wet By perspiration as if he had been ducked in the River and in a Violent tremour and agitation. We then retired to our apartment and the Priest having procured 2 kind of mattress & spread on the floor and finding no refreshments were to be had we lay down to sleept but were much disturbed by fleas and Bugs

6 Got up as soon as Day light appeared & were joined by 2 more guides unsolicited Mr Westall returned for Funchal & the rest proceeded for the Peak—We continued to advance a very difficult and fatiguing way till 9 o'clock when learning from our guides that it would be 2 or 3 hours before we could reach the summit and as long to return to where we were being also obliged to return on Board the same night we thought proper to return. On our way back we met a man who was kind enough to dig some potatoes for us at the church we had them boiled and two ladies who reside there accommodated us with plates knives forkes butter & excellent water on which we feasted heartily—on our departure each made some presents of knives, pencils &c. with which they seemed much pleased at 6 P.M. arrived at Funchal much fatigued we had some dinner and went to the Shore and hired a Boat to take us to the Ship for which they made us pay two Dollars before they would put off as soon as we got in and the Boat shoved off the violence of the surf dashed us again on the Beach & beat full over us so that we all got compleatly ducked, however we all reached the shore in safety but most of us lost some articles of apparel finding it was impossible to get on board that night we returned to the inn and went to bed but were much disturbed by Bugs and fleas

7 Got up at Day break put on our wet cloaths and went to the shore where Captain had sent a Boat for us—we had some difficulty to get into the Boat the surf run so high we were all up to the middle before we got in but as we had not been Dry since last night it was not regarded about 8 we got on Board & all was bustle till noon we got under way & as soon as we were clear of land we had a stiff Gale from North East and bore South West by South

From Madeira to the Cape of Good Hope

August 7 As Madeira is so well known, both its natural History and productions I shall only just remark that it is entirely Mountaneous interspersed with deep Gullies and dreadful precipices—the Natives seem particularly industrious in Cultivating every spot which appear capable of cultivation and seem perfectly to understand the methods of bringing water from the vallies to the more elevated spots to water the Cultivated ground which then becomes particularly fertile, even in such a small spot as Madeira the height of the mountains occasions them to have different seasons at the same time at Funchal and in the low lands about the sea coast the Grapes Peaches Figs were ripe and in high perfection whereas among the mountains near Peak Roiva the Grapes were of the size of full grown Pease and every thing in proportion at least two months later than on Shore.

8 Nothing remarkable occurred a steady Trade continued and on the 12 we entered the Torrid Zone in about 23° of West longitude—Nothing more remarkable till at Day light very near Stantonio the North Westerly of the Cape Verd Islands—light airs and calms—we coasted I think one half of the Island it appeared of the size of Madeira but much more parched and barren and very mountaneous—some lights were seen at night and a boat by Day but no houses or any other appearance of inhabitants some green spots had the appearance of cultivation

16 fine breeze out of sight of Land

17 after sun down one of the sailors while drawing water for Bathing fell over board he caught hold of a rope and was got in although almost insensible but soon recovered lightning thunder and rain at night

18 Calm and light airs—Boat was lowered to try the current and found by a line of 446 fathoms that it set North ½ East half a knot caught a shark[12] & sucking fish[13]—put a conductor to the main maist

19 Variable winds and Calms—at 5 in the evening saw land very distinctly bearing North by East Distance 7 or 8 leagues supposed Brava and Fuego[14]—the current having carried us considerably to North East

20 Wind & weather as yesterday—Sailors exercised small arms and fired several vollies.

21 At 2 in morning very vivid lightening continued till 4 when it began to rain with much violence and continued till 8 wind dying away caught a shark Lat 11.40N.

August 22 Nearly calm all day hot & sultry—Thermometer for a week past usually stood at 80 within two degrees more or less by night or day and in the water very near the same point within one degree more or less in general the air was hottest however we sometimes even at noon found the water one degree hotter than the Air—with such heat it is natural to suppose everything that was kept, free from water would be very dry and parched—it was with much difficulty we could keep any Iron ware from rust even the best polished steel or any kind of leather from moulding there is something in salt which has a peculiar tendency to corrupt Iron and the great evaporation from water kept up to that heat must occaison a perpetual humidity even though the air is clear

23 Fresh Breeze from South West with excessive heavy rain from 8 in the morning till 4 in the evening

24 Steady Breeze from South West, fine weather—same wind continued without any thing remarkable till

27 Caught a Bird and a swallow[15] which had followed us since the 22nd this day disappeared and sometime after was found dead in the State Cabin

28 Wind varying fron South East to South West kept making taks as wind permitted at 11 P.M. saw a Vessel to Leeward bearing North East

29 South West wind prevailed close hawled on starboard tack saw several Birds

30 Wind weather and course as yesterday Mustered all hands and settled their stations and quarters

31 Wind and weather as yesterday many Porpoises[16] some rain

September 1 Dull and hazy

2 Still dull weather saw several Man of War Birds[17] Lat 3°. 50N. Long 13.50W. in evening put about ship and stood West by South—a stiff Breeze ship made 6 inches water an hour.

3 Fresh Breeze as yesterday—Vast shoals of flying Fish[18] Caught a small Albacore[19], many Man of War Birds came very near the ship and were repeatedly fired at but none killed. Thermometer fell to 74

4 Nothing remarkable

5 Caught a Bonito[20]

6 Breeze decaying struck two porpoises one of which was taken on Board and proved a female 9 feet long and 4 feet round after being dissected and sketched and its blubber collected it was by Captain's orders cut up and distributed among the Ship

September 6 company and eat as Beef Steaks—many Said is was equal to fresh Beef although it certainly could not be compared even to Bullock liver, however it was fresh and contributed as a change from Beef and Pork was not to be dispised it had many worms in its stomach of 2 inches length and upwards

7 Performed the usual Ceremony of Shaving for having Crossed the Equator and as usual also the Sailors got drunk and turbulent at night Some were insolent to the officers Steady breeze and fine weather Thermometer 74

8 Wind and weather as yesterday Latitude Observed 0°. 18 South Lon 17° West at 1 P.M. Turned the hands out and the Captain very handsomly and humanely admonished the Sailors respecting their conduct the proceeding evening and took the blame on himself for having permitted them to have so much liquor and that as they had abused that indulgence they must not expect any more leniency and so dimissed them very much to their satisfaction—Then made Sail standing West for land said to have been seen in 1761 by some Dutch Navigators[21] in that latitude and a few degrees to West—lay too at night

9 fine breeze South East bearing West sometimes North West many flying fish and Bonitos saw two Birds in the evening, weather clear and serene Thermometer 76 lay too at night

10 Fresh breeze at sun down hauled our wind and stood South West having given up the search for land being convinced none was in the neibourhood as we had no indication of land and the weather for three days past had been remarkable clear, land of any height would have been seen 35 or 40 miles distant

11 Wind and weather as yesterday, saw several Birds in evening—a Gannet[22] came very near and followed for sometime it gave some reason to suppose land was not very distant as these birds seldom go far from land it appeared fatigued by its manner of flying, it came from westward and returned in same direction.

12 Strong trade squally with showers

13 Weather etc. as yesterday, a Gannet followed us sometime from this Nothing Remarkable occured till

20 Having a fine light exersised Great Guns and swivels Put an old Cask overboard as a mark, and Captain promised double allowance of Grog to the first man that should hit the mark. They all fired very near but none hit—Captain pointed a swivel and when fired it unfortunately hit him on inside of the thigh and hurt him considerably—he soon retired from the Deck having previously given proper directions to Mr Flinders[23] for finishing the exercise and making sail.

September 21 very light air and warm at 11 A.M. hove the lead with a Buket and Valves and at 200 fathoms the water was not near so salt as at surface at that Depth Thermometer stood at 71° at the surface of the water 73° and in the air 76° two bottles of this water were put by to be examined—Caught a Dolphin[24] many birds seen some Ganets

22 Calms and light airs with rain Dull and lowering many Birds seen

23 Land in sight from deck at sun rise right a head, Latitude observed 20 South in evening about 20 miles North of Trinidad.[25] It is a small island and very rocky two very remarkable Rocks one at East point resembling a Church dome and one at west end resembling a large massy spire of Tower of a Church[26]

25 Several Dolphins about the Ship Thermometer fell to 68°

27 Strong Breezes and Sudden Squalls with heavy rain bearing South South East Distance run 165 miles Carried away two Stunsail booms much lightning and Thunder in the night in North West quarter saw one Albatross[27] and many Pintardo Birds[28] also a Small bird with a long Bill apparently a land bird—thence weather gloomy and

30 many Birds till Captain shot 3 Pintado birds, and ordered to keep a good look out for land

October 1 Lat. 30.30 Long 20.20—Nothing remarkable Dull weather and rough sea till

Simons Bay Cape of Good Hope

4 Wind decreasing to a light air Captain shot 2 Procellaria capensis[29] and 2 Procellaria equinoctiale were caught by a hook also an Albatross which measured from tip to tip of his wings 9 feet 9 inches Long 15 West Lat. 32.20S gave over the search for Saxenburgh[30] land—Strong Breezes and variable winds and many birds of the Petrel kind about the ship till

7 The Albatross was killed and I found three distinct insects on it

8 Two men punished for quarrelsome behaviour

9 Crossed the meridian of London.

10 Sailors exercised small arms and fired several vollies Thermometer 54°

12 One Pintado Bird caught and a whale[31] seen

October 13 Many Birds and some whales seen

14 Breeze decreasing Caught many Pintado Birds and found three species of Insects on one

16 At 8 am land in sight from deck Fresh Breeze with showers—in coming near the land appeared very mountaneous and Barren at the entrance of the Bay many whales very near and what the sailors call the phresser[32] 2 of which threw themselves entirely out of the water and such an enormous bulk falling into the water made a noise like the report from a musket—Drop anchor at 6 P.M. in Simons Bay and found here 6 Ships of War

17 Went ashore in morning in Company with Mr Brown Bawer and Allen and Collected a great variety of fine plants Some insects and minerals—The plants for variety and beauty were beyond description some I had never seen before particularly Orchis Drosera and Hemimeris and many I had never seen in flower returned on Board at about 6 P.M. loaded

18 Went ashore in morning with Mr Brown Allen Bell &c. were joined by Mr Ryley Surgeon of Lancaster flag ship a friendly intelligent man and had a very long walk over mountains and sandy deserts and collected a great variety of fine specimens of plants some insects and Birds. Mr Ryley led us to a house where we found an assembly of Hottentots dancing Scotch reels to Scotch Tunes on the Violin—returned on Board about 9 P.M.

19 Went ashore in morning at Mr Browns request over the same grounds we had examined on the 17th for several rare plants particularly Ferns which had been spoiled by our eagerness to collect so many. I procured everything Mr Brown pointed out in high perfection as also a few plants neither of us had met with the two former days and returned on Board about 5 P.M. very wet it having rained from noon

20 Went ashore in the morning with Mr Brown Bell Allen etc. and were found by Mr Ryley and had a long walk over the Mountains of Pauls Bay[33] we came to a Dutch House[34] where we dined heartily on eggs at 6d each. On returning over the same mountains by a different way saw many baboons, and a Bock[35] we met with few plants but what we had found the three preceeding days came on board about 9

21 Went ashore with Mr Allen and had a long walk over the mountains nearest to the Harbour—found two Ferns and a Lichen which we had not met with before also some Stapelias not in flower

22 Went ashore at 6 A.M. with Mr Brown Bell etc. and had a very long fatiguing walk over the Barren sands and Rocky mountains

October 22 about Fish Hoecks Bay[36] but met with few or no plants but what we had found the preceeding days—Mr Bell and Mr Brown's servant shot several beautiful Birds and I killed a large Serpent[37] of a dangerous kind—next day was appointed to set out for Table mountain and Cape Town But on coming on Board Mr Brown complained of having fallen and hurt his leg which would prevent him for tomorrow

23 Sent some letters for England by the Countess of Sunderland Indianman Captain Eccleston—and in the evening went ashore with Mr Allen and had a walk to Company Gardens[38] which are useful but no wise ornamental—on the way found several orchis among which Carnea which we had not found before

24 Set out early in the morning in Company with Mr Brown, Bell, Bawer etc. for Cape Town, each carried provisions and a large tin box for specimens etc.—we missed our way and it rained considerably—we came to a very elegant house where a young lady invited us in and presently entertained us with Tea, Bread Butter Cheese Wine etc.—we learned the House is called Tokay belonging to a Johann Gasper Loos[39] a german who was at this time in Cape Town—as it continued to rain we accepted the lady's kind invitation to remain all night.

25 Set out Early in the morning and passed Constantia, Silver place[40] etc., walking through district of Protea Meliflora[41] & Speciosa and large woods of P. Argentea[42] which is here planted as Timber—The country in this neighbourhood is extremely fertile we then ascended a range of Mountains called Stein Berg adjoining Table Mountain and passed ridge after ridge till about 5 P.M. we got very near the summit of the Table—but it now came on thick fogg and rain—we had not long to consider our situation till we fell in with a small path—we followed and soon arrived at the opening of the Mountain down to Cape Town—here we consulted whether to remain all night and examine the Mountain in the morning and save ourselves the trouble of again ascending it but as we had little provisions and it continued to rain we all descended and arrived in the Town about 8—we enquired for the English Coffee house where they behaved to us with much civility and procured us lodgings where we were well accommodated at a reasonable rate

26 Mr Brown and I took a walk to the Devil's Mountain[43] and collected a few plants and returned to dinner when we met Mr Westal who now joined us having left the Ship in Company with Mr Allen the same day we did but had lost each other on the way and had fared very indifferently and slept one night at Constantia—after dinner walked in Company Gardens[44] and about the Town—but it rained very heavy

October 27 Breakfasted at 6 in morning and Mr Brown & I set out to ascend the Table Mountain while Mr Bawer, Bell and Westall set out the best way for Cape Town. Mr Brown and I ascended to the Top of the Table Mountain in two hours—but very unfortunately as we came to the Top a thick fogg and rain came on which continued all the time we were on the top—and we had not descended far when the day cleared up and became fine—we continued several hours ranging the skirts of the Mountain and found some fine heaths—Saxfari[45] & obliqua[46] but very few thing but we had before found—we then descended a very steep bank with much difficulty by a way which probably never was before attempted—near the bottom we found ourselves in a wood of some extent of natural Timber of a good size consisting chiefly of Taxus elongata,[47] Royena lucida,[48] Rhus lucida, Halleria lucida, Ceanothus africana,[49] & Erica trifolia,[50] 12 to 20 ft high & ...—In this wood which detained us 3 to 4 hours we found 4 or 5 sp. of Ferns which we had not found before also several Mosses and Lichens the Polypodium capensis[51] grew here with fronds 6 or 8 feet long—at length we fell in with a foot path and set out a Brisk walk for Tokay but were benighted some miles distant, however we found our way though not the most direct arrived time enough to meet a kind reception and partake of an elegant supper from Mr Loos

28 When we got up in the morning we found Mr Bell & Mr Westall in bed in an adjoining room having lost their way and with difficulty got to this place at ½ past 10 they were also kindly received and accommodated—having thanked our kind host as well as we could be understood and got his address on purpose to send him some seeds he had expressed a wish to have, we took our leave expecting to Breakfast at Meusenburg[52] 4 or 5 miles distant, being eager to preserve the specimens which we had collected, when we arrived at Meusenburg we could procure nothing either to eat or drink, but were informed one might at a toll a few miles further on but when we arrived there we were in the same predicament—there was nothing now left but proceed for the ship when we arrived at the wharf about noon we found Mr Bawer who had arrived here the night before too late to get on Board and had passed the night in the Tent with Mr Crossley[53] and had not got on board this morning—we then Begged a passage on Board from the Lancasters boat & got all safe on Board before one—and was very sorry to learn Mr Crossley was to leave us and return to England his health not permitting him to go the Voyage, he had been confined to his Cabin by indispostion a great part of the Voyage.

29 Remained on Board securing everything for Sea.

October 30 Went ashore and had a long walk by myself found one species of orchidea we had not before seen & several rare ones as also various other specimens.

31 As the Ship was expected to sail tomorrow I went ashore with Mr Brown and had a walk along the shore where we gathered some specimens of Granite plants &c. and also made necessary preparations for Sea.

From the Cape of Good Hope towards New Holland

November 1 Remained on Board all day expecting to sail every hour. Continued in same state of suspense as wind not permit us to sail till

4 Got under way early in morning with light airs and Calms till about noon being near the entrance to the Bay a steady light Breeze from South South West at this time a singular phenomenon appeared in the water which was tinged with a dull red for a great distance round the Ship. The lead was hove but no bottom found, some of the water was taken up and appeared perfectly clear, but on examination with a microscope it was full of red Insects.[54] The sea appeared all in stripes of red and its natural colour, each stripe from 10 to 50 or 100 yards broad and as far as the eye could reach after some hours it gradually disappeared.

5 Calm and serene in morning a fine View of the Land from the Table Land to the High Mountains of Hottentots Holland and even to Cape Angullus[55]—the Land appears to have many fine deep Bays—at noon a fine Breeze sprung up from North West bore South East

6 Fresh Breeze as yesterday at noon a Brig seen standing to South West—out of sight of Land.
Nothing more remarkable strong winds fair but variable

12 light breeze hove the lead with a Buket and valves and 160 fathoms of line the water at that depth sunk the Thermometer to 63 while at surface it was 64 and in the air 68 the experiment was repeated three times without variation & some bottles of this water put by for examination.
Nothing more remarkable occured variable weather but westerly winds prevailed till

24 Bent cables and prepared boats &c. to land at St Pauls or Amsterdamn[56] many Birds and some Whales seen in evening

November 24 looked well out for land but hazy weather prevented seeing any distance—lay too from 11 pm till

25 4 AM stood on with easy sail, a thick fogg prevented seeing any distance—at noon made sail and stood on for King George the thirds Sound[57] having missed these two Islands of St. Pauls and Amsterdam.

Nothing more remarkable occured strong westerly Winds prevailed with a long swell and sharp keen air till

December 5 Wind abated became much more mild and smooth sea

6 Gentle Breeze and mild weather—punished one of the marines for drunkeness and Bent Cables and at 6 pm saw land from the Fore Top Mast head Sounded 85 fathoms fine white sand—stood on under easy Sail and sounded from 85 to 25 fathoms fine sand or small stones.

7 Land right ahead & on weather & Lea Bow—stood to the Eastward along the Coast from 2 to four Leagues distant The Land generally low—many pieces of considerable extent of Barren white sand in other places entirely covered with (to appearance) a luxuriant vegetation of a dark green in many places Trees evidently of a considerable size—The country appeared very flat no mountains of consequence and the highest covered with Trees. Several reefs of Breakers along the shore and some abrupt rocks.—but the general Coast was a regular ascent of sand bank and in some places a low flat shore where we could see some distance in land where there appeared the greatest fertility—Towards evening the Coast became more rocky and the land terminated in Cliffs nearly perpendicular the Summit of which was covered with a fine low green verdure resembling at a distance Sheep pastures of England—many Breakers and some detached Rocks—Sounded repeatedly all day from 20 to 40 fathoms generally Sand—at night stood too out to Sea

8 Stood in Shore to the place we saw last night—and bore the Coast past Cape How[57]—to the East of which was a considerable Smoak close on the shore—at 11 at night Anchored in King Georges Sound near Seal Island.

9 Early in morning a boat went to Seal Island and soon came off with 4 Seals[59]—after breakfast Mr Brown & party was landed on South shore where we collected many specimens and Some Seeds—we were much at a loss for water this days excursion this being a sandy rocky barren headland aptly enough named by Vancover[60] Bald head—we returned to the Beach to a place separated from where we had landed by a mass of Bare Granite rock very steep—it being nearly dark the Gentlemen did not

December 9 choose to cross to the Boat which came for us to where it had set us down—I went to direct the Boat to come to where they were—but coming there being quite dark and a considerable Surf—they thought it hazardous & remained on shore all night by a good fire The Captain went to Princess Royal Harbour & saw some huts of natives but no traces of their having been lately in them.

Many of the officers & men had eat of the flesh of Seals caught in morning & most of them were sick from it.

10 A Boat went for the Messrs Brown, Bawer & Allen early in morning another went to Seal Island & got several birds both old & young but no Seals—ship got underway before 8 and sailed farther up the Sound & again Anchored the wind preventing from going into Princess Royal Harbour and not having sufficient depth of water to go into Oyster harbour—which is a much more fertile part of the Country—This day I took the opportunity of the Boats and made two Short excursions on the neck of land which separates Princess Royal Harbour from the Sound & collected several new specimens & seeds. The Captain went to Oyster Harbour. Sounding &c and found only 13 feet over the Bar of entrance he found a spot of ground which had been dug up & a piece of Ships copper fixed clumsily stamped August 27th 1800 Christopher Dixson Ship Ellsgood

11 Went ashore with Mr Brown & to the Point on right of entrance of Oyster Harbour where we made a rich harvest of plants & Seeds.

A party were landed to the left of Oyster Harbour & fell in with a fine Lake of fresh water—also a spear of Natives—some showers

12 This morning the natives made a fire near the entrance of the Sound opposite Bald Head—The Ship got underway & sailed into Princess Royal Harbour where Anchored at 10 in 3 fathoms water & was soon moored—immediately on droping Anchor a party were landed to the North shore to which we were most contiguous & we ascended a hill of considerable elevation where we had a fine view of the Country which is low and beautifull covered with woods & frequent natural meadows—The soil of the Hills is sandy & full of Stones even of the low country & the meadows or marshes are black bog with a mixture of Sharp Sand—The Rock is chiefly Granite but there is also on some places much Ironstone & also some Calcareous matter—but the Country appears much better at first sight than on examination—This day the Observatory was erected

December 13 Went ashore in neibourhood of Observatory & collected several specimens & seeds.

14 Messrs Brown & Westall with servants & Mr Allen & I went ashore after breakfast & seeing a fire at farther end of the Harbour which we knew must be kindled by the Natives we walked to it—before we reached the place the fire was gone out but we soon perceived a person walking on the Beach at a little distance we went towards him & he met us very unconcerned till within about 50 yards from us when we discovered some signs of Surprise—began to call to us with great force and seeing us persist in advancing to him he brandished his spear & struck off from the Beach among the bushes calling to us in a threatning manner & making signs with his hand for us not to advance—we followed him & soon saw what we supposed to be his family of women and children—running away as fast as they could—he then begun to set fire to the bushes to prevent us from following him and gain time for his family to escape—we followed some time to the knees in a marsh but finding we could not overtake them we went in another direction while he watched our movements—on our return to the Ship we perceived him looking at us at no great distance & again went towards him—he fled as before having previously sent off his family. We then sat down to eat some Salt beef & Biscuit & one of the party having shot a large water Bird Mr Allen carried it half way to him and left it on a bush—he came & took it to his family who seemed much pleased with it—a handkerchief & knife was then carried & he permitted the person to come very near him—he took the handkerchief but left the knife but would not allow anyone to come close to him

15 Two Natives came along Shore Early in the morning shouting and making very odd gestures—they came near to the Tents & were enticed (by carrying Red night Caps &c and leaving near them and when they came to take it up carrying another not so far which they again took up) till they exchanged one of their Spears & a hatchet of Stone for some of our trinkets &c. They went away very Friendly—and in a few hours four came up confidently to the Tents and Trafficked freely such trifles as they had to spare—They greatly admired the white Skins of our people and prevailed on some of them to satisfy them what sex they were and seemed much pleased with their condescension—They set no value on anything that was given except night caps & handkerchiefs—red was their favourite colour—On going away they would not permit any body to go with them & threw away some rings & Trinkets that had been given them

December 15 This day the Boats procured so many oysters that they were served out to all the Ships Company.

17 Set out at 6 in morning with Mr Brown Allen &c for Oyster Harbour—we kept mostly along shore till we reached the River mentioned by Vancover—we followed the course of this River which winds from West to East we found it very troublesome walking sometimes midly deep in mud at other times in thick brush wood and long grass 5 or 6 feet high and to heighten our difficultys we were in great want of water the River being quite brackish with much fatigue at about one o Clock we found the River divide into two Streams—the one seemed to come from North to South and the other from North West to South East and unite here—we followed the last which was least but still brackish water—we soon came to a small fall in the River which afforded us much satisfaction having neither eat nor drank this day before here—we stopt sometime to refresh ourselves & during out stay the tide rose considerably at the bottom of the fall and it appears that at high water it is covered by the tide—I suppose this to be 6 or 7 miles from the Sea—In tracing the river we saw many wild Ducks which were not very shy & one Kangaroo[61] having refreshed ourselves we set out the nearest way for the Ship walking by compass through an immense Forest we walked with all convenient expedition & occasionally met with pools of standing water which were very desirable—however night overtook us while we were 6 or 7 miles distant from the Ship—we had seen a small Lake in one of our former excursions at no great distance from where we were and as we had good moonlight we made for it & reached it about 9—here we made a fire eat the remainder of our provisions appointed a watch and lay down to sleep

18 Got up at Daylight and proceeded for the Ship which we reached at Breakfast.—In this excursion we found many fine specimens & some seeds—a violent squall with heavy rain came on about noon & continued several hours—also Thunder & some Hail.

19 The ground being moist with frequent showers I went ashore and took up a number of plants to prepare for putting in boxes which were getting ready.

20 Went ashore Early in morning to South of Harbour & traversed a wood of very large Timber—chiefly Eucalyptus resinifera—and directed our Course to the Top of a range of hills to South West during a very heavy rain—on our return we traversed a large tract of barren Sand which had a very singular appearance being full of Coral of various sizes figure & texture

December 21 Went ashore alone & took up several plants to prepare for boxes also gathered several seeds & specimens

22 Took a walk in neibourhood of Harbour with Mr Brown and gathered a few seeds & specimens

23 Went ashore early in morning with a large party of 13 in number in which were included Captain and first Lieutenant we carried provisions with us for two or 3 days intending to go to the Lakes to the west seen from observatory mountain and to ascertain whether they have any communication with the Sea near Cape Howe[62]—we had gone but little distance from the Beach when we perceived a native at some distance before us and soon after heard the voice of children at a little distance we soon came up to one which we found to be the oldest of the Natives which often visited the Tents—he met us unarmed and cordially shook hands with such as offered and endeavoured to prevent us from going any farther by taking hold of the foremost of us & when he saw another pass leave that & again run to the first this he continued to do for sometime & making a great noise—when we had passed his family he permitted us to walk peaceably but continued with us a considerable time while we were walking Midly deep in a morass during a heavy rain—while he was with us one of the party shot a Parroquet[63] which was shown to him he was eager to have it but showed little fear for the report of the musket—however he expressed some degree of surprise and seemed to pay much attention to loading the musket again—we also found a snake[64] which he the native knocked out of the hand of the person who had taken it up with evident symptoms of horror giving us to understand it was dangerous—after mid day we arrived on the borders of the nearest Lake which I think is about 2 miles long and 1 or more broad with extensive morasses near it in one of which we had waded some time more than knee deep—here we saw fit to take some refreshment and drank freely the waters of the Lake and proceeded to westward keeping the Lake on our left when we came to the west extreamity of this Lake we struck off for another which we had seen to South West but were again interrupted by another morass—having extricated ourselves again we soon fell in with a River of 12 or 14 yards broad and apparently very deep very still black water—we traced this River a considerable time walking among large Trees and excessive thick brush wood 5 or 6 feet high with frequent Morasses—we found the River sensibly to Diminish till at length we forded it with tolerable ease and then directed our course for the Sea—we soon came to a fine run of pure water near the border of an extensive wood and

December 23 being near night took up our quarters—made a fire fixed our Centinels &c.

24 Set out early in the morning and soon found ourselves on the Banks of a fine River of Brakish water—this we followed, encountered another Morass and soon found ourselves on the borders of a fine Lagoon of Brakish water, nearly Circular, of I think 2 miles or more in Diameter—we were now ashured this must communicate with the Sea from which we could not be very distant and that in all probability we should not be able to cross this River and Lake nearer to the Sea we thought proper to return the way we came to get to the opposite side of this River—to ascend the mountain, on that side where could see all between us and the Sea and ascertain with certainly their situation & communication—with a continued quick pace about 2 PM we arrived at the place where we had refreshed ourselves yesterday on banks of the first Lake—having in our way met with a path of the natives which we followed several miles and forwarded us much—here we halted to refresh ourselves—and soon set off for the hills but before we could get clear of the morasses which surround the Lake we were obliged to wade knee deep for some time through a thicket of bushes—but getting clear of this thicket we soon ascended the hills and had a fine view of the Lakes and a vast extent of Country—we saw a Lake nearer to the Sea than we had been and which is united to the Brackish one we had seen & the Sea by the River which we had traced for Several hours of both days and on which we had seen some Black Swans[65]—The Sea forms a deep bight to these Lakes but appeared Shoal water with a reef of Breakers opposite the entrance—having rested ourselves and enjoyed this fine prospect—we returned for the Ship—but soon began to want water which was not to be had on these mountains—we had not returned far when Mr Bawer was so much overcome with fatigue and want of water that he could not proceed—Mr Brown as also a Sailor & I continued with him while the others proceeded for the Ship where they arrived about 9 very much exausted—Mr Bawer having rested awhile we again proceeded intending at any rate to search some water if possible of which we were so much in want—but he was frequently obliged to sit down—we could find no water till about midnight we arrived on the Beach & soon came to known spring which was drank with delight—we then proceeded to the Tents where we slept sound till morning.

25 Got on Board about 6 o clock & having secured our collections had the pleasure of eating a Christmas Dinner with the Captain the Sailors had holliday & were more regular & orderly than usual on such occasions however several got compleatly drunk.

December 26 Employed Turning specimens &c which required much attendance.

27 Went ashore with Mr Brown & collected a few things in the neibourhood—he told me tomorrow was the last day we could expect to do anything ashore here & that some boxes would be ready for plants &c.

28 The Boxes were not ready till 11 when I went ashore and had some assistance from the Marines to get earth &c I planted as many and with as much care as time & circumstances would permit—but the day was stormy and unfavourable—so much that they could not be taken on Board—Mr Brown & Allen went ashore on the neck of land which seperates the sound from the Harbour where they found a Birds nest of 22 feet circumference & 5 feet 6 inches high[66]

29 Got the Plant boxes 3 in number on Board with about 60 species of plants—They were placed at the Stern directly under the drop of Log & Leadlines

30 A party of the marines were landed & exercised in presence of several of the Natives who seemed to admire them they showed no other emotion than a sudden start at the reports of the Vollies—Mr Brown & Mr Bell took the demensions of the different parts of the Body of one of them he gave proof of considerable patience by the manner of permitting him to measure him & then begun to name the different parts of the body from which was collected a few words of a Vocabulary Caat–the Head—colit the breast—Nelock cheek—Waart the Neck—Taa mouth—Geur the arm—Davaal the Thigh—Mat the leg—Menal the Eyes—Twang Ears—Catta hair—Mite the privates—Kean Toes—Wurrit the skin which they wear over their shoulders—Yemba sit down—Geant The Sun—This day the Tents were struck and carried on Board—wind would not permit us to sail

31 Wind being contrary went ashore to South of Harbour and collected a few things—Captain & party landed at some place & on the range of Hills saw three large kangaroo's & an Emu[67]

On the south west coast of New Holland

1802

January 1 The wind continued to blow in the entrance of the Harbour—at Mr Browns desire I landed on one side of the Harbour while he with a party landed on the opposite where he saw 4 kangaroos but found nothing new.

January 2 At Mr Browns desire I was landed on the same side of the Harbour which he was yesterday I went alone and saw a very large black snake[68]—saw two fine Rivulets of the finest water I has seen in the Country & found several new plants seeds &c., also some singular Seaweeds—a boat went a fishing and caught so many that they were served out to the Ship's Company.

3 At one P.M. the wind shifted to South West a fine Breeze weighed and sailed into the Sound—Trawled and caught a great variety of Fish some very curious in form—the Trawl also brought up a variety of marine plants and some Coral. Fish were served to the ships Company. Anchored in the evening.

4 Every thing was prepared for Sea—Mr Brown and I went ashore and collected a few things—& in the evening Captain, Mr Fowler and Mr Brown went to Seal Island to deposit a bottle containing a letter and giving information of our progress thus far & our intended route &c. &c. &c.

5 Much rainfall in the night and morning—after 9 got underway and past between the Islands in entrance and mount Gardner—when another high mountain appear after passing which we past between an Island of considerable size & the Main—behind the point was a fire with smooth water—in the evening stood off a stiff breeze & a considerable swell all day

6 In the morning stood on to where we had been last night and ranged along the Coast about 8 hauled up for a deep bight with an Island in the entrance—but seeing the bottom stood on from 2 or 3 miles to several leagues distant—about 5 hauled up again between two Islands and into a spacious Bay with low land to West & North and 2 high mountains to the East—here the boat was lowered and went to Sound the channel between the Islands and the Main and on finding a ship could not pass there we stood on

7 Nearly Calm till noon when a light Breeze sprung up—at this time we were 3 or 4 leagues distant from Land at ½ past one the Breeze encreasing we stood on for an opening which appeared between the two high mountains and a lower one on West—on coming near it proved only a small bight and then stood on—The country now put on a much more barren appearance than to westward of King George III Sound as it appeared entirely destitute of Timber—however it is inhabited and we saw several fires in land—In the evening saw many Breakers ahead and an Island off a point of very low land.

8 In the morning past a small Island with many Birds and some Seals—a vast range of Breakers streached from this Island

January 8 towards the main & another on the opposite side of us—The Coast here for a considerable distance is very low and barren—in evening near a Cluster of Islands laid down by Dentrecasteaux[69]—stood off for the night—fine weather.

9 Light breeze westerly stood on to East and passed a number of small Islands & Breakers which obliged us to keep a distance from the Main & still Islands as far as could be seen—The Coast appeared very barren vast Tracts absolutely destitute of vegetation—The Islands appeared all Granite Rock nearly destitute of vegetation—however some of the longest were Covered with wood—Towards evening we were entirely surrounded with Islands and Breakers in every Direction so that it became dangerous to keep to Sea we therefore stood in for a Bay on the main and anchored at $\frac{1}{2}$ past 7 in 8 fathoms of water sheltered from all Winds but West.

10 Went ashore at Daylight with a large party and collected many fine specimens & seeds—In this days excursion we met with a species of Cycas[70] with plenty of green fruit—on cutting it open and tasting the Seeds were very palatable & full of juice as water was scarce we eat heartily then made a fire and roasted them and eat in that form—but were very soon after taken with a pain on the Stomach a headach and repeated reaching—which continued all day—this was common to all who eat this Palm about 20 in number—two only of which experienced no bad effects from it—It had no other effect than that of a strong emetic as every one was well next day—Captain Cook relates a similar instance which occurred to his crew & on giving the fruit to the Hogs they swelled and died.

11 After Breakfast were landed in a fine snug Bay to North of where we lay and collected several fine specimens and seeds particularly Banksia—Came to a fine Lake of freshwater a few yards from the Sea with plenty of wild Ducks 2 of which were killed.

12 Went ashore in the morning and walked to the mountain where we had landed yesterday where I found a new Banksia I then bent my Course to another high mountain in land with a singular summit—near the base of which I found an extensive marsh & some new plants also evident marks of the natives having been there very recently—finding I would be benighted if I ascended the mountain I returned and got on board before dark loaded with several fine new plants—on Board they caught an enormous Shark with the Carcass of two Seals almost entire in his stomach in one of which was found a piece of natives spear.

January 13 Went ashore with Mr Brown and party to visit the mountain which I had been at the base of yesterday on ascending near the Summit and arriving at the entrance of what we had supposed a Cavern—we were astonished to find it a natural Arch entirely through the mountain—this arch was 70 yards broad at the base 40 yards through the mountain and 9 or 10 yards high here we found a few new plants—when on the Summit we could count the country set on fire in 9 different places by the Natives and one of our boats had gone to a large woody Island to which they had set fire the smoak from so many darkened the air so that we could not see much of the country—but what we saw is barren no luxuriant vegetation to be seen several small Lakes and Marshes—This bay as also the mountains forms a head land which streaches a considerable way into the Sea which almost surrounds it—The Bay is situated between 34 and 35° of South Latitude and 122 & 123 of East Longitude.

14 Got underway early with a fine Breeze & stood on through a great number of Islands and Breakers and past a barren Coast—about 3 p.m. it was reported from the masthead shoal water a head very near and instantly the Ship touched—but fortunately suffered no damage—at this instant we had not 3 fathoms of water & next cast of the lead 7 fathoms on one side and 13 on the other—The boat was instantly lowered and sent ahead and soon made a signal for shoal water hove too and boat soon after made signal to stand on did so and in evening stood for a Bay of a large Island where we anchored about Sun down in a snug well sheltered Bay.

15 Were landed in the morning on the large Island & ranged through the woods and along the Shore—we fell in with a Lake of very salt water tinged of a beautiful red colour with a quantity of fine white Salt on its shores & also fine chrystals of Salt—This Lake was separated from the Sea by a high bank covered with wood about 100 yards broad—this Lake is about ¾ of a mile long & broad—came on board to dinner having found little variety here—in evening were landed on a small Island which shelters the anchorage here we found but little variety—the boat had been here in morning & had set fire to the low brush with which it is covered the smoak of which annoyed us much—The Boats crews killed on this Island upwards of 2 Dozen Geese[71] of a kind peculiar to this country & are little inferior to English Geese—they were divided among the Ship's Company

16 Went ashore on the large Island & ascended the highest part of the Island which commands an extensive prospect of Islands and even the main—from the appearance of the Vegetation the

January 16 South West winds must be very prevalent here—This Island is chiefly composed of Granite of various degrees of fineness and colour—some finely streaked with veins of very pure Quartze also some viens of Mica & Feltspar—here is also Calcareous Stone—Mr Thistle[72] went sounding the different channels among the Islands & visited some Islands more distant & brought on Board 30 Geese which were also distributed among the Crew—which together with the fish caught here proved a great refreshment.

17 Got underway Early in morning and passed many Islands and breakers & a deep bight in the main—the Coast was chiefly low with some hills of considerable elevation in land in evening came to an Anchor in 8 fathoms water near some white sand hills on Shore which was very low—the Country rising slow & gradually to a ridge of moderate height which bounded the prospect of the country.

18 Got underway early with a light air which dyed away to a Calm about noon a Breeze sprung up from Eastward at 4 were very near the Shore—having passed several hills of white sand of a singular appearance. The Coast had now a very different appearance—The land ending abruptly in perpendicular white rock of which we could distinctly see the strata running horizontal—This rock streached to East and West of an equal height—which formed all the prospect of this country as no land could be seen over the apparent wall even from the masthead.

19 Wind more favourable and stood along parralel to the shore with a fine Breeze—a continuation of the same perpendicular rock wall all that could be seen of the land.

20 This and following day the wind contrary with a heavy swell—we made little progress to windward and of course saw little land—but what we saw was only a continuation of the same perpendicular rock of the same height and appearance.

22 Wind still contrary but more smooth water in evening came very near the shore in 7 fathoms water—The land had now a very different appearance—being very low land with some little rising hills of sand and some vegetation but great ranges of sand absolutely void of vegetation many Columns of Smoak rising at no great distance in land—at night wind variable & hot—rather squally.

23 Wind more favourable stood along the Coast which was near a streight line from West to East—low flat Country no hills of consequence.

24 This and following day the same appearance of low land but rather more fertile.

January 26 Brisk wind from South & South West about noon the Coast opposite us had the same appearance as from the 18th to the 22nd the land ending abruptly in a perpendicular rock of 30 to 40 yards high runing in a direct line from East to West.

27 The same shore like a wall composed all our view of land till about noon it changed its appearance to a Sandy Beach and low country—The Rocky Coast I think extended about 100 miles as also the one from 18th to the 22nd and the whole shore since the 16 had run nearly from west to East—It now changed its direction and trended to South East The soundings along this whole extent of Coast were very regular.

28 The coast was now more irregular—in evening stood in for a large Bay behind a rock point and anchored in 3 fathoms water.

29 Went ashore at daylight and ascended the neck of land which shelters the Bay—finding very few plants there directed our course to the flat low country more in land—here we found a large tract which at some seasons must be inundated with salt water as the Surface was covered with Salt—a species or two of Salicornia was all the Vegetation this part afforded we were obliged to be on Board by noon & finding nothing to protract our stay were rather before our time and got underway soon after. This is the most miserable part of the Coast we had landed on—not a drop of fresh water and little variety of either animals or vegetables—we saw in some places the prints of naked feet in the mud and sand but not recent many very recent prints of the feet of Dogs[73]—This was the only part of the main where none of the bushes had been set on fire—but indeed they were so thin scattered as to render it difficult—The Rock here is Calcarions and of different colour & consistence some porous others fine grained and hard.

30 This and following day the wind contrary and we made little progress the coast trended much to the South with a very barren appearance.

February 1 Past to windward of a low Island but made little progress.

2 Wind still contrary—in evening came in sight of a number of Islands and breakers—stood for a Bay on North side of a large Island and anchored—a number of Birds of the Peterel kind on the wing

3 Went ashore in morning and traversed this Island which we found to be all burrowed over by a bird of the Peterel kind which must be very numerous—This Island is chiefly composed of Calcareous matter with a Base of Porphery also some considerable Rocks of Sandstone—towards noon the heat

February 3 became excessive the Thermometer in shade of a Rock on shore rose to 100 laid down in the Sun it rose to the top of the Tube which was 130°—a species of Grass[74] about knee high annoyed us much, it run into our legs as sharp as needles—we met with little variety here every thing was parched up—two Boats went ashore in the evening and brought off 400 of the Peterels which burrow here in such quantity and are tolerable eating—the Sailors call them Mutton birds[75]—Captain & Master were employed taking bearings & sounding the channels—hazy weather.

4 Got underway about 1 PM with a fine Breeze from South South East and stood towards the North—we soon saw the main to West and land to North & East—in standing to the North for a deep Bay and attempting to pass between two Islands—we were very near aground the water having shoaled very suddently to ¼ less 3 fathoms—wore Ship directly and lay too for the night.

5 This day was employed in exploring several deep bights to the Eastward—in every finding the land trend much to South—stood to the North for a Bay which had not been sufficiently explored—several fires on shore

6 Stood to North and passed to westward of where we had nearly grounded on the evening of the 4 then hauled up into a deep Bay for some time till water shoaling to three fathoms when we put about at this time we were several leagues, from the Bottom of the Bay which had a low sandy shore with a flat country—smoak seen in land—In evening anchored in entrance of the straight between the two Islands which separates this Bay from the others to Eastward.

7 Went ashore Early on the largest Island which is 4 or 5 leagues in length—here we saw a great number of quadrupeds of the kangaroo kind about the size of a hare[76] three of which were killed—we found no variety of plants here came on board about one PM—the Ship soon got underway and before midnight Anchored in the same Bay in which we had Anchored on the 2 instant—very hot weather since our arrival here—much lightning in South quarter.

8 Went ashore and traversed a different part of the Island from where we had been before but was equally unsuccessful—In evening the Boat went ashore and brought off 750 birds which were divided among the Crew—hot weather.

9 Got underway Early with a fine Breeze which gradually increased we stood South East and in the afternoon made the same point of land which we had left on evening of the 5 being a high rocky point—the Air was now quite cool.

February 10 In morning stood for a bight behind a point of perpendicular Rock—In this bight was an Island and many breakers—but no safe harbour—stood along the Coast which was high and rocky with a fine Breeze—about noon stood in behind another rocky point where appeared a fine opening in land—we stood very near and saw a narrow opening through a low rock and at some distance beyond a Sandy Beach—from the mast head water was seen overland—so that it is probably there is either a river or some Lake here—but the entrance appeared Shoal water with Breakers—as the wind grew fresh full against the Shore it was dangerous to go near—stood along Shore South East close hauled—In evening came in sight of several Islands some of considerable extent.

11 Strong South East wind with Squalls a number of Islands Rocks and Breakers ahead—about 8 A.M. anchored under the Lee of a Large Island nearest the Main and soon went on shore but the whole Island produces little else but Birds and Seals. Cool air.

12 Got underway Early with a strong South East wind and in even anchored under the Lee of a Large Island far from the Main.

13 Went ashore Early and traversed the greater part of this Island. It is woody but no large timber and no water—it is stocked with a species of kangaroo the same as was found on the 7 instant but here they were in better condition the air is certainly much cooler—This as all the other Islands we have visited are composed of a Calcareous Earth on a Base of Granite or Porphery.

14 Got underway Early with light wind contrary made little advance along the Coast—strong breeze in the afternoon.

South Coast of New Holland

15 Wind more favourable and fine weather—one high Island & 5 bare rocks near it in the South West quarter—The main high land with some deep bights & a number of fires—In evening the land inclined directly from North to South a rocky Coast with hills of considerable elevation the summits of which appeared covered with Trees & more fertile than any we had lately seen—fires in different directions

16 Early in the morning stood into a large Bay with hills of considerable elevation on North and low land on South—at 8 a.m. the water which had shoaled gradually was less than 4 fathoms and all shoal ahead—put about—at this time we could

February 16 not see the bottom of the Bay which had much the appearance as the mouth of a river—but no depth of water to admit ships to enter—light airs and calms it was 7 p.m. before we could pass the West point of Bay when two Islands appeared ahead—many columns of smoak rising in different directions among the hills and several Natives seen walking on the beach.

17 This day we gained little wind being contrary but passed several Islands & a very barren Coast.

18 Kept working to windward the Coast consisted of great tracts entirely void of vegetation & high perpendicular Rocks of a white colour.

19 Kept working to windward—in evening came opposite a small Island near a rocky point behind which appeared a deep Bay—but hazy weather, & strong wind blowing right in kept to Sea.

20 In the morning stood to examine the Bay seen last night and about 8 A.M. could trace the Shore all round—a large open Bay without shelter—again beat to windward & having weathered the South East point stood in behind to an opening of which we could not see the bottom—we passed several Islands and on entering the narrowest part which was not much above a mile we observed a very rapid current running out against the wind which blew fresh from South East right into this Straight—which having passed we still found ourselves in the open Sea & that the high land to the Eastward of us and which we had supposed to be the Main was only a large Island and that we had doubled a high Cape of the Main which now trended from South to North as far as we could see—we found several small Islands between the large one and the Main but breakers entirely across except where we came in—we stood to the Lee of the Large Island and Anchored but on Sounding round found it not safe—up Anchor & stood to Lee of Small Island next & again anchored in a strong Current which regularly ebbed and flowed.

21 Went ashore Early and ranged among the woods with which this Island is covered—we found a few new plants & three Serpents[77] were killed one of which was very large also a species of opposum[78] & a kangaroo of the same species we had seen on the 13th & 7th inst. came on board about noon.

Hitherto we had been very fortunate had no accident of consequence occurring to any of the crew. It is now necessary to relate a melancholy and distressing accident no less than the Total loss of the Master's Cutter & Crew[79] consisting of Mr Thistle Master—a man of much experience whose intrinsic merit

February 21 had raised him from a common Sailor to the Station he then held & which he filled with Credit to himself and satisfaction to all around him—of Mr Taylor, Midshipman a very promising young man & the Crew of six choice sailors—which melancholy accident happened in the following manner.—It was considered of some importance to determine exactly the situation of this remarkable part of the Coast & the day having been cloudy had but a bad observation—Captain therefore proposed remaining another day & as our water began to run short The Master went to the Main which is high land to see if any could be got & to sound & observe the coast &c. The wind blew moderately from South East without any apparent danger—Mr Fowler went with the other Cutter to the large Island—just after sunset the Cutter was seen coming away from the main with a stiff breeze from South East and a strong current setting against it—The Cutter appeared close hauled and the current seemed to take her a little windward of the line she made for the Ship—She was seen distinctly for about a quarter of an hour when she was half way from the Shore to the Ship & just to the Lee of a small Island which confines the Current—not the least danger was apprehended—I was on Deck and frequently looked at her to observe the effect of the Current—I had not taken my eyes 5 minutes from the boat when I again looked and could not see it—I immediately said I had lost sight of the Boat, Mr Evans who had the watch on Deck made the same observation, a general look took place and it was not to be seen, at this time Mr Fowler with the other Cutter was at the Island—some time was spent looking with Glasses without effect & it became dark apace—The distance from the ship to the Main might be from 5 to 7 miles & the Cutter was seen I think not more than 3 from the Ship. Mr Fowler soon came on Board—Captain informed him of his fears, pointed out to him the situation we had last seen the Cutter & requested him to lose no time getting there to assist &c. but advised him to be very careful not to risk his boat—he sailed directly to the place where the other was last seen but it was now dark—he continued rowing and sailing in every direction he thought likely to meet with them till about 11 by signal from the Ship he came on Board without having seen anything of them—but said that he got into a great reef of breakers near the place which was pointed out to him as the last the other Cutter was seen and that it was with great difficulty he could extricate himself from it.

22 Got underway Early and stood across the Straight to the Main and soon perceived the chain of breakers where the Cutter was

February 22 supposed to have upset—Mr Fowler went to sound and found plenty of water & that it was entirely occassioned by the violence of the current—where some Islands confine it to a narrow channel and that it frequently disappears which makes it more dangerous for boats—about 7 anchored in a snug little Bay of the Main sheltered from every wind except East—Mr Fowler went with the other Cutter to search the different Islands in case any had got on them particularly those nearest to where they were supposed to be lost & where the current might carry them, while Captain and party landed on the main & walked along the shore in one Direction & Mr Brown & party in another—Mr Fowler soon found the remains of the Cutter near the point of the Main which sheltered the present Anchorage from the South East winds which seem prevailant here—The Cutter had been on shore & broke to pieces & no part of the Crew about it—and at night when all parties had returned on board nothing was found but broken fragments of the Boat on the Beach & some oars—Mr Fowler also found the Compass & binnacle floating & unhurt—thus all hopes of finding any of the Crew alive vanished.

23 Captain went with Cutter to search to leeward most fragments were found in that direction—Mr Brown & I went to the Top of the hills & collected a few plants—The Shore was searched in every direction & nothing found but trifling fragments & Captain found floating a small cask in which Mr Thistle used to carry his liquor.

24 I went ashore at Mr Browns desire over the same ground we had gone the 22 to gather some things which anxiety to search the shore had then prevented us—Nothing belonging to the Boat was found this day Mr Fowler in evening drew the Seine and caught many fine fish which were distributed among the Crew—This part of the Country forms a long Neck of land which streaches South East a great way into the Sea & is narrow—from the mountains we could see the Sea on both sides—Its surface is almost entirely covered with a very rough hard calcareous stone which renders it difficult to walk—The base is Granite of various degrees of fineness and some veins of other substances—The surface is almost entirely covered with bushes chiefly of the Eucalyptus kind—with some variety of other things—there are few places which have any soil but the bushes growing among the bare loose calcarious stone No water was found here although there must be water at some seasons for at the Bay on the Beach were several huts better built than any we found about King George's Sound—some parts of the country had been lately burnt.

February 25 Took our departure from this Bay which Captain named *Memory Cove* as a small tribute to the memory of the brave fellows who were lost there—he caused to be fixed on shore a plate of Copper commemorating this melancholy and disastrous event—with the date of our anchorage here &c. We stood along the Coast to the North & passed several Bays and Islands and afterwards stood to West into a large Bay with many Islands and anchored to Leeward a small hill—went ashore in afternoon & collected a few things among which a new Opposum[80]—found no fresh water.

26 Went ashore Early as also Captain & Draughtsmen & ascended the nearest hill where we had a fine prospect of the Bay which is spacious and convenient with numerous places for Anchorage we saw near the top of the Bay a Lake which we supposed fresh water came on board at 10 and immediately got underway & stood up the Bay with a fair wind—it is rather shoal from 4 to 6 fathoms water Anchored about one and went ashore directly with Captain & Mr Brown to go to the Lake on arrival we found the water slightly brackish in the marshes near it we found fresh water—this Lake is near two miles from the harbour—on return we found marshy ground near the Top of the Harbour and small pools of fine fresh water in which the Captain expected to be able to water the Ship—In this excursion we collected several new plants.

27 The launch got out and Ship moored early & a party landed to dig for water Tents erected and instruments taken ashore to try the rate of the Timekeepers—Mr Brown and party went to visit a high hill to North of Harbour where we had a fine prospect of the country which consists of hill and valleys—the whole country had been lately burnt a few spots excepted—there were several fires at no great distance—we saw very distinctly the high hills to the North of the Bay in which we were the 16th instant—they did not appear more than 20 miles distant.

28 I went ashore at Mr Brown's desire to South of the harbour but met with little new—Captain went to the hill we had been on yesterday also to some Islands in the Mouth of harbour and to a smaller Lake to south of Ditto which he found to be very Salt although it has no communication with the Sea—Ship's Company bussied watering the Ship.

March 1 Landed with Mr Brown and party to walk round Lake seen on our arrival here on reaching what we considered the extremity of this Lake we found that it had two more Arms—each nearly equal in size to the first—which had been hid by their different direction and some Islands covered with wood—we found

March 1 considerable morasses of fresh water on the North shore of this Lake which is but slightly brackish—on arriving at the farther extremity we ascended the low hills & found ourselves on the Shore of the main Ocean and the Bay which we had looked into on 20 instant which is large open and exposed & a dreadful surf all round—here we saw the mainsail of the Cutter so lately lost—two Arms of this Large Lake run each to about half a mile from the Main Ocean and the other extremity about 2 miles from the Harbour & seems to have no communication with either—we found little interesting in this excursion.

2 Employed in preserving former collections—Captain went to the largest Island in mouth of Harbour & at a Signal agreed on three Great Guns were fired from the Ship with the view to measure the distance.

3 Took a walk in neibourhood with Mr Brown & collected a few things—In evening Mr Fowler with Cutter provided for two or three days set out for Memory Cove to look for the body's of the Crew of the Cutter lost there the Ship having near compleated watering.

4 Took a walk in the neibourhood by myself and saw 4 large birds of the Ostrich[81] kind but was a considerable distance from them—Two of the natives were seen near the Tents & a hut was found in which were found 17 spears & some other implements—This day the Captain was on shore with Telescope attending the Eclipse of the Sun which was almost Total only a small part of the lower limb was not obscured—The day was rather cloudy but it was tolerable distinct even to the naked eye—This day watering the Ship was completed, Tents struck, Launch hoisted in and everything ready for Sea.

5 Unmoored and got underway early & stood on to the first Large Bay in mouth of the harbour and anchored about 10 AM—In afternoon went ashore on South point but met with little new—Mr Fowler returned with the Cutter from Memory Cove without having found any of the wreck of the Cutter or any part of the Crew—The country around this large Bay or harbour is composed chiefly of calcarious matter the greater part of the surface loose rough calcareous Stone—some places it is covered with fine light soil in some places red & others black—there are many places which might be rendered fertile by Cultivation but there seems to be a general want of water every part of this Country which we had yet visited—but this was probably none inferior to the neihbourhood of King George's Sound—The country is more open and no Timber equal to what might be got there—but the soil appeared better adapted for cultivation.

March 6 Got underway in the morning & stood to North & North East & anchored in evening near a small Island—with some others in sight & one of considerable size all low and considerably distant from the Main—strong Current.

7 Went ashore on small Island which is chiefly Granite & very barren—at noon up anchor and stood to the Northward with a fresh breeze—according to the Custom of the Navy, Yesterday were sold at auction the effects of the Crew of the Cutter lately lost which was this day completed & some regulations took place to fill the vacancy of officers Mr Evans Master's mate was appointed acting Master & Mr Nathaniel Wright Seaman, for his meritorious conduct was promoted Midshipman.

8 Stood on the North East with a stiff breeze, a hilly country appeared with some low points on shore with hills rising behind hills in land, about noon land trended Eastward and in afternoon land appeared on both side, in evening we stood to west shore to Anchor, but water shoaling suddenly to less than three fathoms put about and before dark anchored in the open Sea without shelter—wind blowing fresh with hazey weather—high land to the East and hilly country with low shore to the West some land in appearance of Islands to North.

9 Up anchor in morning and stood North with a strong southerly wind—after some time stood East and passed a deep bight and again stood North with a chain of mountains the most considerable we had seen in New Holland to the East and a hilly country to the West with a channel between 8 or 10 miles broad—the wind blew fresh from the South stood right before it about 4 hours when Shoal water appeared ahead, immediately put about and while in the act of wearing there was about 2 fathoms water while the Ship drew 13 or 14 ft. & it must have been owing to the heel which was then considerable or she must have grounded—we soon got into 6 fathoms and anchored—for the last two days we had very regular soundings from 12 to 6 fathoms for the last 50 or 60 miles seldom more than 6 fathoms till in this channel which deepened to 12 or 14 & again shoaled suddenly.

10 Went ashore at day light with Mr Brown and party of 7 in number to visit the chain of mountains to Eastward of us—we were obliged to wade knee deep in mud and sea weed for upwards of a mile at landing low water and the Tide having left that space—we still found the space of several miles the land very little above the level of the Sea with many winding Creaks of Salt water which are filled by the Tides—In these salt marshes & on banks of Creeks grow a quantity of a kind of Mangrove

March 10 Trees—The whole country for 10 or 12 miles from the shore appears to be inundated at some Seasons, the soil is entirely composed of mud which has been washed down from the mountains or from the interiour of the country by floods we directed our course for the highest hill which Terminates the range to the North, the distance was much greater than we expected & it was past noon before we arrived at the bottom of the mountains—we had not ascended far when Mr Browns servant being overcome by fatigue & heat could not proceed, soon after Mr. Westall's servant was in a similar state we directed him to go back to Mr Browns servant and to go to a spot at the bottom of the mountains where was some appearance of water and there wait for us—It was very near Sunset before we reached the summit when we had a most extensive view probably the most extensive ever had in New Holland, being elevated full 3000 feet above the level of the Sea and it may be said 100 miles in the heart of the Country—on the South was the range of mountains rising behind each other with ravins & deep gullies from these mountains to West was a great tract of low land, the River or Arm of the Sea & a hilly country beyond, from which to North was a level plain as far as the eye could reach with the continuation of the River gradually diminishing till it was lost in the low plains to the North from which to the East & round to South was a vast plain terminated by a range of hills paralell to what we were on runing from North to South—having gratified ourselves with viewing this extensive and boundless desert we begun to descend with all expedition, but were soon overtaken by darkness & some of party being overcome with fatigue on arrival at the bottom of a deep Gullie we thought fit to spend the night but it was spent very uncomfortably—little fire wood could be got the night air was very cool in this elevated situation—the ground was full of stones and so uneven that we could not lay—add to which some had no water having trusted to finding water among the mountains & we had not been so fortunate as to find any—The morning was anxiously expected few of the party having had any refreshing sleep.

11 As soon as day appeared continued our descent from these mountains and soon came to where we had directed the servants to go, and found them very comfortable with plenty of fine water and a good fire, here we drank with an exquisite relish eat some musty bisquit & Salt Beef and sufficiently quenched our thirst with this delicious spring—here we found a species of Tobacco[82] & several new plants—we reached the shore about five in the evening & soon got on board, having suffered considerably for

March 11 want of water the heat being so great as to cause much want of that article—In this excursion we found much less variety in the Vegetable Kingdom than was expected—This country produces little Timber—on the mountains many Trees of Cassuarina of a moderate size and in the Gullies and on banks of rivulets from the mountains which were now dryed up grew some fine Trees of Eucalyptus These mountains are chiefly composed of a kind of Schistus or slatestone which are generally loose on surface few pieces of solid rock being seen There is also Quartz and a mixture of Quartz with other substances—On arrival on board we learned that Captain had left the ship soon after us to sail up the River with the Boat & that he was not yet returned he returned before 11 at night having sailed 15 or 20 miles up the River which he found at first brackish & near to its Sources quite salt & met with no fresh water—saw many Black Swans but they were so wild none were killed—some Ducks were killed—saw a native Dog—several huts were seen & recent prints of the feet of Natives in the mud both by Captains party & ours but no Natives though their fires were very near us—some decayed bones were found near the Spring which from their structure appeared to be human—from bearings & observations the mountain on which we had been was 16 or 20 miles from the Ship

12 Employed securing our collections without any thing remarkable

13 Up anchor at day break & stood to South with a westerly wind—before 8 got aground on a mud bank with which this shore abounds—as it was a gentle breeze got the boat out with a Kedge Astern & soon hove her off without any damage—The whole day had shoal water and in great danger of being aground as it frequently shoaled suddenly—particularly near the East shore it would scarce allow us to near enough to see the shore from Deck anchored in evening quite exposed

14 Up anchor early but were still obliged to keep a great distance from the East shore—Anchored in evening several Leagues from land in sight of the Mountain which we had visited though distant 70 miles—we could see the chain of Ditto for 100 miles from North to South

15 Up anchor early & stood along the Coast the soundings were more regular but never more than 15 fathoms—Land seen distinctly on both sides the bay Anchored in evening some Leagues from East Shore

16 Got underway early wind contrary kept working to windward with land on each side

March 17 Out of sight of land in morning stood to Eastward & soon came up with it and kept working to windward along a very barren Coast—the greatest part of the Surface absolutely bare either white sand or stone of that colour all low land, having lost sight of the range of mountains

18 Passed several points which streach considerably to Westward at before 10 in evening Anchored near a point which was for sometime thought to be an Island, so that there is a bight to East of this point, a fire was burning near the Beach & Natives walking about it

19 Got underweight in morning with a Southerly wind and stood to Westward and soon came in sight of the high Island where we had anchored on 20 February, we stood in that direction with a light wind till 4 PM when seeing Breakers ahead & wind veering more to West put about—at this time we could see Memory Cove & the Main for a great distance as also several Islands—one high Island to Eastward had been seen nearly all day—Moon Eclipsed.

20 In morning in sight of the Main to South East and near the high Island seen yesterday to the East, also in sight of the high Island near Memory Cove, so that the mouth of the Bay or Gulph cannot much exceed 30 or 40 miles—about 10 AM saw an extensive high land to South & South West at a considerable Distance—low land to East & a large opening to South East where no land could be seen. Some rocks or small Island off the East point—Becalmed a great part of the Day—in evening a Breeze springing up from West which increased to a gale & varying to South West.

21 Blew a fresh Gale, with high land to the Southward, streaching to East & West as far as we could see on coming near the land we found ourselves much sheltered, with smooth water under the land stood to the Eastward, the whole country covered with wood, we passed two deep open Bays which run in to South or South West and anchored in the Evening well sheltered by high land near the East point a high point of land to Eastward unconnected with that by which we Anchored

22 Went ashore Early and ranged among the woods with which this country is covered and collected a few plants, On landing we found Seals & large Kangaroo's[83] very plenty and quite tame, so much so that in the course of the forenoon near 30 Kangaroos were killed the largest of which weighed 130 lbs and the smallest 70 lb—this proved a valuable acquisition to the Ships Crew as every man had as much fresh provision as he could make use off—this circumstance of finding seals & Kangaroos which

March 22 appeared never to have been disturbed before convinced us we were on an Island

23 Went ashore in morning and walked to Eastward where I found several new plants, came to a spot where fresh water rises in tolerable plenty from the crevices of rock near the Shore a party landed to shoot kangaroos but had bad success only few were killed they were now very shy, 4 Emoos were seen but none killed saw fire on what we had supposed a high Island to Eastward

This Island from what we saw of it cannot be much less than 100 miles in length—it is entirely covered with wood hilly and in many places a considerable Depth of rich soil & very capable of Cultivation, there seems to be a general want of water here as in every place we had visited on the Coast of New Holland, but this certainly merits the preference for the purposes of Cultivation from any we had yet seen. The Base of this Island is chiefly composed of a kind of blue stone laying in strata of different thickness and rather irregular direction but generally at an angle of from sixty to 80 degrees—It is mixed with partial viens of Quartz & mica in very irregular directions at the shore the rock is generally hard & rather inclined to a black colour and as it advances from the Shore it becomes of a feinter colour till it is almost white & high up it becomes more of a Grit stone for much of that near shore is so soft that it will easily cut with a knife.

24 Up Anchor early & stood to North West with a Westerly wind and passed the mouth of two deep Bays in the Island we had just left at top of these Bays the land appeared low with some little hills in land raising their summits above the others.

25 In morning near the point where we were on 20th stood to the Eastward with a low barren looking country to the North in afternoon wind veered to Eastward.

26 This & following day we kept plying to windward with little success at each tack alternately making the high Island & the low shore

27 At noon being nearly calm & a current taking us to Westward came too with a Kedge Anchor in 15 fathoms near the large Island but 8 or 10 miles to West of where we had before anchored, at 3 PM a breeze springing up from South up anchor & stood to Eastward and parallel to the high point of land which we had at first taken for an Island about ½ past 7 light was seen on starboard bow at a considerable distance which became more & more distinct till several were seen and continued the greatest part of the night

March 28 Becalmed in morning with the land to Eastward of us having a promising appearance hills of gentle elevation near the Shore & rising gradually hills beyond hills for some distance the most distant of considerable elevation with large vallies or planes between from some of which smoak issued—about noon a breeze springing from the South stood along the coast to North the land soon began to trend to Westward, the land next the Shore perfectly level & low with the waters edge forming a large plane bounded on the Eastward by a high range of hills which in parts of the ascent appeared broken rock with little vegetation but towards the bottom of the hills appeared well wooded & the greatest part of the summits were covered with vegetation, much smoak rising between the foot of the hills and the shore. The water shoaled gradually & we were obliged to haul farther from the shore, about sundown anchored in 5 fathoms water several Leagues from land little current perceptible here—hazey weather

29 Morning Calm & serene land visible both to East and West & all round to North except some openings to North West where we could not see the bottom, Up Anchor and stood in that direction with a light air from the Southward, about noon water shoaled to near three fathoms, hauled to Westward when it deepened to 8 or 9 fathoms & again stood to the Northward
The water again shoaled to $3\frac{1}{2}$ fathoms with squally weather, again hauled to the West when water deepning again stood to the North and Anchored in the evening about two leagues from land on either side & where could see the bottom of the Bay which seemed to terminate in Shoal water in every direction. All low land on shore & rising gradually in land but no very high land in view

30 Captain & Mr Brown went with Cutter Early intending to go to the top of the highest land in sight which was to the North they had at least three leagues to Sail before they could reach the shore in that direction—the distance from the shore prevented any other Boat from going ashore—The day was very fine and Cutter returned in the dusk—They had not been able to reach the highest land it was more distant than they expected. found the Bay to terminate without any river or inlet and a low country with gently swelling hills—not much wood but plenty of grass which was parched with drought

31 Up anchor early and stood to the Southward with light winds fine serene weather

April 1 Light variable winds, before midnight anchored a little to Westward of where we had anchored on 22d March

Anchorage XIV south coast of New Holland

April 2 Went ashore in morning with Mr Brown & party and ranged along the Shore to South West making occasional streaches up among the woods—but found little but what we had before seen—Captain went early with a party to top of the Bay where 4 Emoos were seen, several partys landed to kill Kangaroos, they were now so shy that they had not much success however so many were got that all hands had again fresh provisions

3 Up anchor early when finding the Timekeeper had stopped. Anchored again & moored—wooding party went ashore and some parties in search of kangaroo's. Several Emoos were seen

4 Went ashore Early & took provisions for two Days intending to penetrate as far as possible through the woods. Messrs Westal & Allen were of the Party—while Captain & Mr Brown went with Cutter to the top of the Bay to explore it and to endeavour to reach the top of a round hill which appeared some distance in land at top of Bay—I penetrated a considerable distance up a Gully near the Eastpoint & from that to the summit of the hills but the trees were so thick as entirely to prevent any extensive view of the country—In this excursion I met with a few new things and returned in evening to the Spring where I found Mr Westal & Allen and where we spent the night

5 Took a ramble through the woods & killed a beautiful bird of the Paroquet kind & a kangaroo, a boat came for us and one of the crew attempting to kill a Seal had his leg bit by one in a very dangerous manner. Mr Westal & Allen had little success in killing kangaroos & birds saw many Emoos but killed none Got on board about 6 in the evening, where we learned the Cutter had come in the morning. that they had found an inlet of the Sea which took them quite to the foot of the hill they proposed going to, which proved to be composed of sand and from which they had an extensive view of the island which composes two large Peninsula's joined by a narrow Istmus not above two miles broad from the extreamity of the Inlet to the opposite shore but they could not see the extent of the land either to East or West. they found an imense number of a singular species of Pelican[84] some of which they brought on Board. a party in evening cutting Brooms saw 14 Emoos

South coast of New Holland

6 Unmoored Early, and got underweigh—but wind shifting to and Current against us anchored again very near where we had

April 6 Anchored on 22 March—past noon current being more favourable Weighed and plyed to windward & before 11 PM anchored in a bay of the same Island—in the streight which seperates it from a high point of the Main—The Streight about 3 leagues broad— two small Islands or rather rocks near the middle of the channel

7 Weighed Early and plyed to windward—and cleared this fine Island where we had been so well refreshed and which appears to me to be the most desirable place we have met with on the Coast of New Holland from what we saw of it, it cannot be less than 100 miles in length it is covered almost everywhere with a light red loam very favourable to Vegetation, in many places a considerable Depth—The Trees & vegetables which are indigenous to this Island are more varied than any we had before met with—It produceth 4 or 5 species of Eucalyptus as many species of Mimosa all with entire leaves—4 or 5 species of Melaleuca with some other plants of the Natural order of Myrtus 2 species of Correa one Alyxia several Syngenesus plants. Atriplices 4 or 5 species of Fern Dodonea, Casuarina, Anthericum, several species of Grass, Lichens, with some others——Its Animals also various the most considerable are the Kangaroo of which it has two species differing chiefly in size very large Gouanas[85] some lizards[86] & with many insects——The feathered race is here in great variety numbers & beauty and many have fine notes the night I slept on shore we heard about 11 oclock a bird calling exactly like the Cukoo.[87] The first of the feathered race is the Emoo—a large Eagle[88] was seen here a large & curious Pelican a brown Pigeon[89] very numerous, Quails,[90] and great variety of the Parrot tribe some of which are decked in the most elegant plumage, with a great number of small birds—the scarcity of water seems a great bar to the cultivation of this fine Island as we found it only in two places about half a mile apart & close on the Sea Shore in South Lat. 34.43 & East long. 137.27 nearly—. The wind & current being against us the greatest part of the day we made little progress, but current being favourable in the night

8 In morning found ourselves considerably to Eastward & the Coast trended from South West to North East a hilly country—about 9 morning land streach to the Southward a low sandy country, harpooned a Porpoise and kept plying to windward at 1 P.M. a Sail was seen to windward standing towards us, & soon came so near that we discovered French colours & a Union jack, about Sun down hailed and Captain & Mr Brown went on Board & learned it was the French National Frigate the Geographe

April 8 Citizen Baudin[91] commander, he informed them he had parted with his Consort Le Naturalist in Basses Streights, that he had lost a boat there with 8 men which he had sent in search of some Islands & had never returnd, they also learned he had lost many men at Timor by sickness among which was his Gardener who had been burried beside Nelson[92] & a monument erected to their memory—kept company all night.

9 Our commander & Mr Brown went on Board the French Frigate early and gained some farther information respecting their discoveries, that they had coasted around Van Diemans Land—and that he had been on some part of the West Coast, and finding they were much in want of wood & water directed him to where he could find both—at Captains return we parted Company—the frenchman standing to Westward & we to Eastward, light airs and cloudy all day in evening much lightning in East & North East, some very heavy showers

10 fine weather and light Breezes stood along the Coast to South East a low sandy shore very uninteresting. nothing to be seen but the shore killed a Porpoise

11 Light variable winds & hazy weather with some rain—the same appearance of land as yesterday

12 light variable winds, land trended much to the South low but covered with vegetation close to the shore

13 A strong Breeze from South East the land trending in that direction, the land still low but some little hills near the Shore covered with vegetation passed some rocks near Shore very little above the water

14 This and following day kept plying to windward with a fresh breeze but gained little an uninteresting Coast

Kings Island in Basses Streight S. coast of New Holland

16 Becalmed most of the day out of sight of land could get no bottom with a line of 200 fathoms

17 light Breeze land in sight at day light distant 13 or 14 miles, stood to Eastward along the Coast with a fair wind—in the afternoon wind shifted to South East the land trending in that direction, at this time some hills of moderate elevation showed themselves in land

18 nearly Calm all Day

April 19 light wind and heavy swell stood along the coast to the South East

20 A fresh Gale from the Westward with a heavy swell and thick cloudy weather with frequent squalls and heavy showers of rain and hail, passed several Bays and some Islands & rocks but weather very unfavourable to trace acurately the Coast

21 The Gale abated a little by 10 AM and the Sea gradually became less turbulent, little land seen this day

22 Wind from the south standing to South West at 8 AM land seen to windward appearing Islands, kept plying to Windward

23 In morning under the Lee of an Island of considerable extent plyed to windward and about 3 PM anchored a few miles from Shore Captain & Messrs Brown & Westal went ashore with Cutter—they killed two animals of the Opossum kind which at Port jackson are called Wumots, it has very short legs flat head and round body, also killed a kangaroo, also an Amphibious Animal which the Sailors killed & brought the skin on Board it was probably a Seal but of a different species from any we had seen

24 Went ashore early with Messrs Brown Bawer, Fowler, Westal and Bell—penetrated in the woods with which this country is covered, fell in with a fine lake of fresh water about a mile in circumference and some marshes about it where we found some fine plants among which 9 species of Fern. 8 of which we had not before met with, two of which were Tree Ferns;[93] The Island is so incumbered with wood that it is difficult to penetrate to the interior, none of us were more than half a mile from the Shore and at that distance we found a rich vegetable loam over a sandy bottom, the air was cool & the soil every where appeared sufficiently moist. The Shore as far as we saw is all sand except opposite where the Ship Anchored a low Granite rock projects a little way into the Sea & helps to break the Surf which however was troublesome. The variety of plants occasioned Mr Brown & I to pass more time about the Lake than we had intended & in making the cirquit of the Lake we met with such a thick brush that before we reached the Beach the Ship had fired two Guns to hasten us—we got on board before 11 AM immediately made Sail & stood to the North with a fresh Southerly Breeze—two Opossums of the same kind as mentioned yesterday were killed this day——In evening very high land to the North fresh Breezes & fine weather.

25 Stood to the North East along the shore which consisted of high mountains covered with Trees & interspersed with Gullies and

April 25 Steep banks in evening broken land was seen from the North West round to East and even to the South of East the last of which appeared an Island fine weather.

26 Stood to the North East and soon came near the land the most Southerly of which we could not weather, then stood to the North & North West into a large open Bay with low land all round—soon after noon an opening appearing to the East hauled up for it. About 2 past the narrowest part which does not appear a mile broad with breakers streaching a considerable way from each Shore & a strong current. we did not find less than 7 fathoms water, stood to the East and opened a large Bay of which we could not see the extent to the North, Shoal water being seen in several places to the North made several Tacks and about 5 ship Grounded & stuck till past six before She was again in deep water when we Anchored in 10 fathoms with a strong current from West to East & vice versa

Port Phillip south coast of New Holland

27 Captain with Mr Brown & Westall went with Cutter to the East end of the Bay to ascend a considerable hill there to have a view of the Country, while Mr Bawer Allen & I were landed on the nearest shore to South which however was several miles from the Ship——We walked in a South West direction till we reached the opposite Shore which is much exposed to the West winds which are prevailing here——This neck of land has a very pleasing appearance, having much resemblance to a Gentlemans Park in England, being covered with fine Green grass and Numerous Trees and Bushes in pleasing irregularity, and so far apart as to admit the whole surface to be covered with Grass, with Gentle rising hills and little vallies; The soil is rather sandy but is probably the best we had seen in New Holland and the only place we had found the Surface covered with Grass & which had preserved its verdure entirely through the Dry Season; There was much Dew on our landing, The Day was very pleasant—We found plenty of fresh water close on the Beach, saw the print of the feet of Dogs on the Sand, The fire places of Natives, and much of the herbage had been burnt a few months ago, but no very recent marks of Natives—came on board about 6 in evening & Cutter came soon after—The Gentlemen having ascended the hill from whence they saw a large Piece of water to the East & which supposed to be Westernport discovered by Basse,[94] but could not see extent to North of the Bay in which we were—they

April 27 found plenty of Oysters and other shellfish on the Beach—found fresh water & Brackish marshes and brought a very favourable report of the beauty and fertility of the Country—Mr Fowler went to a low Island opposite the entrance where he saw Black Swans, Pelicans and an astonishing quantity of Birds of various kinds, with plenty of oysters and other shellfish

28 Weighed early and stood to the East with a very light air——the current setting against us about 10 AM came too with the Kedge about 1 PM Weighed stood to the East & dropt Anchor about 3 a mile or more from the Shore at bottom of the hill—pleasant weather

29 Captain went off early with Cutter & Crew with provisions for two or three days, intending to examine this Bay—a fresh Breeze from the Northward—Up Anchor at 7 and stood to the West at 8 grounded but went off immediately. Anchored at half past 8 in 8 fathoms water Boat went to Sound, when it returned Weighed intending to Drop down to the entrance of the Bay—about 1 PM wind shifted to the West when we Again anchored—after dinner went Ashore with Messrs Bell, Westal & Servants intending to stay all night—I ranged through the woods & meadows to the West of the range of hills and meeting with several new plants induced me to protract my stay till I with difficulty reached the Shore before daylight was quite gone—I walked about the Beach a considerable time near to where the Gentlemen they had proposed staying, but could see or hear nothing of them, when it became quite dark I ascended the hill at length heard the report of a musket and saw a fire which I supposed to be on the Beach. I then descended and when I arrived on the beach could see nothing of the fire—after searching sometime in vain I took up my residence beside a Creak of water slightly Brackish gathered a number of boughs of trees for the double purpose of defending myself from Cold & Dogs, and passed the night tolerably well two large fires were burning on the opposite Shore.

30 As soon as light would permit begun to put last evenings collection in Order and before I had finished a Musket was fired a few yards from me, it proved to be Mr Westal who informed me they had slept about a quarter of a mile from me with a good fire—I soon repaired to it and eat a hearty breakfast of Oysters, and again set out another ramble through the Meadows and woods—I first crossed an extensive plane to the bottom of the hills and then went South for several hours where I found several new plants and met with a fine run of pure water which loses itself before it reaches the Shore in large Swamps and Marshes—having loaded myself I returned to the North West and got on

April 30 board before 4 PM with a fine harvest—the wind had remained westerly since I left the Ship which had not moved—some showers——The Soil near the Sea is composed almost entirly of sand which however produce very respectable Trees of a species of Banksia and other sorts of Vegetation less vigorous, on advancing from the Shore it gradually becomes a misture of Sand & burnt or decayed Vegetables, in various proportions, where dry sand composes the greatest part & where moist decayed vegetables, of a black colour—I had no opportunity to examine the soil on the hills but to the West of the Hills and South of the Bay there is an extensive plane which is chiefly rich Meadow land, the Soil a considerable Depth of rich black bog soil which everywhere gives evident proof of great fertility by the luxuriant growth of its Vegetables—which if it were not frequently cleared by burning would soon become impenetrable as was the case with several spots which had escaped the last general conflagration, which it had experienced a few months before—water was plenty every where in this extensive valley

May 1 Fine pleasant weather, about noon wind veered to North a gentle breeze Weighed and stood for the entrance—Anchored about 5 some rain

2 Weighed early Dropped down nearer to the entrance and Anchored about 8 AM within half a mile of the South Shore—Mr Brown was landed soon after on nearest Shore, but not finding any thing new soon returned and was again landed on the North Shore——Soon after 4 P.M. Captain returned with the Cutter having been 4 Days in ascertaining the full extent of this large Bay which cannot be less than 50 or 60 miles round with an entrance of less than a mile broad and a deep channel to the top—they spoke highly of the country as being beautifull and fertile, saw a vast quantity of Wild Ducks Swans &&& had interviews with the Natives which they describe as brave and at the sametime harmless & inoffensive people and readily parted with their Arms & Utensils which are manufactored with more ingenuity than those about King George the thirds Sound, their spears were well finished & Fishing Utensils which consist of a long streight Stick well pointed with bone joined with cement and thread—some have two bones about 6 or 8 inches long which stand parallel about two inches apart well pointed & fixed to a long handle by cement & String—In this excursion they met with little fresh water—Mr Brown returned about 5 having found a large inlet at North Shore with many Swans but were so shy none were killed——

3 Weighed early with the Wind westerly and dropt out of the Bay

May 3 by the Current which is rapid in the entrance and meeting the Main Sea causes a ripple & looks very dangerous, when clear of the Streight stood South till about noon having cleared the land stood to the Eastward with a strong Westerly Wind and heavy Sea and passed a pleasant looking country low near the Sea but hilly in land, Passed Western Port

In Basses Streights S. coast of New Holland

4 The strong Westerly Wind continued with Showers & hazy weather at times—In morning passed Wilsons Promontory which is high rocky land with rather a romantic appearance and some high pointed Islands or rather rocks near it in the course of the day we passed many detached Islands and Rocks through the channel—saw little of the Main all day and stood on all night for the first time since our arrival on the Coast of New Holland

5 fresh Breeze from the Westward. Stood to the Northward about noon land seen to the Westward

Port Jackson New South Wales

6 Fresh breezes nothing remarkable occurred stood to the Northward and on the evening of the 8 were in sight of the Flag Staff at Entrance into the Harbour of Port jackson wind being contrary could not get in

9 Kept plying to windward & at 1 P.M. got into the entrance of the Harbour where a boat met us and informed us that the French Frigate the Naturalist was in the Harbour also the Lady Nelson, the Porpoise & some Whaler's but that no Ships had been from England later than us

The approach to this place is not very promising a perpendicular rugged cliff of Freestone presents itself to the Ocean and the entrance is scarce to be seen till quite in when it opens a fine Spacious Harbour with a very remarkable appearance a number of fine Snug Coves & inlets & after passing one fine Bay we open three or 4 more all as Smooth as a mill Pond which with the natural appearance of the Country, the North & West Shore entriely uncultivated & the South & East mostly cleared with pretty Snug houses & Gardens appears very romantic—on nearing the Town of Sydney it has a fine appearance It is Seated at the end of a Snug Cove on a piece of ground which Slops in three directions, the Centre Slops to the Sea & each Side slops to the Centre with a gentle declivity to the Sea at the same time.

May 9 each house has a considerable space of Garden ground so that the Town spreads over a great space—though there is nothing grand or magnificent in the Construction of any of the Buildings of the Town yet there is a degree of neatness & regularity which has a fine effect Several of the principal houses are built with Brik and white washed others with wood painted, they are all covered with wood cut in the form of Tiles which very much resembles Slate—Art or even imagination can scarce form any thing more grand than the various windings of the harbour—Anchored between two & three P.M. at the entrance of Sydney Cove—Captain immediately waited on the Governor—Several other Gentlemen went ashore

10 Went ashore in morning and collected a few things in the neibourhood of Town—This evening came into the harbour the Venus Whaler and brought the agreable intelligence that Peace was concluded between France and England in October last. The Venus had received this intelligence from an American Vessel from the Cape of Good Hope to India

11 Went ashore and had a walk with Mr Brown & the French Botanist[95] & collected many fine plants

12 Much rain in morning—went to enquire after Lodging for convenience of Drying & collecting without being detained for Boats &c.

13 Employed taking some necessaries on Shore to Lodgings

14 from this to the 21 constantly employed collecting when the weather would permit & in wet weather preserving those collected

21 Went on Board & Brought ashore the Seeds collected on the south West Coast to separate and send a part by the Speedy whaler for England—this with turning and preserving former Collections employed me till the 26

26 from this till 30 employed every opportunity collecting in the vacinity of Sydney

30 Set out for the Hawksburry—passed the night at Constitution hill and Collected several new things

31 Arrived at the Hawksburry & Richmond hill collecting

June 1 In the morning sallied out into the immense woods alone the fine morning induced me to go a considerable distance when the day becoming obscured and at noon set in a heavy rain, the thickness of the woods and flatness of the Country, I having no Compass lost my direction, and with gteat difficulty I reached the house I had set out from before 10 at night very much

June 1 fatigued having been about 10 hours in a heavy rain which made the long grass & thick brush very troublesome to walk in and I had walked a considerable time in a morass knee deep—In this excursion I found several new things

2 Sailed down the River to the Green hills[96] and from thence proceeded to Constitution hill where I arrived about half past 10 at night much fatigued the roads being very bad in one place for near two miles knee deep from the heavy rains

3 Arrived at Sydney with my Collection—The distance from Richmond hill to Sydney is 50 miles in all this distance I did not find such a variety of new plants as I expected however I found several sufficient to fill all my boxes—

4 from this to the 17 Searching the vicinity of Sydney which produceth the greatest variety

17 Set out for the Hawksburry with Mr Brown & party stoped all night at Parramata

18 Visited the North Rocks & Collected several things

19 Collected several things in the Vicinity of Castle hill

20 Arrived at the Hawksburry

21 Employed in searching the vicinity of Green hills

22 Set out about 2 in the morning & sailed up the River to the first falls when leaving the Boat we proceeded for the Blue mountains with a guide Ascended a part of the first range and returned to the Boat before dark and to the Green hills the same night

23 Set out early in a boat for Portland head[97] and returned to the Green hills about 12 at night—In these two days excursion we sailed on the River Between 30 & 40 miles for about 20 Miles of which distance the land is cleared and Cultivated on both sides and is probably as fertile and productive in wheat & maiz as any in the world as they have a Crop of each annually on the same ground and the general produce of what is 30 bushels an acre The River about Portland head is very romantic consisting of low hills abrupt Cliffs of Rock and fine fertile vallies through which the River winds Majestically bold & deep with the most luxuriant Vegetation on its shores among which must be included the Cabbage Palm a species of Corypha,[98] a Species of Passion flower[99] & many others, the Valleys are generally small interrupted by sudden cliffs of Rock or gentle Rocky hills The Rock all free stone

Towards the falls we found in the bed of the River some other substances particularly coal washed down from the mountains—The soil rich loam some places beds of clay on the Banks of the River

June 24 Set out for Sydney and after taking some refreshment at Toon Gabie[100] arrived at Parramata about 8 P.M.

25 Arrived at Sydney about 4 P.M.—In all this excursion we had very fine weather, sharp hoar frost in Mornings which went off by thick foggs which disappeared about 10 or 11 oclock and regularly succeeded by fine clear weather with hoar frost and fogg at night.

26 From this till the 3 July employed in securing former collections & short walks in neighbourhood

July 3 Visited Cooks River and Botany Bay and Collected several new things, from this till the 13 in taking walks to South head and neibourhood, where I found several new things and various things begun to flower which did not appear on our arrival

13 Carried my things on Board from Lodgings & from this till the 18 employed in putting specimens in boxes to remain here till our return

18 on Shore procuring some necessaries for the Voyage

19 This and following day making every preparation for Sea

21 In morning took a Short walk in the fields and collected a few things & in afternoon Sailed down to the Heads and Anchored

22 Up Anchor Early and was soon in the open Sea with a heavy Swell—Stood to the North North East with a fresh breeze from South West and past Broken Bay[101] Hunters River and also Port Stevens.[102] The country consisted of hills of Moderate elevation covered with Trees and very fertile——The Country in this neibourhood is certainly very different from the South West Coast much better adapted for Settling a Colony, on the whole Coast from King Georges Sound to Port Phillip we found very little grass & what we found was only in tufts but at Port Phillip & all the neighbourhood of Port Jackson particularly on going any distance in land the whole country was covered with fine grass. The natural composition of the Country is also different at King Georges Sound The Base appears Granite with some Calcarious earth and other substances in smaller quantity and sandy Soil with a greater or less proportion of decayed vegetables according to Situation & Circumstances. To the Eastward of D'entrecausteau Archipelago[103] the major part appears Calcareous with a miserably barren Sandy soil; most of the Islands and the main about Memory Cove have Granite or Porphery for their base, from thence we meet with little Calcareous or Granite substances—and the whole time of our stay at Port Jackson I found neither Granite nor Calcarious matter——The principal Stones I saw were Sandstone or Grit

July 22 stones most plentyfull Slate stone, Iron stone & Coal the Soil is various near the Sea sandy with a mixture of black bog or decayed vegetables

29 Up Anchor at 4 in morning and got round the Spit the wind blowing right out of the Bay kept plying to windward & Anchored at 8 P.M. 3 or 4 Leagues from land

30 Weighted at 12 at night & kept plying to windward. about 10 A.M. a Sail seen from the Mast head & at 2 P.M. from Deck & recognized to be the Lady Nelson. Kept plying to windward & anchored between 2 & 3 P.M.—the Brig came through the passage among the breakers & had only 6 feet water—touched the bottom several times in evening went ashore with Mr Brown & had a short walk & gathered a few new things

31 In the night we parted our Cable a fresh Breeze from the South West Early in morning Captain Mr Brown & a large party landed a great Surf on the Beach made it troublesome—on landing several natives were looking at us at a little distance & the Brig came close in Shore to protect us in case of an assault. Mr Brown & party went along the Beach to the Westward to try to get beyond the Sand hills which form the promontory of the Cape in hopes of finding a greater variety—but on finding the distance greater than our limited time would permit we struck into the woods for several miles, and it is astonishing to see what Vegetation is produced from Sand, here were Banksia serrata & dentata in great plenty & it appears the natives set the flowers of the latter also Banksia latifolia some Cassuarina & other Trees of considerable size—on returning we fell in with a human skelton which appeared to have been burried there for some sticks were stuck in the ground and many boughs had been laid over the body all was now decayed except the bones which was tolerably entire—we found fresh water in pits in several places in one place—near the Shore & we found a number of fishing nets executed with much ingenuity almost equal to european manufactor the Cordage seemed to be made from a kind of rush very neatly plaited. one was brought on board but Captain would not permit any more to be took from the Natives 20 or 30 of which were assembled on the Beach with the Captain & boats Crew at our return & had freely given or exchanged their Net ware as I believe no other implements of theirs were seen—They did not permit their women & children to come near the Europeans but some were seen at a distance & it was reported the women had long hair tyed behind. The men were of a middle stature (rather under) well made mild & sociable having no weapons either offensive or defensive that we saw—Bungery[104] (a

July 31 Native of Broken Bay which we had with us) amused them by throughing his Spear, which seemed to surprise them and it appears they are unacquainted with the use of the Wumora[105] they did not differ much in their persons or appearance from the Natives of Port Jackson but have a different Language for Bungery could not understand them—They appeared sorry when we went into the Boat, some came into the water after us & appeared to wish to accompany us—On board they had been employed to regain the Anchor (which had been lost in the night) and which they accomplished

August 1 Up Anchor early & stood across the Bay & were sometime out of sight of land & in afternoon made the opposite side of the Bay and stood along Shore to the North West Shoal water obliged us to stand farther off——passed an opening like the mouth of a small River a low Sandy Shore & flat country covered with herbage but appeared rather barren Anchored before Sundown in 5 fathoms about 2 leagues from land

2 Weighed at Daylight & stood to the Northward with a fine Southerly breeze the country in morning still low in afternoon of tolerable elevation diversified with hills & vallies—in evening Anchored in Bustard Bay which is open with breakers near Shore & a large piece of water in land—the East head consists of rock of a grey colour, the first rock we had seen for sometime, much smoak rising from the head & Natives seen on the Beach

3 Weighed at Day light & stood to the Northward with a light breeze which dyed away to a calm & very hot-afternoon a fresh Breeze spung up from the Northward—Southerly winds had been prevalent since we left Port Jackson—The Country diversifyed with hills of considerable elevation & valleys but does not appear fertile the hills a great way in land but thinly covered with Vegetation

4 Wind variable stood a considerable distance from land which is very hilly & Anchored before dark several leagues from land an opening appeared opposite where we Anchored. Warm weather

5 Weighed early and stood to the Northward light airs & fine weather about 11 A.M. Anchored opposite an opening into a very large Bay—several large Canoes on the Beach & some Natives to the North of entrance. Mr. Brown & party went ashore on North side of entrance near the Canoes a number of Natives appeared making Gestures as we approached the Shore but on coming near they all run into the woods—We walked on in Search of Natural History without paying any attention to them & crossed a neck of land till we found ourselves on an Arm

August 5 of this large Bay—many Natives before us but would not permit us to come near them always retreating as we advanced on advancing to a little hill covered with Trees they threw a number of Stones towards us & kept among the Bushes out of sight—on our advancing up the hill they disappeared—we continued to advance till we came to the opposite side of the hill & in going down the bank the Natives gave the War Song & rushed out among the Bushes in different directions, throwing stones & sticks at us—they appeared to have no Spears we got into an open space at the bottom of the hill and fired some Muskets in the Air when they all run away as fast as they could run—on returning to the Shore we found the Shell of a very large Turtle which they had been roasting very lately, the head & part of the flesh was still firm—a great part of the flesh of Turtle hung up in a Tree of the Pandanus odoratissima so that it appears they live in luxury—they had many fishing nets & cordage about the Beach executed in the same manner as at Sandy Cape—Their Canoes were similar to those at Port Jackson but much larger & better executed Captain went to Sound in entrance but found only 5 feet water over the bar a low rocky Island in entrance he was now persuaded that the low land the whole extent of which we had sailed in the morning was an Island & directed the Brig to sail round and endeavour to get in & ascertain the fact—fine weather

6 Went ashore early with Mr Brown & party & two Marines at the right of the Harbour—we walked to the North a considerable distance fell in with a Creak of water & an extensive open tract of rich land covered with grass & no trees which appears at Seasons to be inundated—The Natives avoided us—The Captain went off early with Cutter to Survey the Bay particularly an Inlet which had the appearance of a River & took provisions for two or three days—The Brig got into the South entrance and come round the Island in sight of the Ship & then Sailed to the Inlet—Mr Brown & party returned on board about 7 P.M. With tolerable success

7 Went ashore early with a party on the large Island which forms the Port & since called Facing Island where I made a fine harvest & among others an elegant Embothrium

8 Captain returned about 9 A.M. having been about 14 miles up a Creek or Arm of the Sea like a River being from 2 to 3 miles broad & carring from 3 to 10 fathoms water—The Brig Sailed round to join the Ship—I went ashore and collected a few things—during our stay here we had regular land & Sea Breezes

9 Weighed Early in doing which the Anchor broke & part lost as

August 9 also the Buoy & Buoy rope Captain would not wait to regain the Buoy but availed himself of a fine fair wind & stood on round Cape Capricorn and entered the Torrid Zone and into Keppel Bay where we Anchored about 3 P.M.—many Islands about the Mouth of the Bay & many places of Shoal water—very high land on the West side of the Bay & very low to the South near Shore but high hills in land one of which was very visible at Port I & Captain had sailed very near its base the East side near which we anchored was low land with some gentle hills—went ashore with Mr Brown & collected many fine plants

10 Captain went off early with Cutter to Survey some deep Inlets to the West of the Bay as many Creeks & Rivers appeared from a hill near Anchorage—Mr Brown & Party went ashore early & we made a tolerable harvest—Master with Cutter went Surveying and Sounding—

11 Went ashore early & collected several things—Captain returned on board about noon

12 Went ashore early with Messrs Westall & Allen and Crossed the Creek which surrounds the land where we Anchored and makes it an Island at Spring Tides—we walked to Cape Keppel where I found some fine plants—The Country is open covered with thin grass & few Trees—no good land a large Marsh with fresh water & many Ducks near Cape Keppel—Captain & Mr Brown went off to Survey a Creek which appeared to go very near to where Captain had sailed from Port I

13 Employed preserving former collections at night Captain & Mr Brown returned having found this Creek to connect at high Tides with the Creek which Captain had explored on the 6 & 7th instant from Port I.

14 Mr Brown & a party went to Cape Keppel which is now found to be an Island as also Cape Capricorn—Captain went to explore another arm which goes inland but returned at night without having seen the extent of it although he found it deep & wide—Employed preserving former collections

15 Messrs Brown Bawer & Self went to a Small Island at the Arm where Captain had been yesterday & Collected a few things—

It being Sunday several people went ashore on liberty no Natives having been seen here—a party went Shooting towards Cape Keppel & saw several Emoos & having two fine Dogs which pursued them & got among them but at this instant a number of Natives made their appearance in a hostile manner, which caused them to neglect the Dogs & Emoos & attend to their own safety—however after a considerable parley they behaved

August 15 friendly accepted some trifling presents & went away satisfyed—soon after 14 or 15 came to the Beach among our people in a friendly manner—when some of the Officers went ashore & carried them some presents, they were very friendly and had left their Spears—one of the Petty officers & a Seaman were missing they had been last seen near Cape Keppel their absence as night approached caused considerable uneasiness a boat remained ashore till 8 or 9 oclock frequently firing a musket but heard nothing of them

16 Early a Great Gun was fired & at 8 another when a musket was heard towards a Creek with much mangrove Swamps

The first Lieutenant went there immediately—& returned without having heard any thing of them while he was preparing a party to go ashore well armed about noon the two people were seen coming along the Beach with a number of Natives—The Boat went ashore immediately & brought them off when they made a ludicruous figure they had been wading the greater part of the night to the middle in mud in mangrove Swamps—their cloaths all rags without Shoes or Stockings having all Stuck in the mud—Mr Evans the midshipman reported—that they were seen in the morning (while still bewildered with Mangroves & Swamps) by a large party of natives one of which came to them & presented him with a bough of a tree making Signals for him to return another which he did as a signal of peace—he then took our two forlorn people to his party & offered them roasted Ducks & fish & afterwards led them to the Beach which they were very near although they did not think so till they saw it & believed they would not have reached it for several hours but for the friendly assistance of the Natives, Mr Evans being very Thirsty made Signal as if to drink the Salt water when they made a dolefull noise very expressive of sorrow & immediately led him to fresh water which was very near & then followed him to the Beach—Several Trifles were given them as presents such as looking Glasses, Hatchets, red night Cape &c—they were much surprised at the looking Glasses—Started suddenly on perceiving the reflexion of themselves & could not be brought to look at it steadily—They were the strongest made Native we had Seen in New Holland painted with a great variety of figures & colours wore necklaces of reed & shells & had a great variety of features some were thought upwards of 6 feet high

17 Up Anchor early with a light air—The Tide was so rapid we were obliged to Drop the Kedge till the Ebb when we again dropt down till Sun down when we Anchored—The Tides in this Bay are considerable rising from 9 to 14 feet during our stay here and overflow immense tracts which are left dry at low water.

August 18 Weighed at Day light & stood on with a fine Breeze, passed near a high inhabited Island which appears barren but covered with grass Natives at one point looking at us—about noon passed a small Island not more than a mile in circumference on the top of which two people stood looking at us & calling so loud that we could distinctly hear them—at this time a great distance from the main, hawled up for it and in evening passed a Snug bay which appears to have Shoal water at entrance—Anchored about Sun Set—serene weather—

19 Weighed early & stood on with light airs & calms thick fogg in morning—afternoon a brisk breeze from North West kept plying to windward & Anchored at 9 PM near the land a Small fire with Natives close to the Beach opposite us—fired a Gun as Signal to the Brig who answered by firing another & was a great distance to Leeward

20 Weighed early with a brisk breeze rather contrary the Lady Nelson missing & stood along near the Shore past 9 AM. light airs and Calms the remainder of the day in evening the Brig seen from the Masthead to Leeward

21 Lady Nelson seen to the Southward wind from that quarter kept plying in for an opening with an Island in entrance & was soon joined by the Brig and before noon anchored in a fine large Bay of which we could not see the extent The Island in entrance and land near the Shore cloathed with the Norfolk Pine[106] formed entire new Scenery to us The country hilly—Mr Brown & party went ashore at North head where we collected some fine plants we ascended a hill of considerable elevation & supposed ourselves on an Island & that we should find a passage to the North West into the Ocean or Bay of Inlets

The mountains are chiefly composed of fine Granite, some sandstone found plenty of fresh water which appears to continue all the year

22 Mr Brown & party went ashore early & we ascended the Highest range of hills to the North where we had a fine prospect we found we were not on an Island—though this bay joins very near to Sea to the North we Saw an extensive piece of water to the Westward distinct from this Bay & which we supposed to be Shoal water Bay of Cook though we could not see its communication with the Sea——The Captain went to the South Shore where he found sufficient depth of water & fine Shelter for Shipping—all hands Employed watering the Ship & Carpenters cutting wood for various purposes &c

23 Wind blowing fresh from Southward a considerable Swell & great Surf prevented getting all the water Casks on board in

August 23 morning—in afternoon it abated a little & everything was got ready for Sea

24 Weighed Early with a light air which soon dyed away to a calm we got but a few miles from our former Anchorage & Anchored at 7 P.M.

25 Weighed early with contrary light airs & Calms in afternoon passed a Bay or inlet of considerable size but appeared Shoal water and anchored after Sun down near it

26 Weighed early stood along Shore with a light air and soon came opposite an opening in the land—the Boat went ahead to Sound found very unequal Bottom & a rapid Current—Anchored about 8 A.M. in the middle of the channel & Captain went ashore to ascend a high hill to take Bearings &c Mr Brown & party also landed & we also ascended the high hill which is the highest we had been on in New Holland except one—This hill presented a Noble prospect as recompense for ascending it. an immense number of Islands of different sizes forms & elevations—appeared about the entrance of the Bay which has two entrances one that in which our Ship lay & is narrow not exceeding a mile broad, the other more to the West many miles broad—the Bay is very large & appeared to go in Shoal creeks very near if not to unite to some of the Arms of Keppel Bay—we had also a fine view of Port II but no appearance of fresh water Rivers we found plenty of fresh water in pools & small Creeks & some fine new plants in this excursion—we returned on board about 8 PM when we were informed that one Cutter had been swamped along side by the rapidity of the Current which runs here at the rate of 4 or 5 miles an hour—one man was near being drowned but picked up by the Brig's boat which was a little astern of us The Gig was at this time gone in Search of the Cutter

27 The Gig returned in morning without having seen the Cutter—Weighed in doing which the Anchor broke & both flues were left as also boy & boy rope we then dropt down the narrow channel which is very intricate & several times dropt the stream Anchor till the Boat could find a passage deep enough and before 9 AM anchored the flood tide being near done—at 4 P.M. Weighed again & dropt down and about 5 got aground where we stuck for about ¼ of an hour when we floated it being flood tide—we then stood on a considerable way into Shoal water Bay and again Anchored in 6 fathoms before Sun Down—some Boats employed in looking for the Cutter & in trying to get up the Broken Anchor but were unsuccessfull in both

28 Captain went to Some Islands in the Bay to Sound & take

August 28 Bearings Mr Brown & party landed on Cape Townsend Island but had little success—some partys fishing had tolerable success

29 This day was employed in dropping down the Bay with the Tide with light airs—Anchored in the evening

30 Early Captain went on board the Brig which immediately got underway & sailed to explore the extent of the Bay a fresh Breeze at same time Mr Brown & party went off for the South West Shore where we landed about 9 AM about 3 leagues from the Ship we found from 5 to 10 fathoms water all the way except a narrow Bank with only 4 feet & which must be dry at low water—on landing we found a Canoe on the Beach & saw some Natives who fled on our approach—after being near an hour in the woods we fell in with a party of Natives who met us resolutely being well armed with Spears & Helemans[107]—it was some time before we could bring them to a parley—but after some time one person going up to them unarmed & carrying a hatchet & some trifling presents they were prevailed on to admit us among them & were friendly & good humoured——they were of moderate size some I think were 5 feet 9 or 10 inches & others I think scarce exceeded 5 feet—they varied as much in their features some had large bushy beards others had little or no beard—They had the same general appearance as all the Natives of New Holland yet seen a hole through the Tendon of the nose Teeth flatted &c some of them had little net

Shoalwater Bay east coast New South Wales

bags of neat workmanship hung about their neck & over their back in one of which was a large Gooana—we had a Native of Port Jackson with us but he could not understand their language——They appeared astonished at Bungery throwing the Spear with the Wumora which it appears they do not use—Their Spears were strong & heavy—having satisfyed our curiosity with them a Musket was fired at a Tree loaded with Ball[108] The report Startled them very much—however one who had acted as chief came to look at the wound in the Tree & called the others to see it—we then seperated they to join their women & children & we in Search of Natural history—There were 17 men & three boys of the Party & they had several Dogs which now come up to join them but stood at a distance making a disagreeable noise——In our walk towards some high hills we fell in with a Brook at this Season near Dry but which at Some Seasons must contain considerable torrents——The bed is

August 30 broad with high banks & the appearance of the ground near indicates that it frequently overflowes its banks——The bed of the Brook was full of Stones rounded by attrition—they were chiefly Porphyry & a blue Whinstone—The Country is not very fertile—but we found several new plants

31 Preserving former Collections Boats Sounding &c

September 1 Fresh breeze from North Lady Nelson returned & Captain came on board in the evening—he had gone a considerable distance up the Bay & found a Deep channel all the way—the Bay he found to Terminate in 4 branches each of which streaches a great way in land with mangroves on the banks but Saw no appearance of fresh water Rivers

2 Fresh Breeze from South up anchor & stood to North & North West & West Anchored about noon a few miles from the South Shore. Boats sounding &c

3 Early Mr Brown & party landed with intention to ascend a round Peak hill at no great distance & very conspicuous in the Bay—on our way we found several new plants & the whole country is very pleasing to the eye The Trees thin & smooth surface with little brush having been lately burnt but much fine grass and appears in many places very fertile—plenty of fresh water in pools & Creeks & many kangaroos—from the hill which is cloathed with Pines we had a very indifferent prospect the day being hazey & the Natives had set fire to the Country in several places which set up such a smoak as to darken the air This hill is composed almost entirely of a very hard kind of blue Whinstone on the hill there was scarce any other stone seen but the beds of the creeks on the low ground was a kind of Schistus similar to Cape Townsend Island—when we got off the hill we found the day too far advanced to get on Board so made for fresh water & Spent the night 2 Ducks were killed by some of the party as also 2 large fish shot in a Creek near the hill which made us a good Supper

4 As soon as it was light set out for the Ship Collecting by the way—the Dogs Caught a large kangaroo and about noon we got on board the Ship which lay too far from us & then stood on & in evening Anchored a few miles from Thirsty Sound—During our Stay in Shoal Bay we had fine weather & variable winds—Several large watersnakes[109] were seen & one caught

5 Up Anchor at Day light & about 7 A.M. anchored in Thirsty Sound—Soon afterwards I went ashore on the Main & Collected a few things found fresh water in several places but not convenient for watering a Ship—Captain went on an Island named Pier head to take bearings &c

September 6 Employed preserving former collections Captain ashore making observations taking bearings & Mr Brown ashore at Pier head in evening Captain set out for some Islands in the offing 8 or 9 miles distant in hopes of finding Turtle & to take bearings &c

7 A strong breeze right in the entrance of the Sound at day light all hands turned out up Anchor. but before it could be got up the Ship drifted very near the Shore & they Dropt the small Bower which immediately parted & before the Best Bower could be got let go & veered away we were in $2\frac{1}{2}$ fathoms very near the rocks By great exertions a hawser[110] was carried to the Brig which rode in deep water to windward & we got washed up & took up the best Bower Anchor & Dropt it in Deep water near the Brig and at the next high water veered away & took up both anchors & shortened in to a proper length of the Best Bower when we were out of Danger. Captain came on board about 4 P.M. with out any Turtle saw evident marks of the Natives visiting these Islands at Seasons & found fresh water on one

8 Weighed in the morning the wind more moderate & Passed Pierhead & stood to the Westward on hawling up to the Southward to pass a point of long Island & a small Island a few miles distant we shoaled our water suddenly to 4 fathoms we then stood to the Westward across the mouth of the Bay or Sound a number of small Islands round us—we carried generally from 7 to 12 fathoms water & in afternoon came in sight of the Main to Westward a range of high hills in the evening hawled up for high round hill which was supposed an Island where Anchorage might be expected about Sun Set the round hill appeared to connect with the Main by lowland. & which formed a Bay for which we stood but shoaling our water stood off the land & Anchored about 10 P.M. off the Point of the round hill.

9 Captain went early with Mr Brown Bawer Westall to the round hill from which we lay distant about a league—Past noon Weighed and Stood down the Bay & soon after touched the ground but soon got off and anchored at Sun down—many whales playing about the Ship some in the day—but more at night.

10 Weighed Early & dropt down the Sound near the West shore—Anchored before noon the flood Tide being done—Captain Mr Brown Bawer Westall & Bell went ashore on a small low Island near the main Collected a few things. 4 P.M. up Anchor & stood on between the Island & Main and Anchored at Sun Set a reef appearing to run across the channel from the Island to the Main.

September 11 Weighed early & stood up the Sound about 7 A.M. dropt Anchor in $2\frac{1}{2}$ fathoms the Boat & Brig ahead in 2 fathoms & a rippling appearing all across from Island to Main. at 9 the Boat having sounded & the Brig sailed over the Bank & back to us up Anchor & stood on over the Bank & up the Sound and Anchored at 4 P.M. a considerable distance from land a Strong Tide which rose near 30 feet of perpendicular height.

12 Weighed Early & stood on & passed the mouth of a large opening very Shoal water with some Islands in entrance and a strong tide carrying us further in the Bay which was now contracted to the appearance of a river—Anchored about 9 A.M. & went ashore with Captain and Mr Brown—we ascended a small hill near Anchorage & had a tolerable view of the Sound—the Inlet which we had past terminated in flat mangrove swamps at 10 or 20 miles distant but the other branch had every appearance of a fine River as far as the horizon, from this elivation I went in the direction to the hills near Cape Keppel—The water very thick & muddy.

13 Weighed about 9 A.M. and dropt up the River with a strong tide about $\frac{1}{2}$ past 9 finding the water Shoal very rapidly dropt Anchor & before it could bring up, the Ship grounded with Broad Side to the Current which being so rapid heeled her over very much—in about half an hour ship floated and at the ebb Tide we dropt to where we had Anchored, last night, where we moored & Captain made preparations to go up the River in the Brig.

14 In morning Captain and Mr Brown went on Board the Brig which soon got under way & stood up the river—soon after the Tents were landed & Mr Flinders commenced his requisite observations to ascertain the roles of the Time Keeper—past noon I went ashore with Mr Bawer and party with provisions for two or three days— we directed our course for the highest hills on the Right bank of the River—on the way we got into a thicket which entangled us for Several hours but getting clear of it we found open ground and soon found fresh water and took up our residence for the night—saw several Kangaroos but could kill none

15 Early left our rural hut & ascended the nearest range of hills from which we had a fine prospect we saw the Brig it being low water and Dry mud all round her—The River appeared to terminate in low land with mangrove Shores at the distance of 30 or 4 miles from the Ship and the country in the same direction appeared low as far as the eye could reach without being terminated by any high hills—the range on which we were

September 15 appeared to Terminate about 20 or 30 miles distant in an considerable extent of flat ground The country in this neighbourhood is barren covered with loose stones & but thinly clothed with trees—fresh water was plenty in pools but probably in a few weeks it may be a scarce article as it appeared but in pools which appeared to have no substantial supply—The Stones of this part are various Granite Porphyry & Schistus &—The Soil a very light red couloured loam mixed with Stones—Kangaroos are numerous but Shy

Broad Sound New South Wales

16 Returned on Board before noon with a tolerable harvest and employed securing them and former collections

17 Early Captain & Mr Brown returned on Board but the Brig had got aground and could not get out till next high water—they had gone with the Boat to the extent of the water where they landed and ascended an ascent where they had a tolerable view but the country did not appear interesting—at low water the bed of the River (if it deserves the name) was dry to within a few miles of the Ship Mr Brown found several plants chiefly annual but entirely different from any in the neighbourhood of the Ship in evening the Lady Nelson arrived & anchored near us

18 Went ashore in morning & spent the day in examining the vicinity of landing place where collected several new things The Brig had some water from the Ship—people employed cutting wood—provisions for a week sent to all the people at the Tents

19 The Brig got underway at high water & run aground to be examined having carried away her main keel & been aground several times—the Ship unmoored & weighed & stood across the Sound to examine the East Coast or shore & on to thirsty Sound and anchored in the evening—During our stay here the rise of Tide was about 30 feet

20 Weighed early & before noon anchored near long Island—Captain went surveying & Mr Brown & party landed but little but immense mangrove swamps & discovered that what Captain Cook denominated Long Isalnd was collection of Islands seperated by channels of different widths

21 Set out early with Mr Brown & party for the main & were landed at a singular red point being a bank near perpendicular of a kind of red ochry substance—The Boat left us & we soon found we were left on a small Island seperated from the main surrounded

September 21 with mangrove swamps & a deep saltwater Creek—Captain set out early surveying and did not expect to return at night

22 Employed preserving former Collections Captain returned in evening having found another wide entrance into Thirsty Sound

24 Weighed in morning & stood back for the Tents with a light wind Anchored in evening

25 Weighed Early at about 8 A.M. anchored at our former anchorage near the Tents—soon after Mr Brown & party went ashore & ranged the neibourhood about Sundown took up our residence at some fresh water at the edge of a large thicket—where we were much disturbed with Moskettos.

26 Early renewed our researches about the thick wood and return on board about 2 PM—fresh breeze & considerable surf This day Tents were struck boats hoisted in & every thing made ready for Sea

27 Weighed at day light & stood out of the Sound light air Anchored in evening.

28 Up Anchor Early & Stood to the North East & in evening Anchored to some leagues to leeward of the largest of the Northumberland Islands wind East

29 Early Captain went to the Island to see if water could be procured & at a Signal from the Boat the Ship got underway but light

Northumberland Islands east coast of New Holland

baffling winds & a considerable current obliged us to Anchor before we got to the intended station—after noon landed on the large Island and collected a few things some people employed searching for the most convenient place to water the Ship as it appeared to be very tedious

30 Early a large party landed to clear the way to the water through a thicket of mangroves—Mr Brown & party landed at the watering place where is a curious bason formed by the Sea at high water we followed the bed of the rivulet to the hills which forms a little run off the Rocks here we found some fine Trees and a species of Palm new to us—on returning we were alarmed to See the Country all on fire—by taking a Circular rout we gained the beach before Sun Set & soon got on Board—we learned the grass had been set on fire by some of the Servants on Shore

September 30 washing—& it continued to Spread with great rapidity. In the night it had a fine appearance from the Ship

October 1 Employed preserving former Collections all stowing the Hold & watering Ship

2 Early Captain & Mr Brown went off for a distant Island—In afternoon I went ashore with boxes for earth.

3 This day Captain went to some of the distant Islands. I got ashore in morning & had some assistance to fill some boxes with earth & took up some plants for Garden & then set out to Search the Island & Traversed most all the high part of the Island & Met with some variety of fine Trees—but every small plant was consumed by fire as far as I went—I with several little runs of water & returned to the Beach just after Sun Set & Found it deserted however a Boat soon came for me and I got on Board before Captain returned

4 Weighed early & plyed to the North East wind from that quarter in evening the fire still raging with fury on the Island where we had watered

5 from this to the 14 in a continual labyrinth of Coral reefs Shoals and Breakers with water at time as smooth as a mill pond at other times looking like a whirlpool and such an eddy as to wheel the Ship about during which time we lost an Anchor and the Lady Nelson lost one and Broke another The Captain with some of the Gentlemen landed on one reef where they saw some singular fish and gathered some very large Shellfish[111] one of which weighed 47 lb with the Shell and without the Shell 31lb 2oz—and a great variety of Coral fine weather all the time—this evening Anchored at Sun down near Some low Islands and clear of Breakers

15 Stood to the North with a fresh breeze from South & Occasionally obliged to haul to the west to avoid Shoals and breakers and in evening Anchored under the lee of one of the Cumberland Islands which is cloathed with pines &c. fires on several of the Islands

East coast of New Holland

16 Went ashore in morning and collected a few things returned at noon

17 Weighed early and Stood North by East a fresh breeze Easterly Anchored in evening & learned that the Lady Nelson would

October 17 return for Port Jackson tomorrow while we should proceed alone to presecute the object of the Voyage—The Brig having only one Anchor fit for use and also having carried away her keel that She could not Sail against the wind and we having lost three anchors could not assist her occasioned this separation

18 having settled every thing between the two vessels & exchanged some hands from their own choice about 8 AM weighted & stood North while Brig at same time Stood South & soon lost sight of each other by her sent some letters for England &c fresh Breeze soon came in Sight of Breakers—in various directions, obliged to change our Course almost every hour to avoid them about Sun down found ourselves almost embayed by reefs to Leeward on both sides. hawled close to the wind & stood on till quite dark when we Anchored fresh Breeze & considerable swell.

19 Weighed Early & stood to the Northward with a fresh Breeze from the East Southerly but frequently obliged to haul to the West to avoid Breakers in evening hawled close to the wind under easy Sail & taked every two hours. Keeping near to the track we had passed in the afternoon.

20 Made Sail early & stood North but frequently obliged to haul to the West to avoid Breakers—before noon past between two reefs about a mile distant each—past noon a considerable swell & heavy Sea which indicated we were clear of the Reefs—a heavy Shower of rain the first since leaving Sydney—Stood on with easy Sail good part of the night.

21 Stood Northward with a fresh breeze Easterly—some breakers seen from the Mast head to Westward a heavy Swell Some of the Gentlemen Sea Sick

22 from this to the 26 Stood Northerly without anything remarkable—with fine weather some Showers & very hot—on 26 crossed the Sun in the Zenith & at noon had him to the South.

27 Cloudy weather with heavy showers & variable wind

28 frequently obliged to change our Course on account of Breakers sounded but no bottom with 30 fathoms

29 Stood to Westward & finding ourselves near Breakers tacked several times to weather them—about noon Saw land to South West Stood for it parallel to a big reef of Breakers & about 4 PM Anchored under the fine Clay of various colours and consistences & in land particularly about the Hawksburry River fine deep rich Brown or Red loam

23 Stood along the coast with a fresh breeze and passed the three Brothers[112] Smoaky Cape[113] & a fine looking Country in evening Clawed off the land

October 24 In morning missed the Lady Nelson after waiting sometime made sail along the Coast and near Shore, a fine hilly country with a Shore much indented with larger & smaller Bays. Some bold rocks of a black colour appearing different from any about Port Jackson

25 Stood on near the Shore with a fair wind. The Country very beautyfull diversifved with vallies and large plains covered with Trees. Some spots near Shore fine smooth Green Grass without any Trees in evening passed Mount Warning[114]

26 fair wind & fine weather The country less diversifved of a moderate elevation many large patches of white sand and white shore. Saw a Sail to Eastward

27 The Country appeared Sandy & Barren, passed a wide Bay which has a range of Breakers right across its entrance, many leaves of Trees & much blubber floating opposite this entrance many Natives seen on the Beach with a great number of fires all along the Shore

28 Early in morning passed Indian Head[115] & before noon made Sand Cape[115]—Sent the Cutter to see if there was any passage through the Breakers of Break Sea spit[115]—the first place tryd was near the Cape but did not find sufficient depth—Stood from the land parallel to the Breakers and anchored about Sundown—The Boat found a passage with 13 or 14 feet water some leagues from the Cape and returned to the Ship about 7 P.M.

Lee of one of Murrays Islands Wind Southerly Saw many Natives on the Beach & in the water—immediately on Anchoring the Natives launched 3 Canoes

Endeavour Straits

Canoes which soon reached the Ship one after another—they were at first shy but being shown some Hatchets at length one plunged off the Canoe & swam to the Ship bringing a piece of Bamboo filled with very bad water & some plantains—after which various articles were exchanged & some Cocoa nuts plantains Bows arrows & shell ornaments were exchanged

30 Early several Canoes came off & soon commensed a traffic for Arms Ornaments & in lieu of hatchets knives cloathing & They were all well made of a good stature & in good condition very active & expert swimmers they were naked but wore various ornaments, most all had the ears Cut in several places & pieces of a kind of pearle shell neatly cut & fixed in the ears of different

October 30 shapes—they had various tassells made from fibres of the Bark of some Tree neatly plait & fixed some round the neck others the Arms some round the middle & some the legs, they had also Gorgets[116] for the Breast some neat neck bands & some had a piece of a large Shell with string fastned to to lye round the middle which completely covered the privy parts but few wore it. They had Cocoa nuts ripe & green plantains of two kinds[117] raw & roasted, Yams[118] & a kind of fruit of the size of a love apple of a beautiful red colour but rather an insipid taste, they were entirely without seed of any kind but had the remains of stamina on the top which resembled the Genus Eugenia[119] They had also many Bows arrows Baskets &c &c &c They seemed perfectly to understand traffic & would not part with their articles without something that appeared to them of equal value, they knew Iron well & called it Tooree It was most desired by them, however they also took clothing looking glasses &c.—One of them sold a Bow to Mr Bell which had a piece of blue striped Cotton cloth tied to it which appeared of European manufactor—after trafficking for some time many Swam to the Ship & came on Board where they looked round in Surprise at every thing but without fixing their attention to any one thing—at 8 AM we begun to weigh Anchor & when they were given to understand they were in the way they readily retired & at desire sat down on the Deck at the Stern of the Ship and when at last they were desired to leave the Ship they readily did so & leapt into the Sea Swam to their canoes Set Sail and Stood for the Shore. Their Canoes were one large tree hollowed & some pieces fixed on each end an elevated platform in the middle with outryger &c their sails were neat mats & they set two back in the Bow of the Canoe which were variously ornamented both in Bow & Stern with Shells hair paint—several of the men were much ruptured and one was blind of an eye was all the bodily defects

Endeavour Straits

observed among them—The Canoes which came off last night brought a good quantity of water in Bamboos but finding no demand for it this day they brought none—on leaving this Island we had an intricate passage frequently obliged to change our course on account of breakers which were on both sides we soon came in sight of Taits Island[120] & some others to the North at about 4 PM Anchored to the Lee of a small low Island covered

October 30 with trees & Captain Messrs Brown Bawer & Westall landed & collected a few things.

31 Weighed at Day light & stood to the South West with a strong Breeze, obliged to change our Course several times on account of Breakers & Shoals, passed some flat Sands dry & some Bushes on them before noon past 4 large Turtles & came in sight of some high land to Southward past noon strong Breezes & squally past several small Islands & reefs of Breakers—Anchored before Sun down to Leeward of a large Island with another large Island to Leeward of us as also distant land to South either the main or Islands

November 1 Fresh Breeze a reef with water breaking occasionally all between the Ship & Shore Captain with some of the Gentlemen went in the Boat to go ashore but finding themselves in danger of being Swamped returned without reaching the Shore Strong Breeeze all day dull hazy

2 more moderate Weighed early & stood to the West before the wind past a point of a large Island where some natives were looking at us Some Islands seen a considerable distance to North &c in the same direction a long sand bank dry at low water extending a great length from East to West at 8 A.M. observing the water Shoal all a head Anchored & soon after Messers Fowler Brown Westall & Bell went Ashore & returned about 2 P.M. at 4 P.M. Captain Mr Bawer & Self went on Shore & collected a few things. This is one of the Prince of Wales Islands—from a hill we had a fine prospect.—a number of Islands with narrow channels as much like artificial ponds & Canals as the Main Ocean—if there is a sufficient depth of water they form numerous fine Harbours—The Soil is naturally barren very rocky & little Soil the rock chiefly Granite—on the point where we landed the face of the Rock was tinged very green with Copper—but could not observe any Veins of Ore of consequence but had very little time to examine.

3 Weighed early. Wind Easterly moderate. Stood to the Westward frequently attempted to Stand to the South but Shoal water obliged us again to Stand to the west very Shoal water a boat ahead Sounding in afternoon out of Sight of land & carrying 7 or 8 fathoms water Stood to the South & Anchored in the dark.

4 Weighed early & Stood South East while the wind would permit & about 5 P M made the land a low flat Shore Stood South parallel to it with Shoal water & fine weather Anchored in the Dusk little Tide observable while in the Straits & at Prince of Wales Islands—the Tide always run from East to West the rise

November 4 was not considerable and at high & low water there was no current

5 Weighed early & Stood along to South the Shore low & uninteresting some fires

Gulf of Carpentarra

6 Weighed at Day break & Stood South with variable light airs and Calms Shore Still uniformly low Anchored in evening

7 Weighed at Day light & stood South wind Dying away to a Calm—about 8 A M being opposite an opening Anchored & Captain Messrs Brown & Bawer went ashore—about 11 a m a breeze Springing up weighed & Stood off and on till about 4 P M Captain returned when we made Sail to South—this opening proved an extensive Creek of Salt water but very Shoal about 6 or 9 feet, but so extensive that they did not See the extreamity—they Saw several natives but could not induce them to come to an interview—they had Spears & throwing Sticks in the same manner as at Port Jackson as also canoes on this Creek of the Same construction & materials Some hatchets were left in Such a manner as they must find them The land was entirely low covered with Trees & Shrubs the Soil Sandy; as soon as the Boat returned Stood South and Anchored in the evening.

8 Weighed at day light & past noon opened a Spacious Bay into which we Stood the water rather Shoal. Natives on the Beach at the North point—about 4 P M saw three openings one to the North which probably communicates with the Creek in which Captain had been yesterday & two others near the extreamity of the Bay a few miles apart—we Stood for the two last till the water which had not exceeded 5 fathoms in the Bay gradually shoaled to 15 feet when we hawled to the Wind & worked out & Anchored at 10 P M.

9 Weighed at Day Break & Stood to the South Still a low uninteresting Shore not one Spot of rising ground Since entering the Gulf but the whole country covered with trees, Since entering the Gulf we had regular land & Sea Breezes & fine weather Anchored at 10 P M.

10 Weighed at day light & stood Southward in afternoon passed a deep bight with Shoal water probably Veeresiedge River of the Dutch[121] Anchored at 8 P M.

11 Weighed early & stood South in afternoon past a deep bight with Shoal water Anchored at 8 P M.

November 12 Weighed & Stood South West parallel to the Shore past a small opening Still Shoal water soft muddy bottom. Got into two fathoms water but Standing farther out from the Shore soon came into 3 fathoms Anchored at night

13 Weighed at Day light & stood to South South West with a fresh Breeze, Shoal water obliged us to Stand off till we lost Sight of land from the Deck in afternoon came in Sight of land from the Deck but Still obliged to keep a respectful distance—Anchored in the evening

14 Stood South South West along shore as usual very low & Shoal water

15 Shoal water obliged us to stand so far to the West that land was scarce seen from the Mast head—in evening seen from the Deck as usual remarkable low Shore running from East to West

16 This day steered most all day to the North West Shoal water obliged us to keep so far from the land that it was not seen from the Deck a great part of the Day

Gulf of Carpentarra Islands a, b, c.

17 Weighed at Day break & stood to North West & soon got into deep water 12 & 14 fathoms which we had not before found in the Gulf—we soon came near some low Islands & befor 8 A M Anchored near the first & sheltered by some rocks streaching to South East from the Island a Native was seen on the beach near us but on the boats approaching the Shore he disappeared we ranged this Island till 4 P M when we returned on board with a tolerable harvest This Island appears very recently formed chiefly of Coral, Sand & Ironstone & a mixture of Sandstone & Ironstone—there is no luxuriant vegetation or soil capable of producing such on the Island however there is considerable variety of vegetables—The Carpenters were employed in Calking & examining the Ship which had leaked very much lately & found several planks quite rotten

18 Early two boats went to draw the Seine in a bay between this & another large Island. Mr Allen & I were landed on the large Island where we saw 11 Natives who fled from us. here we found the Stumps of several Cassuarina Trees which had been neat cut with sharp edge tools & yesterday the Captain had picked up a piece of Teak squared as if by European workmen & this day the Fishing seineing party found 6 or 7 human skeletons near each other where fires had been with roasted Shells & many of the

November 18 human bones appeared to have been in the fire returned on Board about 3 P M with fishing party which had been tolerable successful & had fish served out to the Crew. Carpenters Employed Calking & discovered still more serious defects about back plank & Timbers.

19 Weighed Early & stood westward with light breeze met with Shoals which obliged us to tack several Times Anchored in Evening

20 Weighed early & stood to westward & about 8 A M Anchored near a low Island in sight of the Main & Soon after two boats landed on the nearest Island where we collected a few things. this Island is composed similar to the two last mentioned and the same symptoms of recent formation. The Captain soon left this Island & went to another farther from the main where he surprised some of the Natives on a point from which they could not get away & then they had an interview & presented them with some hatches & other trifles and received from them some clumsy Spears & throwing Sticks which they had similar to the Natives of Port Jackson but much more clumsy & ill finished. They had a kind of Canoe which consisted simply of several small spars lashed together with which they manage to go from one Island to another—The party the Captain met with consisted of three men all very tall one in particular was allowed to be at least 6 feet & 2 inches, their language & customs seemed to resemble the Sydney Natives & three people were seen which were supposed to be women which went into the water to the neck & continued while our people were with the three men who seemed very desirous our people should not go near them

21 Weighed early & stood Eastward & in evening Anchored opposite the passage between the two Islands where we had been fishing on the 18 fine weather

22 Mr Brown & party were landed on the large Island & directed our course to the west we found plenty of fresh water. fresh water was also found on the small Island in a hole dug by the Natives & near to where the human bones were found. preparations made for watering the Ship Drew the Seine and caught many fish which were distributed to the Crew—brought on board some plants for Garden

23 Employed preserving former collections which required much attention from the heat of the weather. Ships Company watering Ship

24 Landed with Mr Brown on the Spot where we landed on the 17 & crossed the Island to the watering place & collected a few things we found some large roots like Potatoes probably the roots of

November 24 Convolvulus longiflorus[122] laying by the fire place of Natives & in the holes dug among the sand near Trees where the Convolvulus grows—all hands employed watering the Ship & Carpenters Calking & examining her & found her to be seriously decayed near 4 Timbers in 5 quite decayed & many planks rotten

25 Employed preserving former Collections & all hands watering Ship in afternoon went ashore & strolled to the North East point of the Island where I fell in with a large marsh & plenty of fresh water & collected several new plants. Captain this day Sailed to the North East point of the Island where he saw some Natives who fled at sight of him he then Sailed to a distant part of the large Island where he found a number of Trees cut by Sharp edge tools & found a broken earthen Jar Strong indications of Europeans or Indians having been here within these few years as the marks appear recent. This day Mr Bawer Shot a large Bustard[123]

26 Employed preserving former collections. Ships Crew watering Ship much Thunder and Lightning in afternoon to West & South

27 Went ashore in morning with Mr Brown & walked towards the North East point of the Island & collected several new plants. Thunder in afternoon

28 Went Ashore on large Island & collected several plants this day the Ship compleated watering & took some wood on board Struck Tents hoisted in boats & made everything ready for Sea

29 In morning the Boats went fishing Mr Flinders landed to take observations for rates of Timekeeper & about 9 A M weighed & attempted to go through the channel between the two Islands but soon but water soon came to Shoal that we were obliged to Anchor & sent the boat to Sound but found no channel deep enough about 1 P M weighed & worked back to where we had Anchored on the 17 when we again Anchored for the night

30 In morning Mr Flinders landed & took some observations & about 10 A M weighed & plyed to windward but could not weather the reef which extends from the South East of the Island—on these Islands we made a tolerable harvest of plants—this Island contained near 200 species many of which were new

December 1 Weighed early & coasted the East shore of the Islands where we had watered & in afternoon came near a large point of land which appeared the main to North with much smoak on it stood along this shore keeping the land on our Starboard beam & Anchored in evening

2 Weighed early with light Airs the Land trended to Southward in

December 2 a direction to meet what we had seen on the 20 November—Shoal water obliged us to put about & stand to Eastward made little progress

3 Weighed early with light & variable winds & Stood to Eastward & Northward with land to North & some Islands to South. Anchored about 4 P M near a small Island & Captain & party went ashore & caught three large Turtle & many young afterwards a party landed to stay all night & catch Turtle

4 Early a boat went ashore & came off loaded with Turtle with information the party had been verry successful. Boats employed most of the day in bringing them on board & in the evening found we had 46. I took the opportunity of the Boats and landed & collected a few things. found the Cycas circinalis[124] in great perfection & the fruit being both pleasant to the taste and sight I eat some as also Mr Brown & Bawer. on coming on board Mr Bawer and I were taken with a violent reaching with sickness which continued with short intervals the greater part of the night it had an unpleasant effect with Mr Brown—but several other people in the Ship eat a little & most did so were affected in like manner though not so violent

5 Weighed early & stood to North West with a fresh breeze, Thunder & heavy rain which did not continue long. soon came up with the land but could not weather the East point. Kept plying to windward & in evening Anchored between the point & a small woody Island

6 Weighed early & attempted to pass between this Island & the Cape but found breakers to streach all the way across then stood round the Island & about one P M wind dying away & Tide pulling us towards the Breakers Anchored & Captain with Messrs. Brown Bawer Westall & Bell went ashore

7 Weighed early with a fresh breeze from North East past the Cape & made a firm run parallel to the land about South West till about 5 P M when the water shoaled to 2 fathoms when we put about & plyed to windward at this time an opening appeared to South East so that there is reason to think the land we had been coasting for sometime was an Island & that the Coast of the Main Since that 16 November has been unperfectly seen. but the water is so shoal that it can never be surveyed by Vessels of burden. Anchored in evening.

8 Weighed early light airs & Calms about 10 A M being calm a water Spout was seen a few miles distant to Eastward which for a short time raised a great quantity of water in the air. It soon stoped & appeared to rain very heavy about the same place. soon

December 8 after a fresh breeze came along the surface of the water in a narrow space like a river which gradually spread broad it at first brought heavy rain with it which was soon over but the breeze continued most of the day we stood westward paralel to a low woody Shore with very Shoal water never in more than 5 fathoms & Anchored in evening.

9 Weighed early & stood along a low shore wind contrary a range of hills seen a considerable distance in land Anchored at 8 in evening

10 Weighed Early & plyed to windward. Shore low & hills in land

11 Weighed early & plyed along to windward land as yesterday about 7 P M Ship Struck on a rocky bottom being a gentle breeze soon got off without an injury though she touched several times. this day some small openings appeared in land. Anchored at 8 P M

12 Weighed early & plyed along the Shore which appear much to westward. Shore low & gentle rising land a considerable distance in land passed a small opening & Anchored at 8 P M

13 Weighed Early & plyed to windward to where land was seen North and about noon came up with it but an opening appeared to West stood for it but found Shoal water & many rocks plyed to windward and in evening anchored off a point where much smoak was rising & some Natives were seen hauling a Canoe on the Beach

14 Weighed early & plyed to windward. Natives to the number of 30 were seen on the Beach before noon a boat was sent in Shore to look for Anchorage but found a very rocky bottom in evening Anchored of the East point of the Island

15 Captain & party landed but returned by 11 A M when we Weighed & soon found that what we had been Coasting for two days was one of Cluster of Islands with broad channels between & many detached rocks. In evening Anchored near a small Island being the farthest from the main to the North East
In morning Captain & Party landed on this small Island & returned by nine when we weighed and stood between the two largest Islands in a channel of 2 or 3 leagues broad with some small Islands about noon stood in a narrow channel between a small Island & a point of the large North Island & found ourselves in a fine Bay well sheltered & Anchored. Soon after Mr Brown & party went ashore & collected several fine plants found fresh water and a singular momument of the Natives. It consisted of two Stones rounded one of which was about 18 inches long the other about 1 foot & about 6 or 8 inches

December 15 diameter they were fixed in the ground under the shade of Trees & well covered with bark these stones were covered with down of young birds white but in stripes & oval spots of brown or dull black—an old bark Canoe similar to those at Port Jackson lay on the Beach & some pieces of bamboo & cordage were found which indicated superior intelligence to any New Hollanders we had yet met with

17 Early a party landed to cut wood. I was landed on a point to the Westward of a deep inlet round which I walked & collected several fine plants among which an elegant Sterculia and a fine blue water Lilly[125]—Thunder & some heavy rain

18 Went ashore Early & directed my course to the North East & round a Lake of fresh water & considerable marsh & collected some new plants—Thunder & much heavy rain

19 heavy rain in morning about A M weighed & stood to Eastward & before noon Anchored near the Island we made on the 13th. Captain Mr Brown & Bawer landed—here they found a small species of Nutmeg[126] & a piece of Basket work thrown on the Beach similar to the Chinese hats—when the Boat returned Weighed & stood to the South West & in evening Anchored to the Westward of the Island we had Anchored at on the 16 which was denominated Island h here we were compleatly land locked by Islands all round us

20 Went ashore in morning with Mr Brown & party on Island h and found a fine Stream of fresh water collected several new plants & Mr Westal saw three or 4 of the Natives a few yards distant from us who ran away as soon as they saw us boats in fishing & looking for water picked up various pieces of wreck of boats wooden Anchors & a pair of Trousers of Striped cotton far above the ingenuity of the Natives of new Holland

21 Went with Captain to various coves & points of land & to a small rocky Island laying South West distant 3 or 4 leagues but found little new

22 Ship Early Sailed back & moored where we had anchored on the 16—Captain set out with the Boat for three or 4 days and a party landed to water the Ship. Employed preserving former collections

23 Early Mr Brown & party landed in the deep cove to westward of where we lay we traversed the Island to the West North West & soon came to the cove on the opposite side of which I had landed with the Captain on the 21, on tracing this shore a little distance we found that what he had then supposed to be all one Island formed three, two of which were seperate from what we

December 23 were now on & both seperations we saw very distinctly on tracing the shore a little farther we fell in with a place where a great number of mangrove Trees had been cut several years ago & where 38 built fireplaces still remained[127] all built in divisions of 2, 3 4 or 5 together with an wooden frame over each division as if intended to lay wood on to heat so as to make it bend to whatever purpose it was intended and appeared to have been used as a substitute for the European method of bending wood by Steam for the purpose of boat building—pieces of bamboo. Coccoa nut Shells broken earthen Jars & some bits of Striped Cotton & Shells lay about the place & every Tree of any Size in the neighbourhood had been cut with Sharp edge Tools & carried away—Several conjectures were thought of to have done this but none seemed satisfactory. the most reasonable appeared to be the wreck of some vessel probably Indian or chinese & that they had here built boats to transport themselves. but this appeared suspicious as there appeared to be difference in the Time of cutting the mangroves & the frames about the fire places. the remains about the fireplaces appeared not to have been left more than a year or two at most whereas the Mangroves appeared to have been cut from 5 to 10 years ago as every piece of bark was off the stumps & the cut appeared decaying however as they are occasionally covered with Salt water it is probable a much shorter time may be sufficient to give them that decayed appearance. however it appeared very evident some people from India or Europe had been here—in the night a dreadful Storm of Thunder lightning and heavy rain

24 Went ashore & took up some plants for Garden & brought them on Board. This day a Skeleton was found burried in a cavern of a rock very carefully rolled up in bark & lashed with a neat rope apparantly of Indian manufactory—there was some hair upon the skull of a brown colour, which as well as the scull & skeleton agreed perfectly with the European

25 Mr Brown & party Set out early for the large Island to South distance 2 or 3 leagues—we landed in two places & walked a considerable distance but found little new—In a small creak near fresh water we found a number of bamboos exactly similar to what the Natives of Murray's Island brought off to our Ship full of fresh water here they lay useless & appeared to have been left as they were out of the reach of the Sea on the Beach some pieces of Timber of the Wreck of some Vessel but not European Timber and at a point going into a deep cove a pole was fixed in the ground in the water in a similar method to what we use to try the rise of the Tide returned on Board about 8 P M & Captain

December 25 had returned before us he had met with a number of fireplaces exactly resembling what is mentioned on the 23

26 Employed preserving former collections & at noon as Captain landed on a small Island to observe the ettitude landed with him & brought off some plants for Garden

27 Weighed Early & put to Sea & left these fine Islands which afford excellent Shelter wood & water. The soil is universally Sandy or rock the Rock chiefly freestone excellent for building. some Ironstone but much less common. These Islands contain numerous deep coves which form excellent harbours for small Vessels but the water is generally Shaol, however the Islands give shelter from any wind in 4 or 3 fathoms water. here we made a tolerable harvest in the Botanical department—as soon as we cleared the North point of this Island we stood Westward & in evening Anchored near a low Island in sight of the Main

28 Weighed Early & plyed to North West along a low uninteresting Shore and Anchored in evening

29 Weighed early & plyed to windward in evening some rising ground a distance from the Shore. Much Thunder lightning & some rain in evening Anchored

30 Weighed early & plyed to windward & found Shoal water a great distance from land which was rising in gentle hills. land seen at a distance & indistinctly all day

31 Weighed early and in evening Anchored to the South of an Island in sight of the high land we had seen yesterday—a smoak on Shore near to where we Anchored

1803

January 1 went Ashore early with Mr Brown & party & ranged this Island but found few things returned on board before 9 A M weighed and stood for the high land of the main on nearing the land stood parallel to the Shore North West Anchored at night much Thunder lightning & rain with a sudden gust of wind from Southward

2 Weighed early with a fine Southerly Breeze & stood on parallel to the Shore which trended to the Eastward of North. Shoal water obliged us to keep a considerable distance from Shore. at noon passed a rock and a Sand bank anchored in evening. Thunder & lightning at night

3 Weighed early & stood North in sight of land. about noon land was seen from West to North East past noon having suddenly Shoaled our water from 7 to 4 fathoms with a fresh breeze the boat was lowered & sent a head to Sound the Breeze increasing

January 3 with a considerable Sea & water again deepened the boat was called back & towing along side with two men to take care of it. about 4 P M by some unaccountable accident the Boat filled & swamped along side The men were both swimmers & both got under water at first but one soon appeared again & took hold of the wreck & was soon picked up without having received any injury the other was never seen when the man was safe the Ship Anchored & picked up the wreck of the Boat which taken on Board & repaired some oars &c were lost

4 Weighed early & stood Northward & before 8 A M Anchored near the main with a large Island to Eastward distant two or three leagues. Mr Brown & party went on Shore & ranged among the woods & collected several fine plants we fell in with some extensive Marshes & fresh water lakes—near which we found a burying place of the Natives which consisted of poles or rather Trees hollowed by age or art & the Corps placed in the hollow of the Tree pushed in feet first at the Thick end of the Tree. which is then raised perpendicular & the Small end fixed in the ground & the Skul just in sight at the Top—Three of these poles stood together in one place & some fallen down each of which contained the Skeleton of a human body these poles were from 12 to 18 feet high, the smallest we took down & found some of the bones curiously painted with Streaks of red—five Skuls were found at the bottom of the poles well covered with bark—three other poles were found about 100 yards distant with each a Skeleton—but had fallen down from age—There were some neat & large bark huts near the Standing poles

5 Weighed Early & Stood Eastward & again South & South West past some openings & Islands & Anchored in evening.

6 Weighed early ply to South West & in evening past the South West point of a large Island where the land Trended Eastward & Anchored

7 Weighed early & plyed to Eastward but made little progress

8 Weighed early & plyed to Eastward the contrary wind made little progress

9 Weighed early with a light wind from South West Stood easterly and passed among a number of small rocky islands of a point of the large Island found a strong current—past noon having past the East point of the Large Island stood Northerly & Anchored in evening between a small rocky Island & the large one

10 Weighed early & rocky bottom & great inequality of Depth depth & seeing a rippling on the water very near Anchored again & sent the Boat ahead to sound soon weighed again & past very near

January 10 some rocks at the waters edge & afterwards some Bays in the large Island & Anchored in the evening

11 Weighed early & plyed to Northward with wind from that quarter made little progress—fine weather

12 Weighed early & attempted to pass to Westward between some small Islands & large one but finding Shoal water put about & plyed to windward wind North made little progress

13 Weighed early and plyed to windward & Anchored at 10 P M

14 Weighed early & plyed to windward & about 11 A M not being able to weather a rocky point Anchored & Captain Mr Brown Bawer and Westall went ashore—past noon a Breeze springing up weighed & stood past the rocky point & Captain & party came on Board we then stood to the Southward into a spacious Bay which affords good Anchorage & Anchored. On small rocky Island where Captain landed they found plenty of Nutmegs and saw dome paintings done by the Natives with Ochre on the rock in imitation of fish turtle Kangaroo.[128] &c. &c.

15 landed in morning with Mr Brown & party on the East side of the Bay & collected several plants saw no fresh water & little traces of Natives & None recent

16 Went ashore in morning in Company with Mr Bawer & Allen on West side of Bay & collected several new plants. Mr Westall went to the Small Island called Gavern Island where Captain had been on the 14 to examine the drawings of the Natives & brought many nutmegs on Board—some of the Sailors ashore for amusement—The Rock here is chiefly free stone of different degrees of hardness, the Country barren & without fresh water as far as we Saw

17 Weighed early but made little progress to Westward Anchored in evening

18 Weighed early & stood Westward & about 11 A M anchored to South of some small Islands in Sight of Groote Eyland. Captain Mr Brown Bawer & Westall went ashore—returned in afternoon & a party went ashore to remain all night and Catch Turtle

19 Early the Boat returned with party & one Turtle Weighed & stood North West & passed several Islands & about 4 P M Anchored to South of a small Island & land with Captain Mr Brown & Bawer & collected a few plants

20 Weighed early & stood North West passed some Islands & about 4 P M Anchored to South of a rocky Island of moderate height and went ashore with Captain & party & collected some new plants—found fresh water & saw the print of the feet of Natives very recent on the Sand

January 21 Early a party landed to cut wood, boats also went to fish &c. about 9 A M went ashore with Mr Brown & party with Directions to return by ½ past noon—we crossed the Island to the opposite Shore & collected several plants Seeds & returned to the landing place one P M The Boats were then ashore taking on board wood. The Captain not yet returned from Surveying the Island—we had not been long at the Beach when Mr Westall & Servant came to us with information that they had seen a Canoe come from the Large Island to Eastward from which 6 Natives landed very near him & had chased him all the way to very near us some of our people who were getting water which was some distance from the Shore were chased down by them, & party of us then went to meet them but Seeing so many they run away although we attempted to have an interview by one person going to them unarmed. we followed them to the Top of the Hill & finding they would not come to an interview returned & the Boats being ready put off—The wooding party Still remained on Shore the wood not being all brought off—on the way to the Ship the report of some muskets were heard on Shore & after we were on Board one of our people was seen coming down to the Beach supported between two other several Muskets fired on the Beach &c. Two Boats immediately went off one in which was the Surgeon to bring off the wounded man & the other in which Mr Westall went & if it was found the Natives had made the attack to go round the point to where the Canoe landed and bring it off. The Boat soon returned with Mr Whitwood Masters Mate who had received 6 spear wounds in different parts of his body The other Boat went round the point to where the Canoe landed. in afternoon the other Boat went ashore & brought off the wood and also Bengamin Morgan a Marine who was taken very ill from heat & fatigue he was when taken on board quite senseless & continued in violent convulsive fits with intervals of ease till about 9 P M he expired. about 10 P M the Boat returned & brought with it the Natives Canoe which proved of bark but well executed & strengthened with sticks & braces & large enough to contain 6 men

From the reports of those concerned it appeared that soon after the Boats put off for the Ship between 1 & 2 P M the Natives to the number of 6 appeared on the hill. that Mr Whitwood with a loaded musket & Mr Allen unarmed went up to them & desired the men to keep near 200 yeards distance behind them with more arms ready Mr Westall & Allen were about 30 yards distant & the Natives divided themselves 3 to each. those nearest Mr Allen had laid down their spears & had exchanged a green bough with him that next Mr Whitwood (who still kept his musket) held out a Spear which Mr Whitwood held out his hand

January 21 to take hold of when he run it into his breast he then attempted to fire his musket but it missed fire Mr Allen seeing this run down the hill & Spears flying past him but was fortunate enough to escape them. Mr Whitwood also run as fast as he could but several Spears having hit him & one hanging in his Side he turned presented his Musket which now went off & he Supposed wounded the man nearest him as they all retired the party from the Bottom of the hill being also near & one having fired a musket—The wooding party then Crossed the Island to meet the Boat where the Canoe had landed but meeting the Boat & not finding the Canoe they returned to the landing place—They again went back in the Dusk of the evening when they saw two Natives carry the Canoe on their heads to the Beach when they came up they found three Natives in it paddling away from the Shore as fast as they could & saw another man coming to the Canoe who on seeing our people between him & the Shore ran back into the Country our people immediately began to fire their Muskets loaded with ball & Buck Shot at the Canoe & soon perceived one Man to fall down in it & the other two leaped out & swam—one of the men then went out to the Canoe & found one Native in it dead who had on his head the hat of the man who found him and in pulling his his hat off the head of the Corpse he upset the Canoe & the corpse dropped out & was not found

22 Early a Boat went & brought off the Dead body of the Native which was found on Shore at high water mark very near where he was seen in the evening—he was under the usual size measuring only five feet six inches, he had some resemblance to the generality of the Natives of New Holland—a long beard, high forehead, thick lips Nose short thick & turned up—he had many bracelets on his arms & a band round his middle on which was fastened a piece of bark to cover his privates which appeared to have been circumcised as he had entirely lost his foreskin but no scar remained. He was dissected & his head put in Spirits & the body of Bengamin Morgan comitted to the deep with the usual ceremony—about ½ past one P M weighed & stood westward—Anchored in evening

23 Weighed early & finding Shoal water & little prospect of a passage to North between the Island & Main stood to Eastward & about 4 P M was suddenly taken aback with a heavy squall accompanyed with Thunder lightning & heavy rain & so dark that it was found necessary to Anchor as we had land all round, rain occasionally although

24 Weighed early & before 3 A M was taken aback with a heavy

January 24 squall with rain Anchored—squally weather & wind Easterly all day

25 Weighed early & plyed to windward Eastward & at 8 in the evening Anchored to Leeward of an Island

26 Weighed early & stood Eastward & about 10 A M Anchored off a point of land & soon went on Shore and collected several plants Captain & party fell in with a fine lake of fresh water & well stocked with Ducks—Saw some huts of Natives made of Bark—from the appearance of the land supposed it a point of the main. all low land and very sandy

27 Weighed Early & stood North West into a deep Bay with some little hills on the Westside—in afternoon Anchored near the East Shore of Bay and a Boat went ashore with Mr Fowler & Mr Brown about 7 P M Mr Fowler returned with the Boat without Mr Brown who had lost his way he had a Sailor with him. about 8 a Great gun was fired &c. and at 10 the Boat went ashore but Mr Brown was not arrived

28 Early the Captain set out for the highest hill on West of Bay accompany with Messrs Allen & Westall about 7 A M Mr Brown was seen on a point to South East & a Boat went for him—about 9 I landed with Mr Allen & Mr Browns Servant & collected several plants—fell in with a large Marsh & fresh water very Shoal much frequented by Ducks Cranes.[129] Saw two Emoos—Some Showers of rain

29 Weighed Early & plyed to Eastward—wind contrary with frequent squalls and heavy rain made little progress & Anchored in evening very near our last anchorage

30 Weighed early & plyed to Eastward a heavy squall obliged us to Anchor before 8 A M—In afternoon weighed again & plyed to Eastward all night

31 Kept plying to the South East wind dying away & in evening from South West with a heavy Swell in evening Anchored at our former Anchorage on the 26th

February 1 Weighed Early & worked to Eastward & when clear of the land Stood South East and afterwards North East with a fresh Breeze & considerable swell

2 plyed to North East along an indented Shore in Afternoon into a large Bay & anchored near Some Islands

3 Early Mr Allen went with Boat to look for water—about 11 A M weighed and stood farther in & soon met the Boat Mr Allen had not Seen any water—Stood on into a fine Sheltered Bay saw some Natives on the Beach & Anchored before 4 P M & Mr

February 3 Fowler went to look for water—met a party of Natives about 12 who conducted him to water very convenient on the Beach & were very friendly

4 Early a Strong party went ashore Tents landed & boats to fish &c a party of the Natives about 12 in number met us at the Beach very friendly Mr Brown & party walked across the Country & were followed by most of the natives. it appeared evident that they knew the effect of fire arms—they were all unarmed & very friendly & rather intelligent compared to the other inhabitants of the country—in our progress we fell in with a large Mangrove Swamp & Creek of Salt water which appeared to extensive for us to go round this day & we begun to return by a different way by what we had gone. the Natives endeavoured to persuade us to go round the Mangroves but as we did not comply with their wishes & had sat down to put up some specimens they sat down with us when Suddenly one took an opportunity & Snatched a hatched from Mr Westalls Servant & run off all the Natives run off but one who sat with his back in that direction & did not see them. this one carried a hatchet which has been given him I proposed detaining him & securing the hatchet he had in lieu of the one Stole. but Mr Brown objected. the man remained with us very unconcerned & some of the other being still in sight Mr Brown went towards them & enticed three of them back as we were walking gently towards the Tents. one of them suddenly snatched a Musket from Mr Browns servant & run off with it the others all run off at the same time. Mr Bawer fired his Musket at the man who Stole the Musket but it did not take effect & we soon lost Sight of them. we then returned to the Tents & Messrs Brown & Bawer went on Board with the Captain & afterwards to a point on west side of the Bay—ranged in the Vicinity of Tents & collected Several plants & fell in with a number of fireplaces similar to what is mentioned at Island h but here they appeared of an older date & several stacks of Billet wood remained—In the afternoon some of the Natives came Sculking about the Tent & an interview was obtained and they were given to understand that if they would return the Musket they would receive a hatchet which they promised to perform & soon actually did but somewhat damaged & without the ramrod & soon became familiar. they pretended they had beat the man which took it but pretended not to understand any thing of the Stolen hatchet

5 In morning Mr Brown informed me I might go on Shore & take a box from the Garden for Some plants. Employed me shifting plants till Boat was ready & the box could not be got out of the

February 5 Garden in time as the Boat would not wait a moment no other opportunity affected till near 3 P M when on landing I learned the natives had been very friendly at the Tents till about 2 P M when one had stole a hatchet & all disappeared our people had pursued them some time & the Corporal of Marines was missing & two men in Search of him. he came to the Tents in the evening having been taken with the cramp very ill & unable to walk & it was with great difficulty he reached the Tents. he was carried on Board—In the Morning Mr Brown & Bell had been employed with the Natives in learning their language Customs &c.—and in afternoon Captain with Mr Brown & Westall Set out with Boat set out for Some hills of moderate elevation on South West Side of the Bay with intention of staying all night

6 In morning went Ashore &c examined the vicinity of the Tents & compleated the Box of plants for the Garden—I searched the neighbourhood of the Tents but could not go far for the Natives, none of which came near the Tents this day. In afternoon the Captain &c returned having met with some fine rivulets of fresh water running from the hills to the Beach

7 In morning the Natives came to the Tents bringing with them some fruits, honey & some little roots probably of a species of Grass which eat very pleasant two of them were taken & confined. one was soon liberated & given to understand it was expected he would return & bring with him the Stolen hatchet which would procure liberty for the other. they continued near the Tents in considerable numbers till the afternoon when they all crossed the Creek to the North In the afternoon Captain went on Shore & took the Native into the Boat & Sailed to the North of the Creek near the Natives. when Several of them came to the Beach & made Signs for our people to land. and to induce them presented a young woman, called Bungery & gave him to understand he might have her if he would land—They pretended the man who had stole the hatchet had carried it a great distance & that he belonged to a different Tribe. The Native was then brought on board. he expressed much anxiety when tore from his friends, on Board he was tolerable cheerful appeared sensible eat fish & bread heartily, but refused to drink Spirits, looked very attentively at every thing he saw & seemed. quite confounded. on Seeing Sheep & Pigs, he took both for dogs & gave them the same name—

8 It appears they have some knowledge of Botany and distinguish the different Trees & vegetables by distinct names In morning the Native eat a hearty Breakfast & seeing boats prepare to go ashore, seemed very anxious to go, applying earnistly to

February 8 Bungery for that purpose—Mr Brown & Party of 6 landed on the North Shore where we saw several natives running among the Bushes before we landed & on landing two of them kept in Sight of us—& retreated as we advanced into the wood which is not very thick here—the two continued about Musket Shot from us while we kept advancing into the woods & finding ourselves closely watched & likely to be taken suddenly in some place where we could not well defend ourselves, as there was reason to Suppose. they were collecting their force we returned for the Beach, immediately on our retreat they gave a Shout which was answered at Some distance & in a few minutes a number of about 12 men appeared with great bundles of Spears & throwing Sticks & came pressing upon us—on presenting a Musket they retired a little distance but when we walked towards the Beach they followed us close & attempted to surround us & on coming near the Beach they became so daring as to Ship their Spears & to disregard pointing a musket at them. & we found it absolutely necessary to fire on them. Mr Browns Servant & Mr Allen each fired a musket at two of the most daring & I believe wounded them they then retired & soon dissappeared, & we returned on board. The prisoner was taken on Shore & had attempted to make his escape from the Tents but was soon taken. In afternoon Captain went on Shore & he was liberated he endeavoured to prevail on Bungery to go with him, gave us to understand he would bring back the hatchet & went away well pleased

9 Mr Brown & party landed on the West of the Bay for two hours & collected a few things.—this day watering was compleated Tents Struck & every thing made ready for Sea. Thunder & Showers of rain. no Natives came near us—during our Stay here we had been so much disturbed with the Natives that we could not examine the Country as we could have wished. as far as we saw the Soil was Sandy, but the face of the Country finely diversified with gentle elevations & large plains, some Granite rock but scarce, some Iron Stone & a sort of red Grit Stone, at this Season water was plenty but it is probably not so all the Year

10 Weighed early & Stood out of the Bay with a fine fair wind. at 11 A M Captain wih Mr Brown & Bawer landed on a small Island, returned about one P M when we Stood North with a fine Southerly Breeze & anchored in the evening

11 Weighed early & stood North North East & soon past a point of land where the Coast trended to Westward. light winds made little progress & Anchored in evening
The Cape just past being Cape Arnheim we were now out of the Gulf in which we had been since the 2 November during which

February 11 time the wind was never settled in any direction, but the Northerly winds greatly prevailed, sometimes East & sometimes West but rarely South The Climate hot but not excessive, the winds were always Cool & in general a fine & refreshing breeze. the weather generally clear & serene. but laterly as the Sun approached us more cloudy with Showers The appearance of the Country is one Continued flat, with no rising ground of any consequence till near Cape Arnheim & even there the rise is very inconsiderable. It is every where covered with woods & the appearance of fertility. & although we saw no very fertile Soil except in small inconsiderable spots, yet it is probable there is much fertile Soil more in the interior, for except Arnheim Bay we never landed on the Main during our stay in the Gulf but 4 days in different places. & was never above half a mile from the Shore & what Soil we then saw was Sandy. Some of the Islands we had a better opportunity of examining & very stony the stone free stone & some places Iron Stone, at the entrance of the Gulf on both Shores. viz. on Cape Arnheim & prince of Wales Islands the Stone is Granite The variety of Vegetables is considerable but there is much sameness. every time we landed we could count from 100 at the least to 200 different Species at the Greatest in any one place

12 Weighed early, light winds made little progress. In afternoon sailed through a passage between an Island & the Main while a Native stood on the Beach of the Island waving his hand & calling to us. Anchored in evening dull hazey weather & some rain

13 Weighed in morning & soon opened a deep Bay Stood for it and about 3 P M anchored in a very large & well Sheltered harbour the extream of which to Eastward we could not See. In evening went ashore on the North Side of Bay & Collected a few things—Boats fishing & caught plenty for all hands

14 In morning landed with Mr Brown & party & collected some plants Captain employed Surveying the harbour. he as also Mr Bawer & Westall who were with him found some Quartz Crystals they were found in Caverns in Ironstone & Granite.

15 Employed preserving former collections Boats Fishing with success In evening landed with Mr Brown on North Shore & collected a few things found fresh water near the Beach in a hole dug in the Sand by natives. Saw 4 native Dogs wild which made a singular howling noise

16 Early Captain with Messers Brown & Bawer went to Survey the Eastern part of the Harbour, on their return Weighed & stood out of the harbour & Anchored in evening

February 17 Weighed early & stood Northward & passed a broken & indented Shore about noon past between some rocky Islands & stood for a steep point behind which was an opening. on making the point we perceived the land to the Right to be Islands & and a passage between & the main we soon observed some vessels laying under the lee of the Islands & some Canoes paddling about them when we came within a few Cables length of them a Boat was sent on Board well armed & soon returned with Information that they were 6 Proas[130] being part of a fleet of 60 from Maccassar[131] sent by the King of that Island to collect Trepang a kind of Marine production of a gelatinous substance & somewhat of the Shape of a Cucumber. which when dried is a great delicacy with the Chinese & brings a great price—
Anchored for the night & had a visit from the Captains of the Malay Proas, who informed us that they had practised coming to this Country for that commodity for these 20 years & the Commodore of this Squadron Said this was his 7 voyage to the Gulf

18 In morning Captain went on board the Chiefs Proa & 5 more Proas came in from the westward & Anchored & begun to take on Board water Before noon landed with Mr Brown & party & ranged the neibourhood & collected some plants, This Island is very hilly & full of Stones, which are grit stone & in Some places a kind of Slate stone—at this Season plenty of water run down to the Shore in various little rivulets or rills in great plenty—The Canoes of the Maccassars came along Side & exchanged Cocoa nuts poultry &c for hardward Cloathing &c and were very friendly & honest in all their Transactions. from them was collected some useful information relative to the Winds & weather in this part of the Globe, they informed us that we might expect rough weather with wind from the North West for two or three weeks when it would change & South East winds prevail—Informed us they would Sail in the night

19 In morning the fleet of 11 Proas were in Sight Standing to Eastward Captain went in Boat to Survey the Islands &c I landed with a party who went to bring off some water & collected a few things

20 landed with Mr Brown & party on an Island to Eastward of where had been the two former days here we collected a few things & brought on Board some plants for the Garden—Since our arrival here we had frequent Gusts of wind accompanied with heavy rain. It gave us great satisfaction meeting with the Maccassars as it satisfied all our doubts relative to appearances we had seen in the Gulf. the fire places are to dry the Trepang in

February 20 the Smoak & they have no other vessels to carry their water but Bamboos the damaged ones of which we had frequently met with—we learned that they usually make the Voyage in 6 months from Maccassar, that they meet chinese Vessels at Timor laut[133] which purchase their Cargo for about 40 Dollars a bag of 1000 insects &c we had a Malay on Board who acted as interpreter

21 Employed preserving former collections Captain with Messrs Bawer & Westall went to the North East to take bearings &c they fell in with a party of Natives who did not See our people till very near when they fled in great confusion & left an elegant Spear which was brought on Board & a hatchet left in its place, the party consisted of an old man two women & some children—frequent Squalls & heavy rain

22 Went with Captain & Mr Westall to an Island at some distance in North West & collected a few things

23 at day light went ashore & planted 4 Cocoanuts & some Potatoes in various situations such as appeared most favourable, one of the Cocoa nuts I have procured at Murrays Island at that time in a state of Vegetation & it had been growing in the Garden ever since & was now a fine plant, one of the others was also beginning to Vegetate & two had no appearance of Vegetation—In the afternoon weighed & stood West and anchored in evening near Some Islands in Sight of those we had left

24 landed with Mr Brown & party on the largest Island Z & collected a few things—Captain & Mr. Westall went in morning to Westward between the large Island & main & proposed returning to dinner—but did not return all day

25 As the Captain had not returned Mr Fowler went with the launch to look for him. I landed early & brought some things on board before 7 A M about ½ past One P M the Captains boat was seen to windward of the Island & soon came on Board—They found the Island much larger than was expected & had required all this time to go round it, The launch came along side soon after

26 landed in morning on the Small Island near Anchorage with Mr Brown & Bawer & collected a few things

27 Weighed Early & stood westward & soon got aground on a Sand Bank with a very rapid Tide—some of the Bank at a little distance from us had only 6 feet water—about noon we got clear and anchored in deep water

28 Weighed Early & Stood South West in a fine channel between the Island & the main—at noon anchored opposite a Small opening between an Island & the main behind the island no land could be Seen boat Sounded & a breeze springing up weighed & stood

February 28 round the Island when we found a very rapid current running out of the opening which is broad & deep close to the Shore. about 8 PM having got round the Island Anchord

March 1 Early went ashore on the Island with Mr Brown & Party also Captain & party, here we collected a few things & as the Island is tolerable high had a fine View of the Bay which is large so much so that we could see no land to South West & only in small spots to South & South East—returned about 11 A M weighed & Stood Eastward up the Bay anchored in evening

2 Weighed in morning & stood on near the Eastern extreme of the Bay & anchored about 3 P M & soon went on Shore with Mr Flinders & collected a few things, about 4 Captain with Mr. Bawer set out to Survey the Bay & took provisions for three days

3 Went ashore in morning with Mr Fowler & a party—& collected several new plants—Saw many Kangaroos—this part has much resemblance to the different places we had visited of the main in the Gulf, but I think more fertile—many Swampy flats of Considerable extent at this Season Standing some inches deep of water which if cleared bids fair to be productive in rice, came on Board before 3 P M weighed & stood for the West of Bay Anchored in evening

4 Weighed Early & stood for a Sandy Beach round red (?) cliff & anchored in afternoon & soon went ashore & collected some new plants. Boat went to fish but had no success. before 9 P M Captain returned having Seen no appearance of any river had caught a Turtle—In this excursion Mr Bawer had found few New plants

5 Early the Boat went to haul the Seine but had no success about 9 A M weighed & stood out of the Bay—wind & tide being contrary about 5 P M anchored & saw a Canoe with two natives close in Shore

6 Weighed early & stood Northward with a fresh Breeze about 1 P M having cleared the land & Islands stood North West and at 7 P M. West North West in which course we continued during the

7 In morning no land in sight & nothing material occurred till

12 we made some low Islands called New Years Islands & the Ship hove too while a boat landed on one which Mr Fowler & I walked round, saw the shells of some Turtle which had been lately killed

The whole Island is composed of Coral & sand & shells and some lakes of Salt water with mangroves, with scarce any thing

March 12 new in the Botanical department—nothing of consequence occurred hot sultry weather Calms & light airs till the

19 About 8 A.M. we were surprised to see the bottom as we had for several days had from 100 to 120 fathoms Soundings on Sounding we found 10 fathoms sent the Boat ahead & stood on & in less than an hour we had 60 fathoms—the least water we had was 7 fathoms hot sultry weather with light airs and Calms

29 till 29 saw the Island of Timor very high land and on the

31 Anchored in Coopang[134] roads near the Fort of Concordia here we learned some of the transactions in Europe since our leaving it, we found here a Dutch Brig and a small American Ship just come from Europe—we remained here till the 8 April during which time we made a considerable collection of specimens by repeated Short walks near the Town but we made no distant excursions—This Island is peculiarly fertile in comparison to anything we had seen during this Voyage—as far as we saw it is entirely coral rock or at least in the greatest part for in the River & some parts of its banks there is some primitive Rock but it is in small proportion to the Calcareous—but the soil consists of a very rich vegetable Soil of a yellowish or light brown Colour & of a glutinous consistance which laid on the very porous Calcareous rock gives the greatest luxurience to the vegetation particularly as it appears to be frequently refreshed by plentifull showers of rain——all the Ships Company were refreshed with fresh provisions & fruit here and the Symptoms of Scurvey which appeared generall were soon dissipated—two men contrived to leave the Boats and secret themselves on Shore the last night of our stay here & could not be found when we sailed

April 8 Weighed Early & stood Northward light airs kept Standing to the westward & Southward on the 12 in sight of the little Island of Java from this till the 20 fresh breezes & much rain with

20 with much Thunder & lightning & very dull moist atmosphere many of the Crew Complaining of disorders & dysenterie attacked several which seemed to increase—from 20 to 23 fresh steady Breeze from South East cool air

23 from the 23 to 27 in search of the Trial rocks[135] which we had not the good fortune to fall in with

27 on the 27 stood to Southward as wind would permit and on the

May 2 crossed the Tropic of Capricorn—wind & weather variable

14 and nothing material occurred till 14 at Day light the South West Cape bore North stood Eastward South East with a fine breeze in sight of land

May 15 Past King George IIIrd Sound Mount Gardener[136] &c steering East

16 Standing East by North fresh breezes & hazy cloudy weather no land seen this day

17 At day break past Termination Island & about 8 A M past Bay No 1 keeping to the South of all the Islands—past noon departed this life Charles Douglas Boatswain of a Dysentery with which he had laboured since the middle of Aprile—Sell and several of the Crew labouring under the Same disorder
In the evening Anchored to Leward of Salt Island or Bay II near where we Anchored in the middle of January 1802

Chronology

The dates given for a particular locality have been compiled from Flinders *Voyage* (1814), Good's seed lists and Brown's herbarium labels. Unfortunately these three sources sometimes differ.

1801

July 18	Departure from Spithead
August 2	Madeira
October 16	Cape of Good Hope

Western Australia

December 6	Arrived off Cape Leewin
December 8	King George the third Sound
December 12	Princess Royal Harbour

1802

January 4	Seal Island
January 8	Archipelago of Recherche
January 10	Lucky Bay, Bay I
January 15	Middle Island, Goose Island
January 16	Bay II
January 28	Bay III

South Australia

February 2	Nuyts Archipelago
February 8	Petrel Bay
February 13	Flinders Island, Waldergrave Island, Bay IV
February 21	Thistle Island
February 23	Memory Cove, Bay IX
February 24	Bay X
February 26	Port Lincoln
March 8	Spencers Gulf, Bay XII
March 22	Kangaroo Island
March 29	St. Vincent Gulf
April 1	Nepean Bay
April 8	Encounter Bay

Victoria

April 22	Bass Strait
April 23	King's Island
April 26	Port Philip, Bay XVI

New South Wales

May 9	Port Jackson
July 21	Left Port Jackson

Queensland

July 30	Sandy Cape
August 1	Hervey's Bay
August 2	Bustard Bay
August 5	Port I
August 6	Port Curtis
August 9	Keppel Bay
August 20	Harvey's Isles
August 21	Port Bowen, Port II
August 28	Shoal Water Bay, Cape Townshend Island
September 5	Thirsty Sound
September 12	Broad Sound
September 29	Northumberland Islands
October 6	Great Barrier Reef
October 16	Cumberland Isles
October 21	Break-sea Spit
October 29	Murray's Islands
November 2	Prince of Wales Islands, Good Island
November 3	Endeavour Strait
November 17	Wellesleys Islands (Islands a, b, c)

Northern Territory

December 4	Turtle Island
December 8	Mornington Island (Island d)
December 16	Pellew's Islands, Vanderlin's Island (Island g)
December 25	North Island, (Island h)

1803

January 1	Maria Island (Island l)
January 4	Carpentaria mainland
January 15	Groote Eylandt
January 16	Winchelsea Island (Island p)
January 18	Bustard Island (Island q)
January 19	Burney Island (Island r) & Morgan Island (Island s)
January 26	Carpentaria mainland
February 2	Caledon Bay
February 11	Cape Arnhem
February 12	Melville Isles
February 13	N. Arnhem Bay
February 17	English Company Islands
March 1	North Coast Bay No. 3
March 5	Arnhem Bay
March 17	New Year's Isle

Timor

March 31	Coepany
April 8	Left Coepany

Western Australia

May 15	Archipelago of Recherche
May 17	Middle Island
June 9	Port Jackson

Notes

* Where no description is given and the common name applies to several genera identification is naturally impossible.

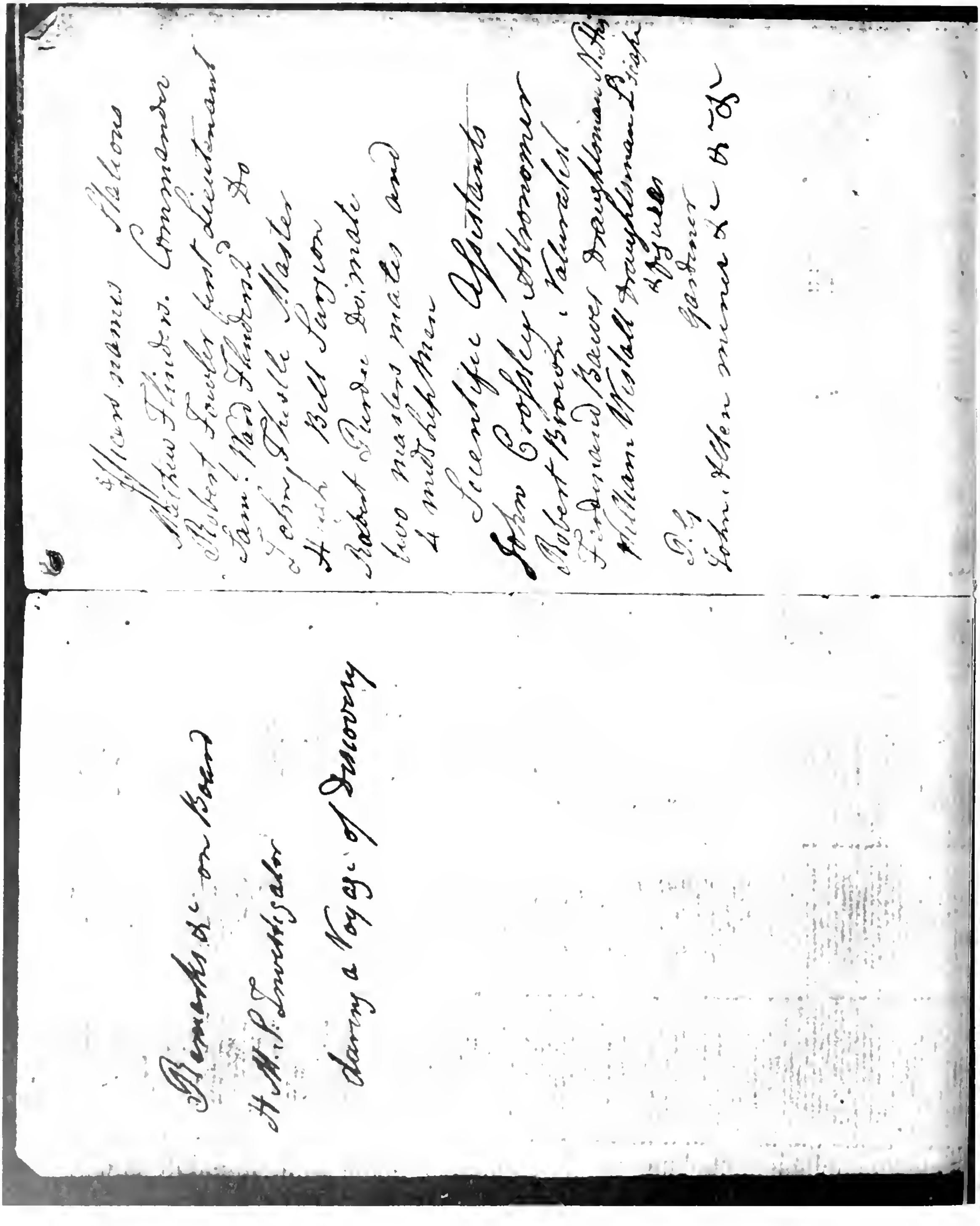
1 Cap de la Hague, opposite St. Albans Head, Dorset.
2 Promontory on the south coast of Dorset.
3 Square-rigged vessel with two masts.
4 *Ferdinand L. Bauer's sketch not traced (Brown's Diary).
5 Robert Brown (1773–1858) naturalist.
6 Ferdinand Lucas Bauer (1776–1826), natural history painter.
7 Rear Admiral Robert Merrick Fowler (–d. 1860), entered the Navy in 1793 promoted Lieutenant on joining H.M.S. *Investigator* (O. Byrne, 1849).
8 William Westall (1776–1850), landscape and figure painter.
9 Hugh Bell, surgeon, obtained a warrant in 1800 (Steel, 1790).
10 John Allen, miner, from the Ashover district of Derbyshire, who was member of a family known to Sir Joseph Banks.
11 Pico Riuvo, volcanic mountain of 6056 feet, Madeira.
12 *Identification impossible.
13 *Remora remora* (L. 1758).
14 Fogo, one of the Cape Verde Islands.
15 Probably the common swallow *Hirundo rustica* L. 1758 on migration.
16 The common names porpoise and dolphin were interchangeable at this time so identification impossible.
17 Sailor's name for the Frigate bird, *Fregata* sp.
18 Flying fish—family Exocaetidae.
19 This may refer to the albacore or long-finned tunny (*Thunnus alalunga* (Bonnaterre, 1788).
20 ?, The oceanic bonito *Katsuwonus pelamis* (L. 1758).
21 Maalstrom Island charted as 16° 00N 37° 00W in the early 19th century. Findlay, 1861, gives the Dutch cartographer Van Keulen as the source and describes it as not found in 1799.
22 *Sula* sp.
23 Samuel Ward Flinders, 2nd Lieutenant, younger brother of Matthew Flinders (–1834 or 5).
24 The common name dolphin usually denotes a cetacean but was sometimes used for the dolphin fish *Coryphaena hippuris* (L. 1758), species given in Brown's diary.
25 A reference to P. de Auverne's topographical plan of *Isle of Trinidada*, 1787, though this chart is not mentioned in *Some early printed maps of Trinidad and Tobago* (Map Collectors Circle No. 10, 1964).
26 Flinder's (*Voyage*, 1814) considered this to be the Nine Pin of Auverne's chart.
27 *Diomedia* sp.

28 Pintardo birds, here refer to the petrels commonly known as Cape Pigeons *Daption capensis* L. 1758 formerly *Procellaria capensis*.
29 *Procellaria aequinoctialis* L. 1758, a large dark shearwater commonly known as the Cape hen.
30 Saxenburg island, a mythical island reported by John Lidestz, a Dutchman in 1670 as 30°45′S 20°00W. Flinders (*Vogage*, 1814) states the position 30°18′S 28°20W.
31 *Identification impossible.
32 *Alopias sp*, a shark with a long tail.
33 Paulsberg, one of the major mountain peaks in Cape Point nature reserve, Cape Town, South Africa (Rourke *in lett*.)
34 ? The homestead of Viterstehoek in Cape Town, marked as Smith's farm on modern maps (Rourke *in lett*.).
35 Variant spelling for buck, male deer.
36 Fish Hoek Bay.
37 Cape Cobra, *Naja nivea* (L., 1755) (Rourke, 1974).
38 The road from Simons Town to a place called the Company's garden, led close past the observatory (Flinder's *Voyage*) 'Since the observatory which Flinders mentions had been set up on the South side of Simons Bay, we may deduce that the Company's garden was situated somewhere between the present day Simonstown and Froggy pond' (Rourke, 1974). Good's remark that the garden was 'usefull but not ornamental' would suggest that it was used for the cultivation of vegetables to supply the needs of shipping during the winter months.
39 Loos only occupied Tokai for a short period. The house was built for A. G. H. Teubes, 1795–96 (Rourke *in lett*.).
40 ? A reference to the farms Groot Constantia and Silverplace, the latter is, today, either Silverhurst or Witterboom (Rourke *in lett*).
41 *Protea repens* (L.) (Rourke, 1974).
42 *Leucodendron argenteum* (L.) R. Br. (Rourke, 1974).
43 Devil's Peak.
44 Van Riebeck (1618–77) established a fort at the Cape in 1652, leased a stretch of forest to Leendert Cornelissen, in 1657, of a garden developed there and known as Leendertsbos Guy Tachard (1650–1712) wrote in 1685, 'we were greatly surprised to find one of the most beautiful and curious gardens which I have ever seen in a country which appears to be most barren and miserable in the world.' This garden eventually renamed Kirstenbosch is today the National Botanic Garden of South Africa.
45 *Erica sexfaria* Ait. (Rourke, 1974).
46 *Erica obliqua* Thunb. (Rourke, 1974).
47 *Podocarpus latifolius* (Thunb.) R. Br. ex Mirb. (Rourke, 1974).
48 *Diospyros whyteana* (Hiern) F. White (Rourke, 1974).
49 *Noltea africana* (L.) Reich. f. (Rourke, 1974).
50 *Erica triflora* L. (Rourke, 1974).
51 *Alsophila capensis* (L.f.) Sm. (Rourke, 1974).
52 Muizenberg.

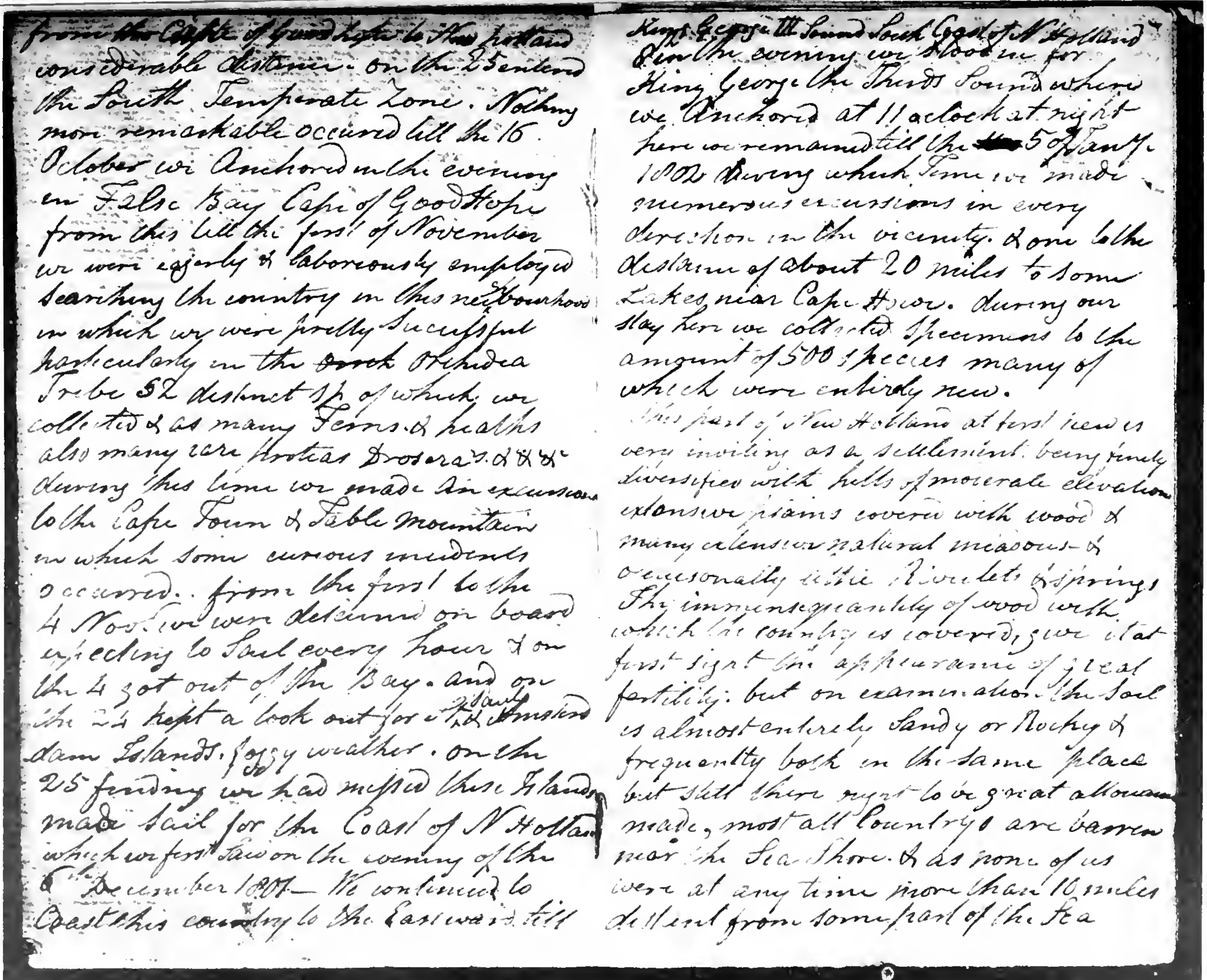
53 John Crosley, astronomer, was from 1790 assistant to the Astronomer Royal N. Maskelyne (1732–1811). Ill health forced him to return to England after reaching the Cape.
54 Brown (Diary) examined a water sample under the highest magnification of an Ellis aquatic microscope and found it contained a minute animacule. Plankton bloom is a well known phenomenon in False Bay. The reddish discolouration of the surface waters in early summer is chiefly due to two dinoflagellates *Gonyaulax polygramma* Stein and *Noctiluca scintillans* Macartney (Grindley & Taylor, 1964).
55 Cape Agulhas is the southern most tip of South Africa.
56 St Pauls and Amsterdam Islands 60 miles apart in southern Indian Ocean.
57 Western Australia.
58 West Cape Howe, West of Albany, Western Australia.
59 *Arctocephalus dorifera* (Jones, 1923).
60 Captain George Vancouver (1758–98), in command of a voyage to the North Atlantic Ocean and round the world in H.M.S. *Discovery*, 1790–95. discovered King George III Sound, 28 September 1791.
61 *Macropus fuliginosus* (Desmarest, 1817), Bauer drawing No. 10, Zoology Library, British Museum (Natural History).
62 See No. 58.
63 *Identification impossible.
64 *Identification impossible.
65 *Cygnus atratus* (Latham, 1790).
66 ? Built by the osprey *Pandion haliaetus* (L. 1758).
67 *Dromaius novaehollandiae* (Latham, 1790).
68 *Egernia cunninghami* (Gray, 1843) Bauer drawing No. 27 Zoology Library, British Museum (Natural History).
69 Islands shown on a chart publshed in J. A. B. d'Entracasteaux *Voyage de Dentracasteaux ou La Recherche* ..., 1807–8.
70 *Cycas media* R. Br.
71 Cape Barren Geese, *Cereopsis novaehollandiae* Latham, 1801.
72 Robert Thistle, Master of the *Investigator*'s cutter.
73 ? The prints of the dingo *Canis familiaris dingo*, (Meyer 1793).
74 ? *Bromus arenarius* Labill.
75 Mutton bird—sooty petrel, *Puffinus tenuirostris* Temminck 1835.
76 Tamar wallaby, *Marcropus eugenii* (J. H. Calaby *in lett.*).
77 ? Carpet python *Phython spilotes* or black tiger snake *Notechis ater* (J. H. Calaby *in lett.*).
78 *Trichosarus vulspecula* (J. H. Calaby *in lett.*).
79 Crew members, Taylor midshipman; Smith, Coxswain, George Lewis, William Grindall, Little, Hopkins and Williams (Brown's Diary).
80 *Identification impossible.
81 Good is probably referring to the emu *see* 63.
82 *Nicotinia* sp.
83 *Macropus fuliginosus* (Desmarest, 1817).
84 *Pelecanus conspicullatus*, Temminck, 1824.

85/86 Good is referring to the monitor lizards of the family Veranidae.
87 Boobook (or Spotted) owl *Ninox novaeseelandiae* (Gmelin, 1788).
88 *Aquila audax* (Latham, 1801).
89 ? *Phaps chalcoptera* (Latham, 1790) or *P. elegans* (Temminck, 1810).
90 "Identification impossible.
91 Nicolas Baudin (1756–1803), Commander of the *Le Naturaliste* and *Le Geographie* who sailed from Le Havre 19 October 1800 ostensively to explore the south coast of New Holland.
92 David Nelson (d. 1789), botanical collector on H.M.S. *Discovery* on Captain Cook's third voyage.
93 ? *Cyathea* sp.
94 George Bass (d. 1812), Surgeon, who in 1798 with Lieutenant Flinders sailed round Tasmania in H.M.S. *Norfolk* and discovered the strait named after him.
95 Jean Baptiste Louis Claude Theodore Leschenault de la Tour (1773–1826).
96 General use of this name discontinued in the first half of the nineteenth century. It is an area east of Richmond and bounded approximately by Richmond on the West, the Richmond Road to the South, South Creek down to the Hawkesbury on the East (McGillivray *in lett.*).
97 On the Hawksbury river at the place now known as Wisemans Ferry (McGillivray *in lett.*).
98 *Livistonia australis* Mart.
99 *Passiflora* sp.
100 Toongabbie, Sydney.
101 At the mouth of the Hawkesbury river (McGillivray *in lett.*).
102 Port Stephens, Sydney.
103 A misidentification, d'Entracasteaux's Archipelago is off Papua.
104 Bongaree, a native who had sailed with Lieutenant Flinders in H.M.S. *Norfolk*.
105 Woomera, a throwing stick used by natives.
106 *Araucaria cunninghamii* Ait.
107 Derived from the Aboriginal word for a shield, originally in Port Jackson language but use of the word spread through New South Wales and Queensland. E-lee-mong-a shield made of bark (Collins, 1798) E-li-mang-a small shield made of bark (Hunter, 1793).
108 *Xylocarpus* sp.
109 Probably a reference to Sea Snakes.
110 Large rope.
111 *Tridacna gigas* (L. 1758).
112 Three brothers, now known as South Brother, Middle Brother and North Brother, in the vicinity of 31°15S, 152°45E (McGillivray *in lett.*)
113 Smoky Cape 30°55S, 153°05E.
114 Mount Warning 20°24S, 153°16E.
115 Indian Head, Sand Cape and Breaksea spit are all locations on or near Fraser Island, Queensland (McGillivray *in lett.*).
116 Piece of armour for the throat.

117 ? *Musa banksii* or *M. hillii* (N. Byrnes *in lett.*).
118 *Dioscorea* sp. (N. Byrnes *in lett.*).
119 ? *Ficus racemosa* L. (N. Byrnes *in lett.*).
120 Endeavour strait.
121 Jan Cartenz in the Pera, in 1623, discovered the Vereenichde river on the western end of Cape York between 14° and 15°N (Sharp, 1963).
122 *Ipomoea biloba* Forsk.
123 ? *Ardeotis australis* (J. E. Gray, 1829).
124 *Cycas media* R. Br.
125 *Nymphaea stellata* Willd.
126 *Myristica insipida* R. Br.
127 Explanation of fireplaces given in entry for February 20.
128 *Macropus giganteus* Shaw 1790.
129 A Malay boat propelled by sails or oars.
130 *Grus* sp.
131 Traders from Malaya.
132 Holothurians commonly called sea cucumbers, bêche de mer. Used by Chinese to make soup.
133 Timor Laut Islands, East Indies 8OS 130. 1 E.
134 Kupany, capital of Timor.
135 The Trial rocks obtained their name from an English ship Trial, which was lost upon them in 1622, but their exact situation seemed not to be well known (Flinders, 1814). It remains impossible to give a location for these rocks (Wood, 1922).
136 Situated at the eastern end of King George's Sound, separating it from the Baie des Deux Peuples.


Remarks &c on Board
H.M.S. Investigator
during a Voyage of Discovery

Officers names Stations
Mathew Flinders Commander
Robert Fowler first Lieutenant
Saml. Ward Flinders 2d Do
John Thistle Master
Hugh Bell Surgeon
Robert Purdie Do mate
two masters mates and
4 midshipmen
Scientific Assistants
John Crossley Astronomer
Robert Brown Naturalist
Ferdinand Bauer Draughtsman N.H.
William Westall Draughtsman Landscape
P. G. Gardener
John Allen miner &c &c



~~from the Cape of Good hope to New holland~~
considerable distance - on the 25 entered
the South Temperate Zone. Nothing
more remarkable occured till the 16
October we Anchored in the evening
in False Bay Cape of Good Hope
from this till the first of November
we were eagerly & laboriously employed
searching the country in this neighbourhood
in which we were pretty successful
particularly in the Orchidea
Tribe 52 distinct Sp of which we
collected & as many Ferns & heaths
also many rare Proteas Droseras &c &c &c
during this time we made an excursion
to the Cape Town & Table mountain
in which some curious incidents
occurred. from the first to the
4 Nov. we were detained on board
expecting to sail every hour & on
the 4 got out of the Bay. and on
the 24 kept a look out for St Pauls & Amsterdam Islands. foggy weather. on the
25 finding we had missed these Islands
made sail for the Coast of N Holland
which we first saw on the evening of the
6th December 1801 — We continued to
Coast this country to the Eastward till

~~King George III Sound South Coast of N Holland~~
8 in the evening we stood in for
King George the Thirds Sound where
we Anchored at 11 oclock at night
here we remained till the 5 of Jany.
1802 during which time we made
numerous excursions in every
direction in the vicinity. & one to the
distance of about 20 miles to some
Lakes near Cape Howe. during our
stay here we collected specimens to the
amount of 500 species many of
which were entirely new.
This part of New Holland at first view is
very inviting as a settlement being finely
diversified with hills of moderate elevation
extensive plains covered with wood &
many extensive natural meadows &
occasionally little Rivulets & springs
The immense quantity of wood with
which the country is covered, give it at
first sight the appearance of great
fertility: but on examination the soil
is almost entirely sandy or Rocky &
frequently both in the same place
but still there ought to be great allowance
made, most all Countrys are barren
near the Sea Shore. & as none of us
were at any time more than 10 miles
distant from some part of the Sea

King George III Sound S. Coast of New Holland

we can only be said to to have seen the Sea Shore of this part of the Coast & the interior may be very fertile. as far as I could observe the Soil always appeared better adapted to Cultivation the more distant it was from the Sea. It will probably appear surprising that in very near a month which we remained here we had not seen more of the interior of the Country. but of the State of the Country it consists of the immense woods thickets long grass & the great difficulty of walking a few miles, as also that these obstacles became more formidable the farther we left the Shore & at the same time less to induce us as we always found the greatest variety of plants within a few miles of the Shore it will not be thought to proceed from neglect

During our Stay here we had various interviews with the Natives. some of which during the latter part of our Stay Visited the Tents regularly & were very friendly. They have much resemblance to the Port Jackson Natives but have no kind of Canoes & could

King Georges Sound to Dentrecasteaux Archipelago [5]

not be prevailed upon to come on board of our Ship or even Stay in a boat if under Sail although they readily went into the boat while it lay on the Beach. none of the Female Sex were Seen & but few children. the only clothing which the men wore was the Skin of a Kangaroo round their Shoulders like a Cloak some String apparently of human hair round their middle into which they fix their Stone hatchets & saws of similar materials. they had a hole in the Cartilage of the nose but I saw no Ornaments in it. they paint themselves variously. & appear very quiet inoffensive people & at the same time very courageous of which we had some instances *

On the 5 of Jan[y] we Sailed from K G Sound & stood to the Eastward in view of the land which is here somewhat hilly & is indented for many Bays of different Sizes but generally open. & as we increased our longitude the Country appeared more barren. being covered with low herbage but no luxuriant woods & on the 8 we fell in with Dentrecasteaux's Archipelago ● which

* the mountains were composed of Granite. Some Coral & calcareous matter but Granite was predominant

Bay I. South Coast N Holland
which consists of a great number of small
Islands all formd of Granite with
many bare Granite rocks & an
astonishing extent of Breakers.
The Coast of the Main very low and
barren on the 9 we were surounded
most all day with Islands & breakers
the main appearing miserably
barren vast tracts appearing white
Sand absolutely void of vegetation. in
the evening of the 9 finding ourselves
entangled with islands rocks & breakers
that it is impracticable to keep to Sea
during the night. Stood in for a Bay
in a point of the Main & anchored
here we remained till the 14 during
which time we collected several
fine plants particularly 7 or 8 sp
of Curious new Banksia. This part
of the Coast has for its foundation
a hard Coarse Granite. in many places
Ironstone. & the Soil is all Sandy
and very barren. no luxuriant
vegetation nor any soil to produce such
plenty of fresh water in ponds in several
places one close to the Shore & convenient
for supplying. but the whole Country

Bay I to Bay II S Coast N Holland
has a miserably barren appearance
from the Top of some hills of a considerable
elevation (particularly one whose summit
forms an immense natural arch
entirely through the mountain. this
arch is 70 yards broad at the base and
40 yards through the mountain it is 9
or 10 yards high) we had an extensive
View of the Country which except at
this point is a continued flat without
Any large wood & many little lakes
The Natives appear numerous as
fires were in every direction.
during our stay here we found a Palm
Tree with large fruit Green & which
was very pleasant to eat but some of
us suffered severely for eating it. being
taking with a violent reaching which
continued for many hours. Some who
eat of it were not in the least affected
On the 14 at Day light set sail from this
Bay & stood [illegible] through a number
of small islands. Rocks & Breakers
& kept sight of the Main which is
very barren. in the afternoon we
touched a Rock but received no
Damage & in evening Anchored in

Bay II South Coast N Holland
in a Bay of a large Island & Sheltered by
a small Island, here we appeared safe
for the present but we had been in the
imminent danger in coming here &
it appeared equally dangerous to go
away as we were still surrounded with
small Islands Rocks, Breakers &
Shoal water, here we remained two
Days during which time Captain &
officers were indefatigable in taking
bearings of the Islands, breakers &c.
seven of the 11th which was in sight
dist three or 4 Leagues, & the Scientific
assistants in their proper department
The Natural productions here were
not much varied. The Islands were
formed of Granite Some Quartz &c.
on the large Island we found a Lake
of salt water tinged with a red
colour which looked beautiful the
water of this Lake was much Salter
than the Sea & contained much salt
well dried laying on its shores as well
as much Crystalized in it.* On the 17th we
Got underway early & in afternoon got
clear of this Labyrinth of Rocks &
breakers. & Anchored in evening near
the Main which appeared barren

from Bay II to Bay III South Coast N Holl.
from the 18 to the 22 the Shore was
one Continued perpendicular Rock
of a whitish colour & whose Strata
appeared to run horizontal, no more
land could be seen than this Rock
even from the mast head. the Rock
was probably about 30 yards high
from the 22 to the 26 the Coast was
low with a Barren aspect many
little sands hills & much Smoak
The 26 & 27 we had again no other
view of land than a perpendicular rock
of 30 or 40 yards high in every respect
Similar to what we had passed from
the 18 to the 22. each of which I think
extended about 100 miles & no land
could be seen over from the mast
head. The Soundings since leaving
the Breakers had been very regular
On the 28 the coast was more irregular
& in evening stood in to a large Bay and
Anchored in three fths water. on the
29 went ashore early on the point of
land which shelters the Bay, we found
very little variety in the productions here
the country is very barren. the low
land appears as if innundated with
salt water at some seasons, it was
covered with a crust of Salt & no other

other Vegetation than a Sp or two of Salicornia on the low places although it appeard considerably above the level of the Sea As we were obliged to be on Board by noon of Course we could not penetrate far into the Country. we saw in some places the print of the feet of Natives and Dogs but no fresh water. what we saw of this part is very barren but the interior looked better. the Rock is Calcarious. after noon Weighed and Stood to Eastward along a barren Country without any thing material till the 2d of February saw many Islands & breakers & a number of Birds of the Peterel kind on the wing & in evening Anchord in a Bay on N side of a large Island the 3d was employed in ~~examining~~ this Island which is very barren in Vegetables & without a drop of fresh water on the island which Inhabited by an innumerable quantity of Birds of the Peterel kind which burrow here in the Sand in the night as also to deposit their eggs & in the day time take to the Ocean for Subsistence here are also many Seals Several of which were killed as also 4 or 500 of these birds which for want of fresh meat were tolerable food but taste very fishy & oily. The heat was very troublesom here. the Rock was various consist

consisting of Porphery or Granite for Base & Sandstone & Calcarious stone The 4, 5 & 6 were employed in exploring some deep Bays & inlets of the Main opposite the abovementioned Islands on the 7 Mr Brown & party landed on a long narrow Island near the main which was well Stocked with a Sp of Kangaroo about the size of a hare, but at this season in very bad condition, three of them were killd The heat here was excessive & the Soil barren Sand & little variety of vegetation. In the night of the 7 returned to our former Anchorage of the 2d & next day upwards of 750 birds were caught — on the 9 got under way in the & stood Eastward fresh breeze & cool Air the 10 the Coast had a pleasant appearance high rocky points fine hills & Bays in one place a small opening appeard & water seen over land from the mast head, but the water appeard Shoal at entrance & the shore rocky — the 11 fell in with a number of Islands & Breakers the wind being Contrary Anchord we were detained by this & other

Extant Lists of Seeds
British Museum (Natural History), Botany Library

(a) 'List of seeds collected in the vicinity of George III Sound from December 10 to January 4 1801–2', 8 folios*. There is also an incomplete version of 6 folios* and a further version of 6 folios. In these lists details are given of habit and habitat of some species and if the flower was described, the latter being a reference to the descriptions made by Brown. [See pp. 144–158]

(b) 'List of seeds collected on the South West Coast of New Holland. King George III Sound December 10 1801 January 4 1802: Seeds collected in the neihbourhood of Bay I January 10–13 inclusive 1802, Bay III, Bay IV Anchorage V, Anchorage VII, Anchorage VIII, Memory Cove, Bay X, Anchorage XI, Inlet, Kangaroo Island, Kings Island, Port Philip, Seeds Collected in the neihbourhood of Port Jackson from 10 May 1802 to 20 July 1802', 11 folios*. These are merely alphabetical lists of species collected at the various anchorages. [See pp. 159–169]

(c) 'Seeds collected from 10 to 13 January 1802', 4 folios*. 'Seeds collected in the neihbourhood of Port Jackson from 10 May 1802 to July 1802', 7 folios.* 'Seeds collected in neihbourhood of Port Jackson from 10 May to 12 July 1802', 1 folio*. These lists give details of habit and habitat. [See pp. 170–181]

(d) 'List of seeds collected on the East Coast of New Holland Sandy Cape. July 30–31– 1802, Port I from 5th to 8th August 1802, Keppel Bay from 9 to 15 August 1802, Port II 21–22 August 1802, Passage III Shoalwater Bay 26 August 1802, Cape Townshend Island 28 August 1802, Shoal Bay S.W. Side 30 August and 3 & 4 September 1802, Thirsty Sound 5–6 September 1802 Broad Sound 12–26 September 1802, Northumberland Islands from September 29 to October 3–1802, Cumberland Islands 16 Oct. 1802, Prince of Wales Island Nov. 2 1802, Carpentaria Islands a b c Nov. 17–28– 1802, Turtle Island Dec. 4 1802, Carpentaria Island g h and i 16 to 25 December 1802, Carpentaria Island l 1 January 1803, Carpentaria on the main January 4 1803, Carpentaria Groots Eyland 15–10 January 1803, Gulf of Carpentaria Islands r and s January 19–21 1803, Gulf of Carpentaria on the main January 26–28 1803, Gulf of Carpentaria Arnheim S. Bay February 4–9– 1803, North Coast of New Holland Arnheim N Bay February 3–18 1803, North Coast Islands v to &c February 4–9– 1803, North Coast of New Holland Arnheim N. Bay February 3–18 1803, North Coast Islands v to &c. February 18–27 1803', 1 folio*, 'N. 1803, N. Coast No 3 Bay March 1–4 1803, North Coast New Tears Day Island March 12 1803', 17 folios. These lists give details of habit and habitat. There is also an incomplete version of 9 folios. [See p. 182]

(e) 'List of seeds collected on the East and North Coasts of New Holland from the 30th July 1802 to the 4 March 1803', 9 folios*. An alphabetical list giving the locality where the species was collected and concluded with a list of the dates at the different anchorages. Many of the species are prefixed by a + which indicated where they were included in that particular consignment; those species without a + were duplicates which were to be forwarded by the first opportunity. There are also three extra versions of this list, 8 folios; 13 folios and 9 folios. [See pp. 183–192]

'Seeds collected on the Island of Timor from 1–8 April 1803', 2 folios*.
'List of seed sown in vicinity of spring and various other situations of the island on the 2–4 & 5 April 1802'*. [See pp. 193–195]

Note: Those marked with an asterisk are here reproduced.

Facsimile of Seed Lists

List of Seeds Collected in the
vicinity of King George III.d Sound
from Decr 10 to Jany 4
1801 — 1802

1 Banksia grandis some Trees of
this were seen 20 feet high though
rarely above 10 & when at its best appearing
from 5 to 8 feet high when of that height
it is nearly covered with its fine foliage
which with well serve to indicate its Flowers
plentiful like ~~ta[illegible]~~ in Spikes similar
to a bottle Brush of from 5 to 8 or 10 inches
in length of a fine orange colour and
very large Cones - when it exceeds the
height of 10 feet it is in shady Situation
its stem is slender & naked and can
scarce support a few branches at top
with the weight of a few flowers & fruit
It grows in great plenty in all situations
about King George Sound except in
marshes & the tops of hills where it is
never found - produces flowers in Decr
and Janry & probably longer

2 Spruce moss a Shrubby Spreading Bush
seldom exceeding five or six feet high &
producing many flowers & fruit none
of the best we saw in perfection as
they were all Decayed but appeared at
this time Decr at a distance a fine red
but near it was dull - it must be
very showy when in perfection for over

now it had a pleasing effect - grows on the sides of steep hills ~~near the shore~~ composed of Granite & covered with little but sand grows very near the shore and only seen in vicinity of Bald head at entrance of Sound probably flowers in [illegible] & Nov

3 B Serra Grows plentiful in woods & level ground of a Sandy Soil, forms a handsome Tree its Timber of a red colour & hard durable Compact texture but not very strong, might be used for various Economical purposes [illegible] with a Stem thicker than a [illegible] the height of 10 or 12 feet when it branches into a large spreading top not unlike a Shrubb ~~oak~~ [illegible] but with long serrated leaves produces it flowers in Spikes yellow of a light yellow Colour in Dec & [illegible] longer

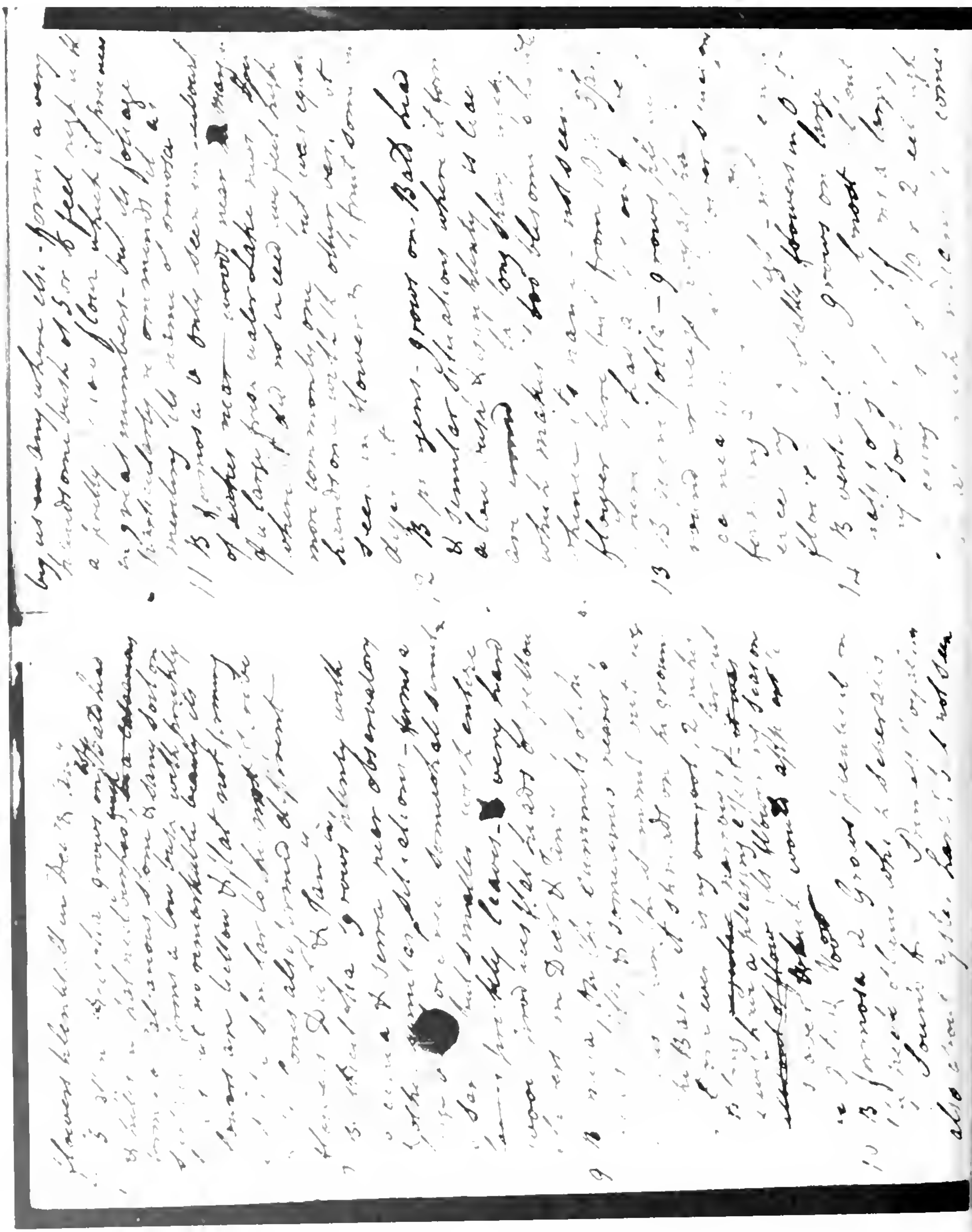
4 B [illegible] nutosa [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] & [illegible] [illegible] [illegible] honey [illegible] [illegible] [illegible] [illegible] [illegible] different leaves [illegible] in [illegible] [illegible] [illegible] [illegible] [illegible] also grows in marshes [illegible] [illegible] but plenty about [illegible] [illegible] [illegible] Cape Howe forms a handsome [illegible] near [illegible] [illegible] feet high and [illegible] [illegible] [illegible] flowers in [illegible] in [illegible] & June

5 B [illegible] only seen in one place

2

in coming from Oyster H near to the Sound on the skirts of a wood & a swamp - forms a dwarf spreading bush with entire leaves and round knotted cones not seen in flower

6 B coccinea grows in great plenty ~~near~~ on side of hills near to their base about where observatory was placed in [illegible] harbour and in several other similar situations about Oyster harb & sound it seldom exceeds four feet in height and is but little branched & never gains any strength of stem it leaves are entire & rounded [illegible] entire in the Stem & adhering long it begins to flower at the height of 6 or 8 inches producing its flower at the top of the Branch which frequently becomes forked at the flower but as frequently only pushes out one branch leaving a [illegible] [illegible] & every years growth seems to produce a flower next spring Its flowers make it very desirable [illegible] in form nearly round like [illegible] the beautiful Scarlet ~~flowers anthers &~~ stamens forming such regular and exact rows as to make it more desirable than any of the genus yet discovered - it grows in a soil little else than a mixture of black & white Sand which at this season was quite dry - it is very shy of being removed I transplanted many plants of different size with balls sufficiently large not to disturb its roots, but many died in a few days after removal and none lived long



flowers plentifully in Dec & Jan
[illegible] grows on Bats head
[illegible] near Observatory ~~in a calcareous~~
[illegible] & damp soil on
[illegible] forms a low bush with prickly
[illegible] no remarkable beauty its
flowers are yellow & flat not forming
[illegible]
[illegible] also formed different
flowers Dec & Jan
[illegible] grows plenty with
[illegible] & serra near observatory
& other similar situations — forms a
[illegible] somewhat similar
[illegible] but smaller with entire
[illegible] prickly leaves — very hard
wood [illegible] flat heads of yellow
flowers in Dec & Jan
9 B [illegible] on the summits of the
[illegible] & sometimes nearer to
[illegible]
[illegible] It spreads on the ground
[illegible] is my own root, 2 inches
[illegible] ~~[illegible]~~ narrow [illegible]
[illegible] have a pleasing effect ~~it was~~
~~[illegible]~~ its flowering season
[illegible] would [illegible]
[illegible]
10 B formosa it Grows plentiful on
[illegible]
Sounds [illegible]
also [illegible] have [illegible] not seen

by us in any where else — forms a very
handsome bush of 5 or 6 feet high [illegible]
a pretty [illegible] flower which it produces
in great numbers — but its foliage
particularly recommends it [illegible]
meriting its name of formosa
11 B formosa b only seen in [illegible]
of [illegible] near woods near [illegible]
of a large fresh water Lake [illegible]
where it did not exceed [illegible] feet high
more commonly one [illegible] was equal
handsome with the other var. [illegible]
seen in flower [illegible] fruit some [illegible]
[illegible]
12 B [illegible] grows on Bats head
& similar situations where it form
a low bush & [illegible] plenty, its leaves
are [illegible] long sharp [illegible]
which makes it too blossom [illegible]
thence its name — not seen in
flower here but from [illegible]
[illegible] had [illegible]
13 B [illegible] — grows [illegible]
[illegible]
[illegible]
[illegible]
[illegible] flowers in [illegible]
[illegible]
14 B [illegible] grows on large
[illegible] knott [illegible]
[illegible]
[illegible]
[illegible]
[illegible] come

comes into flower in Jany and was only seen in the vicinity of Bald head & on Granite as before mentioned with more or less soil

Conchium

1 C dimorphum a hansome bush seldom exceeding six feet high its leaves generally entire & needle shaped but frequently intermixt with many oval leaves grows on the sides of hills of Granite without much soil flowering season uncertain

2 C dentatum found in woods on a sandy soil forming a tolerable bush flowers Decr & Jany

3 C compositum – grows also in woods on sandy soil a pretty shrub flowers in Decr

4 C decompositum – similar to last but different in ge

5 C floridum – a handsome little shrub producing numerous white flowers with a very sweet & [illegible] very fragrant in Decr & Jany

6 C integrifolium – a handsome shrub with entire leaves – you are already possessed of at a new Banksia

7 C latifolium a handsome shrub or bush of 2 or 3 feet high with broad roundish leaves of a rusty colour on the side of hills near the summit ..

8 C prostratum U a shrub with prickly leaves in woods on sandy soil flowers Decr ..

9 C prostratum b commonly on high land where it creeps on the ground on sandy soil not seen in flower

Protea

1 conifera

2 nitriflora

3 [illegible] all pretty little shrubs flower in Decr on soil of red earth & small stones

Eucalyptus

1 E affin. Metrosideros gummifera a large tree plentiful in woods

2 E Caps [illegible] umbellatus a smaller tree also common in woods

3 E cornuta Billard a handsome small tree flowers Decr & Jany

4 E globulus Billard a fine tree in woods – not plentiful here flowers in Jany

Melaleuca

1 M polyneura grows in woods a small shrub with fine scarlet flowers in Decr & Jany

2 M [illegible]neura affin & similar to the former with leaves & capsules smaller not seen in flower

3 M [illegible] a pretty low shrub in places that appear to be inundated at some seasons in Decr

4 [illegible]mosa a dwarf shrub on sides of hills part[icularly] near Bald head sandy soil producing plenty of pink [illegible] flowers in Decr

5 M densi[illegible] pretty little shrub on borders of marshes [illegible] boggy soil

6 M densifol[ia] [illegible] in situation & appearance [illegible]

7 M [illegible] in appearance [illegible] [illegible] produces yellow flowers [illegible] Jany

8 M aversa pretty shrub in marshes with beautiful scarlet or crimson flowers Decr

Mimosa

1 M oblongata a pretty shrub grows among rocks close on shore on the neck which separates the Sound from P K harbr & not seen elsewhere flowers Jany

2 M [illegible]uneata a pretty low shrub [illegible] a very singular appearance grows plentiful on sandy soil near shore of harbr

3 M cuneata b very like the former found in wood

4 M [illegible] a beautiful tree in shady woods [illegible] a rich light soil not seen in flower

5 M B a pretty small shrub on sandy soil [illegible] Decr & Jany

6 M C more dwarf than former with hairy leaves similar soil & sit[uatio]n

7 M D time I only seen in wood at top of P K harb in a light red gravelly soil shaded with tall trees itself not exceeding 6 feet high fl Decr Jany

8 M E handsome shrub only seen on [illegible] north of P K harb growing in a [illegible] streak of light red soil on granite rock fl Decr

9 M F a shrub near the shore not seen in flower

10 M F b similar to former

11 M microphylla pretty little dwarf shrub on sandy or gravelly soil

12 M paradoxa comonly in the shade among woods on light red soil its leaves & branches are the same being [illegible] & then growing from joints like a cactus fl Decr & Jany & prob[abl]y Feby

Glycine

1 A On tops of hills particularly about Bald head on sandy soil fl Nov Decr

2 G B on sandy soil exposed situation & spreads far on the ground this & former has red flowers - fl Decr

3 G C very dwarf with simple leaves & fine scarlet flowers in Decr

6

4 G D Grows in woods where it climbs a great height on bushes & produces much fruit not seen in flower
5 G E rather scarce not seen in flower
Epacris
1 E coccinea a most beautiful little shrub or ~~plant~~ with long tubular bellied flowers of a fine scarlet colour grows in marshes of a Black bog soil, flowers in Decr
2 E caerulea very pretty ~~small plant~~ with red ~~calyx~~ & blue corol on sandy soil. in Nov & Decr
3 E pentapetala very handsome with white flowers plentiful on rather elevated situations & sandy soil fl. Decr
4 E rigida generally with shrub soil on granite rocks. Novr Decr
5 E affin reflexo very handsome white flowers, grows in great patches in low places between hills composed of a sandy soil. but which appears to be inundated at some seasons
Pimelia
1 P. sylvestris handsome low shrub grows in woods & flowers in Novr & Decr
2 P formosa grows in more exposed sites on sandy soil very handsome fl. Decr
3 P. decussata on sandy soil on sides of hills generally near the sea coast where it has a beautiful appearance flowering very plentifull in Decr
4 P. arborescens. tolerable sized shrub in woods found in flower only on 16 Jany 1802
Styphelia
1 microphylla. ~~handsome~~ dwarf shrub on sandy soil not seen in flower
2 S ericoid. affin handsome small shrub on rather moist situations
3 S longifolia pretty shrub on borders of marshes bog soil not seen in flower
4 S ~~affin lanceolata~~ pretty Dwarf shrub ~~elliptica~~ on dry sandy soil
5 S affin lanceolata handsome shrub in marshy situations
1 Conostomum flexifolium - on the sides of hills on sandy soil is probably evergreen as all the longong are, it is at any rate durable but probably its foliage ... on fl. Decr - 12 inches high
1 Embothrium viscidum pretty low shrub on sandy soil fl. Decr
1 ... bothrium sp
1 Persoonia salicifolia a fine bush or shrub 10 or 12 feet high with pretty yellow flowers in Decr - dry sit.n
2 Persoonia pilformis - lowish shrub

grows about marshes with black soil
producing ... low flowers in Dec
1 Leptospermum salicifolium
on top of hills in sandy soil
where it forms a bush or dwarf
tree 12 or 15 feet high with hard
strong wood fl Dec
1 Le. ostegmoides arbuscula a little
dwarf shrub on sandy soil in low
situations which at some seasons
inundated fl Dec
1 Pultenaeoides A a curious bush in
woods on sandy soil fl Nov Dec
2 P. retusa in woods to W of P K
harb^r where it forms a bush of 10 or 12
feet high not seen in flower
1 Chorizema ilicifolia a pretty
little D. or S. grows in various situations
generally on sandy soil fl Dec
1 Thelymetra grandiflora moist
soil fl Dec curious orchis
1 Lobelia azurea ⊙ fl Dec & Jany
1 Menyanthes exalta one with
yellow flowers & another with
white grows in marshes fl Dec
1 Dianella paniculata, only seen
in wood at top of harb sparingly
fl Dec
2

2 D. grows on a thin stratum of
earth on granite rock where it flowers
plentiful in Dec
1 Lepidium dentatum on small
Island in mouth of Sound called Seal
Island fl Dec ⊙
1 Centauroides scariosa ⊙ grows on the
tops of hills in sandy soil fl Dec
1 Boronia alata a handsome shrub
grows among sand & rocks near
the shore of Sound not seen elsewhere
fl Dec & Jany
1 Westringia rosmariniformis on
same situations as last fl Dec & Jany
1 ... goodenia Bald head Dec
1 Goodenoides arborea. handsome plant
on sandy soil generally elevated Dec
1 Lobeliastrum gramineum handsome
appears perennial on sandy soil &
flowers in Dec
2 L. ... dwarf annual grows on
moist ground fl Dec
1 Lasiopetaloides collina shruby 10
or 12 feet high in wood to N of harb^r
flowers Dec
1 Tetratheca ferruginea handsome
little plant appears perennial &
grows in woods on the sides of
hills in dry situations fl Dec

1 Exocarpus juncea. handsome bush of
tolerable height - produces very minute
flowers in Decr & Jany grows generally
in somewhat elevated situations
1 Xyris flexuosa; little plant with a beautiful
~~yellow~~ flower appears ⊙ grows in marshes
on bog soil or rather on thin strata of
black soil on granite rocks where water
is constantly draining throu fl Decr
12 Xyris capitata

1 Schoenus capitat on moist bog soil
1 Stackhousia paniculata ⊙ on light
soil fl Decr
2 S pubescens - this & former commonly
in woods on light soil ⊙ fl Decr
1 Fimbriaria ~~flexuosa~~ ramosa
small plant elegant blue fringed
flowers in Decr appears ⊙
2 F umbellata - flower equally fine
with last both of which grow in same
situations as Xyris flexuosa fl Decr
the flowers of these two are delicate
& very desirable might probably succeed
in pots placed in water with the surface
a little raised
1 Lavatera canescens on Seal Island
probably biennial fl Decr & Jany
1 Anigozanthus lutea - fam Liliaceous
perennial grows on sandy moist
situations fl Decr

1 Mesembryanthemum Angulare on sandy
soil fl Decr
1 Casuarina Stricta generally on
hills where it makes a moderate tree
1 Myoporum tuberculatum on sandy
soil ~~near Sea Shore~~ in woods to
South of Lark 5 fl Decr
renea repitans - a pretty
creeping plant with yellow flowers
in Decr on sandy soil

1 a small shrub on sandy soil
2 beautiful little diadelphous plant
with a scarlet flower, twining among
bushes in woods probably ⊙ fl Decr
3 Diadelphous shrub on sandy soil fl Decr
4 Liliaceous appears a beautiful grass
grows in woods fl Decr
5 Diadelphous shrub
6 Styphelia handsome shrub
7 shrubby on situations rather elevated
fl Decr
8 Goodenia probably ⊙ low spreading
very handsome fl Decr
9 low plant appears deciduous fl Decr
on sandy
1 curious umbelliferous plant on
sandy soil 4 fl Decr
1 Diplarena - perennial handsome
blue flower in Decr
12 Styphelia shrubby

13 Styphelia Shrubby
14 Solanoides pretty dwarf shrub on sandy soil in various situations fl Decr
15 Diadelphous shrub in woods
16 Pentandrous on sandy soil near Sea fl Decr flowers handsome & singular probably biennial
17 curious umbelliferous 4 fl Decr
18 shrub in marshes in woods resembling a raspberry bush fl Nov Decr
19 Syngenes 0 not seen in leaf or flower
20 Styphelia on light red soil on tops of hills very Dwarf 5 fl Decr
21 New Genus a curious dwarf shrub on sandy soil
22 Cestoides Dwarf creeping or climbing plant in shady situations fl Decr
23 curious bulbous plant in moist situations & sandy soil
24 In moist bogs
25 on thin strata of earth on Granite not seen in fl 4
26 Lobeliastrum very handsome climbing among bushes in woods. fl Decr
27 Styphelia shrub in woods
28 on sandy soil & rather elevated
29 Proteoidea millifolia on light red soil flowers N & Decr handsome 3
30 in wood on Sof hard shrub; fl Decr
31 Dwarf shrub black bog & sandy soil
32 probably the same as 18

Alyxie buxifolia 5 sandy soil
Syngenes.

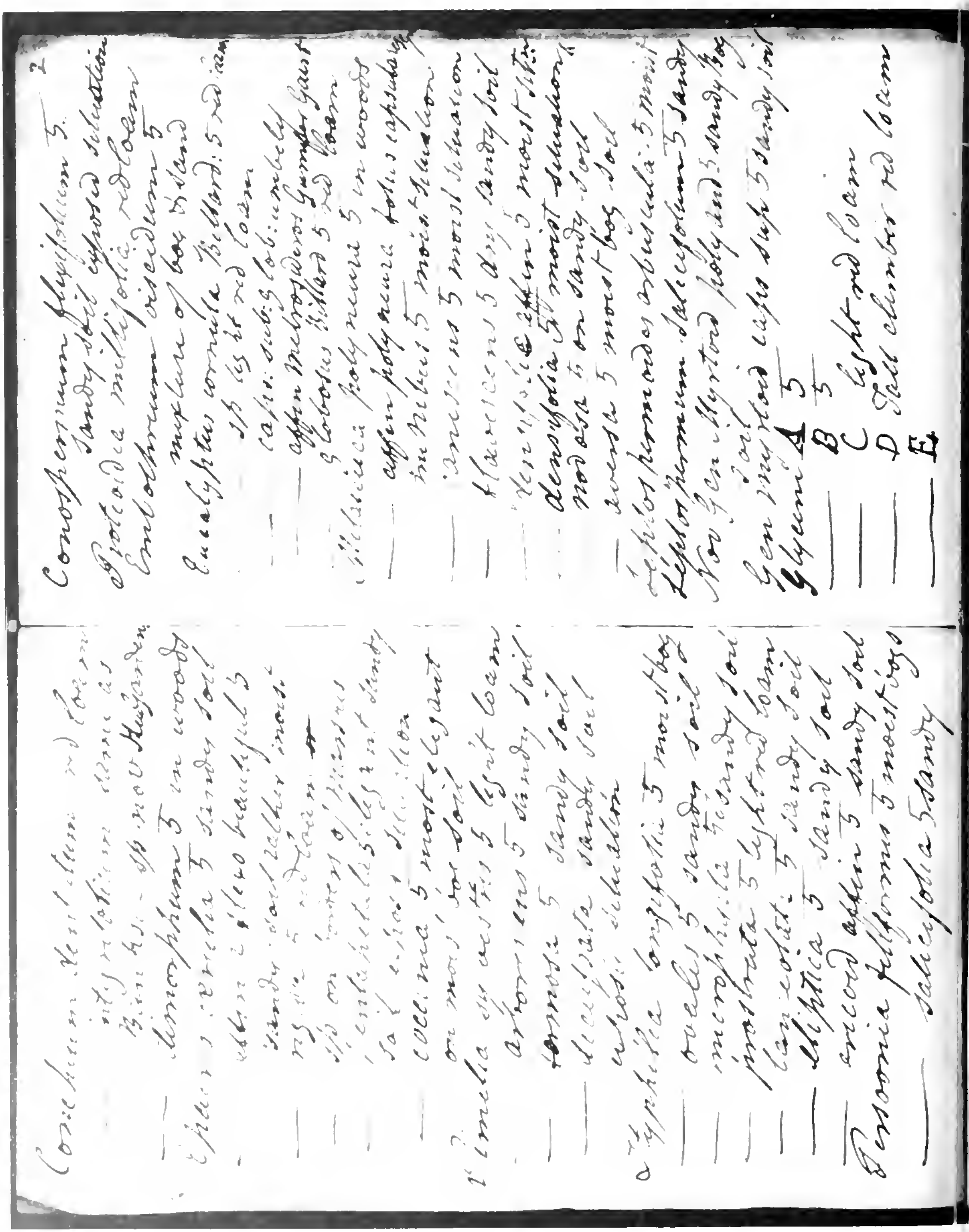
Memory Cove

Scutellarioides odorata fine 5 sandy soil
[illegible]
[illegible] 5 [illegible] loam
[illegible] Package of mistake
[illegible] soil
[illegible] cumbens 4 sandy soil
Spinosissima 5 light red loam
[illegible] 5 sandy soil
[illegible] no flowers seen red loam
[illegible] in the package
D. alata 5 light red loam
[illegible] 5 sandy soil
[illegible] red loam
Crotonoides [illegible] sandy soil
Syngenes [illegible] red loam
[illegible] red loam
[illegible] light loam
[illegible] 3
[illegible] red loam
[illegible] 5 loam
[illegible] 5 red loam
[illegible] 5 red loam
[illegible] caules.

1

List of Seeds Collected in the neighbourhood of King George the Thirds Sound from the 10 Dec 1801 to the 4 Jany 1802 inclusive

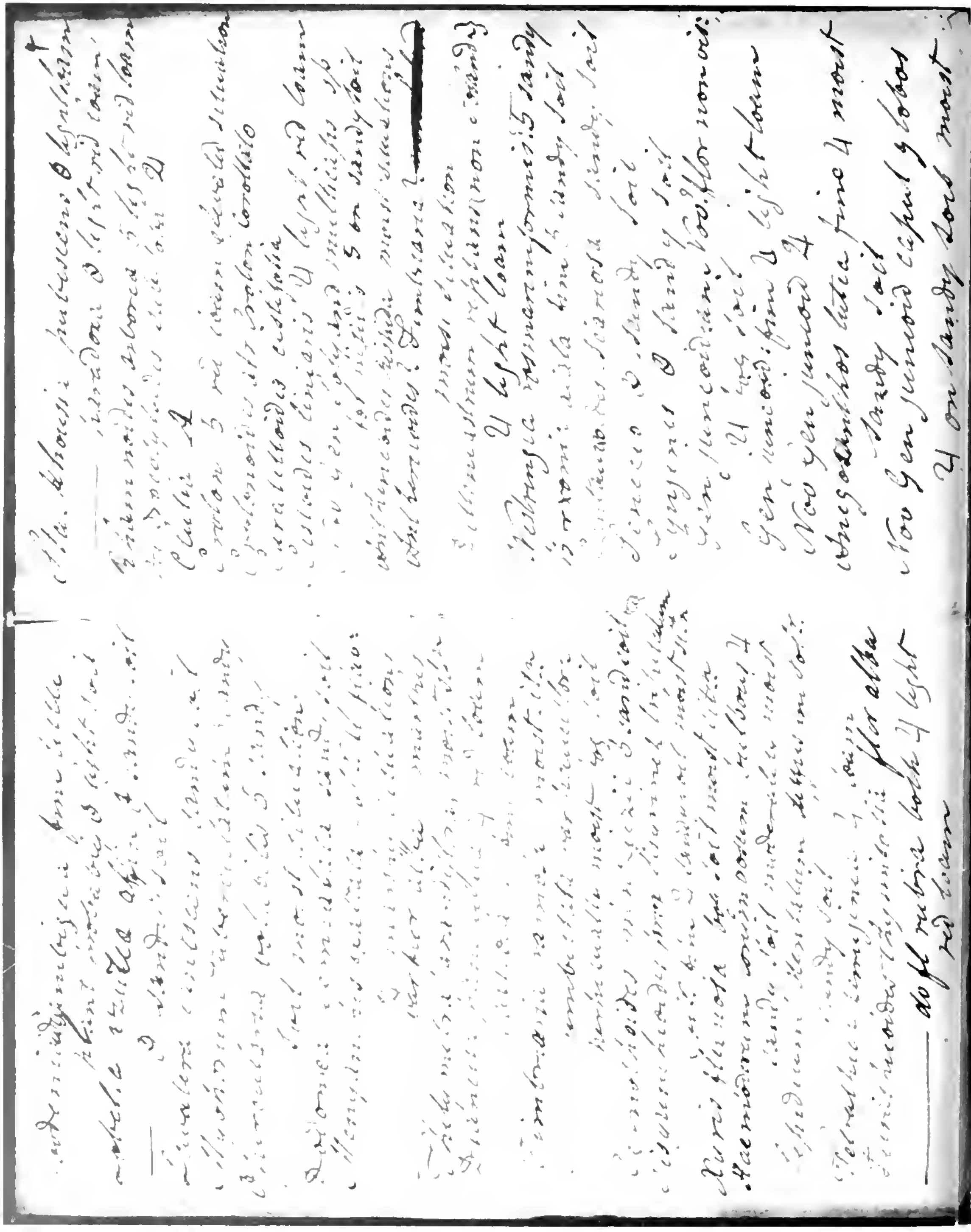
Banksia ericifoliodes 4 sandy dry soil
— quercifolia 4 sandy soil
— spinulosa 4 major 4 sandy soil moist situation
— spinulosoides minor 5 moist situation
— serra 5 sandy soil
— affin formosa 5 red loam little shade
— ilicifolia 5 sand or wood
— nivea 5 fine red loam exposed situation
— pungens 5 sandy soil
— formosa 5 sandy soil
— coccinea 5 sandy soil
Conchium prostratum 5 sandy
— [illegible] 5 sandy soil
— compositum 5 in wood
— decompositum loam
— prostratum var: sandy
— latifolium red loam


Conchium dentatum red loam
— integrifolium same as
Banksia — sp nov [illegible]
— [illegible] 5 in woods
Epacris [illegible] 5 sandy soil
— [illegible] beautiful 5
sandy soil rather moist
— [illegible] 5 red loam
— sp on [illegible] of marshes
— pentapetala [illegible] sandy
soil exposed situation
— coccinea 5 most elegant
on moist bog soil
Pimelia sylvestris 5 light loam
— arborescens 5 sandy soil
— formosa 5 sandy soil
— decussata sandy soil
exposed situation
Styphelia longifolia 5 moist bog
— ovalis 5 sandy soil
— microphylla 5 sandy soil
— prostrata 5 light red loam
— lanceolata 5 sandy soil
— elliptica 5 sandy soil
— ericoid affin 5 sandy soil
Persoonia filiformis 5 moist bogs
— salicifolia 5 sandy

Conospermum flexifolium 5. 2
sandy soil exposed situation
Proteoidea millifolia red loam
Embothrium viscidum 5
mixture of bog & sand
Eucalyptus cornuta Billard: 5 red loam
— sp light red loam
— caps: sub:glob: umbels
— affin Metrosideros Gummifera Gaert
— globosus Billard 5 red loam
Melaleuca polyneura 5 in woods
— affin polyneura folius capsularg
in ribus 5 moist situation
— canescens 5 moist situation
— flavescens 5 dry sandy soil
— densifolia affin 5 moist situ
— densifolia 5 moist situation
— nodosa 5 on sandy soil
— aversa 5 moist bog soil
Leptospermoides arbuscula 5 moist
Leptospermum salicifolium 5 sandy
Nov Gen Myrtoid poly and 5 sandy bog soil
Gen myrtoid caps sup 5 sandy soil
Glycine A 5
— B 5
— C light red loam
— D Tall climber red loam
— E

Mimosa oblongata 5 sandy or
gravelly soil
—— microphylla red soil
—— paradoxa light red loam
shady situation
—— truncata sandy soil
—— truncata 3 sandy soil
—— A light red loam shady
—— B mixt. of sand & red soil
—— C sandy soil
—— D light red loam shady wood
—— E light loam [illegible] situation
—— F [illegible] soil
—— F 3 [illegible] soil
[illegible] sandy soil
—— [illegible] sandy soil
[illegible] 5 moist situa.
—— [illegible] soil
[illegible] sandy soil
Gomphalobium [illegible] sandy soil
—— [illegible]
—— [illegible] soil
—— [illegible] sandy soil
—— [illegible] sandy soil
[illegible] sandy soil
Gen inter [illegible] et Gomphalob [illegible]
—— [illegible] sandy soil

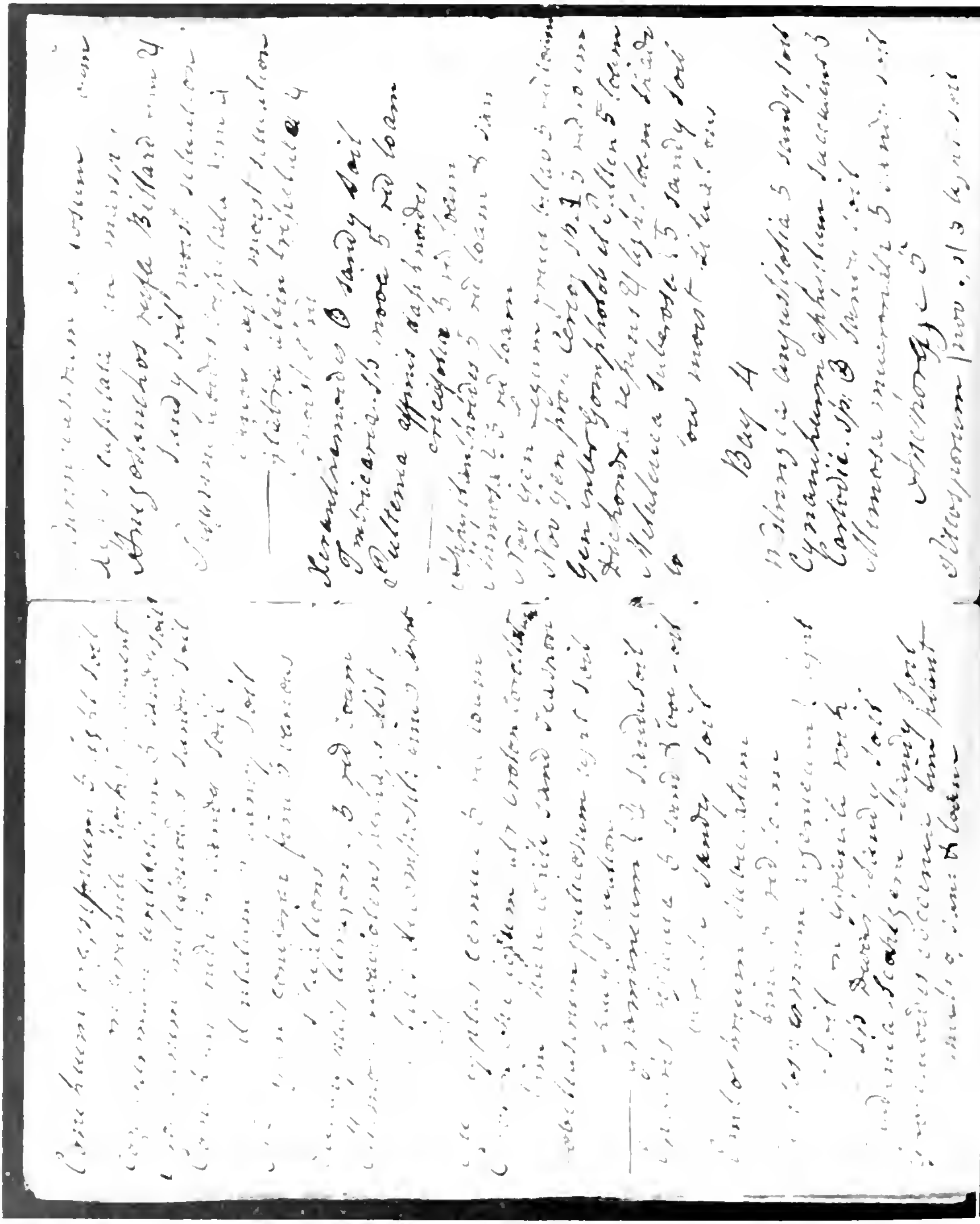
Gen: inter: Pult: et Gomphalob: 3
sp foliis integrifolia
Pultenia biloba 5 rather moist
—— lanceolata 3
—— subsericea [illegible] 5 sandy soil
Pultenioides [illegible] sandy soil
—— [illegible] light red loam
—— A 3 sandy soil in woods
Gen Pulten [illegible]
Gen Legum Stam X [illegible]
[illegible] ⊙ sandy soil
Gen Legumnos: Stam Decem:
[illegible]
ventricos [illegible] moist situations
sp B [illegible] situations
Chorizema [illegible]
⊙ sandy soil
[illegible]
[illegible] sandy soil
[illegible] 5 sandy
—— 3 light red loam
[illegible] 5 [illegible] situation
Bulinnodes [illegible] 5 [illegible]
[illegible] sandy soil
[illegible] in woods
[illegible] loam 4
[illegible] sandy soil
—— [illegible] moist [illegible]
a little shaded [illegible]
[illegible] ⊙ in sandy soil
Scaevola arborescens [illegible] sandy
[illegible]



Nov Gen triand 1gyn cal: infer:
cor 1 pet 9 sem 1 nuc calice
corticatum
Nov Gen 4and 1gyn sem papos 5
Pentand 1gyn: caps sup
sp latifolia 5 sandy soil
Gen 5and 1gyn caps sup herbac
Gen 5and 1gyn caps sup sp
fol linear lanc 5
Nov Gen Rutae Eriostem prox
5 light loam
Nov Gen umbellif: U sandy soil
Nov gen umbellif Bupleur prox sp A
Nov gen Didyn Angiosp sp A sandy so
Nov Gen Atriplex calyx ampuecea
4 succulent among rocks
Syngenesia 5 among rocks
3 on sandy soil
Seeds collected Brown No 1

Banksia latiflora 5 sandy soil
—— humilis. like the former
but distinct
—— repens Dwarf 5 sandy soil
—— macrophylla fine 5 sandy soil

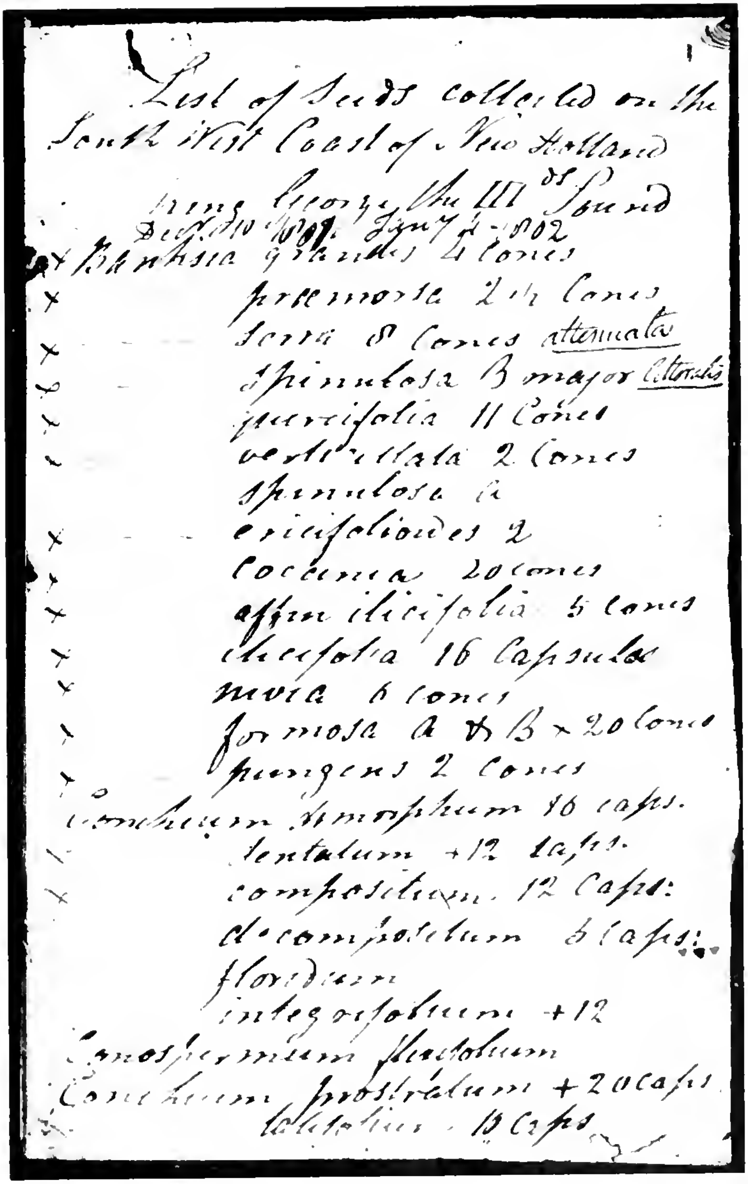
Banksia longifolia 5 light brown[5]
loam exposed situation
—— oligosperma fine 5 sandy soil
—— ilicifolia fine 5 sandy soil
longifolia minor distinct
from longifolia sandy soil
low moist situation
—— pungens 5 gravelly soil
minor fine 5 somewhat distinct
from that of same .. R G B
—— nivea max affin sed distinct
5 red loam & sand
Protea tenuifolia 5 sandy soil
—— 5 sandy soil
Melaleuca A 5 light soil on rocks
—— B 5 sandy soil
—— C 5
—— D 5
—— E 5 all with filiform leaves
—— 5 shrub on sandy soil
moist situations
—— floridas 5 sandy soil
—— capitellata 5 sandy soil
—— fimbriata fine 5 sandy soil
moist situations
Conchium oblongatum 5 sandy
soil low moist situations



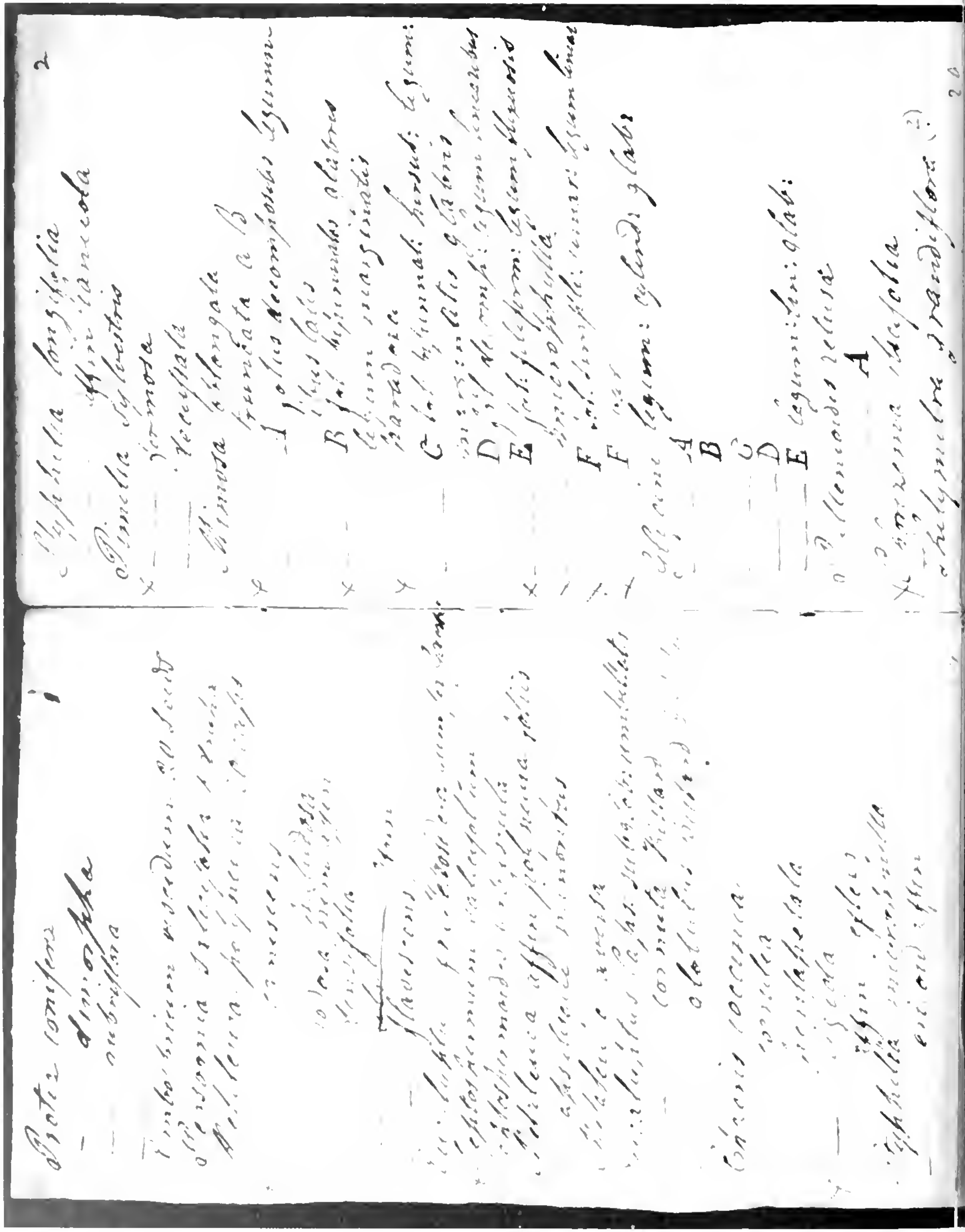
Conchium crassifolium 5 light soil
on Granite Rocks [illegible]
[illegible] 5 sandy soil
[illegible] sandy soil
Conchium [illegible] sandy soil
[illegible] sandy soil
[illegible]
[illegible] 5 red loam
[illegible]
[illegible] red loam
[illegible] white sand seashore
[illegible] sandy soil
—— gramineum 4 sandy soil
[illegible] sand & [illegible] soil
[illegible] sandy soil
[illegible]
[illegible] 5 red loam
[illegible] light
soil on Granite rock
sp. [illegible] sandy soil
[illegible] Scaligera sandy soil
[illegible] coccinea [illegible] plant
[illegible] loam

[illegible] rosum [illegible]
[illegible] capitata in manus
Anigozanthos rufa Billard [illegible] 4
sandy soil moist situation
[illegible] trifida [illegible]
[illegible] soil moist situation
—— glabra [illegible] 4
[illegible]
Xeranthemoides ⊙ sandy soil
Imbricaria sp. nova 5 red loam
Pultenaea affinis daphnoides
—— ericifolia 5 red loam
[illegible]anthoides 5 red loam & san[d]
[illegible] 5 red loam
Nov gen Legum [illegible] 5 red loam
Nov gen prox Cercis sp. 1 5 red loam
Gen inter Gompholob et Pullen 5 loam
Dichondra repens 4 light loam Shade
Melaleuca suberosa 5 sandy soil
low moist situations

Bay 4
Westringia angustifolia 5 sandy soil
Cynanchum aphyllum succulent 5
Cartodie sp. ⊙ sandy soil
Mimosa [illegible] 5 sandy soil
Anchorage 5
Pittosporum nov. sp. 5 light soil



List of Seeds collected on the
South West Coast of New Holland
King George the III^ds Sound
Dec^r 10 1801 - Jan^y 4 - 1802
Banksia grandis 4 Cones
praemorsa 2½ Cones
serrata 8 Cones attenuata
spinulosa B major attenuata
quercifolia 11 Cones
verticillata 2 Cones
spinulosa a
ericifolioides 2
coccinea 20 cones
affin ilicifolia 5 cones
ilicifolia 16 Capsulae
nivea 6 cones
formosa a & B × 20 cones
pungens 2 Cones
Conchium Amorphum 16 caps.
Sentalum +12 caps.
compositum 12 Caps:
decompositum 5 caps:
floridum
integrifolium +12
Conospermum flexifolium
Conchium prostratum +20 caps.
[illegible] 13 Caps.

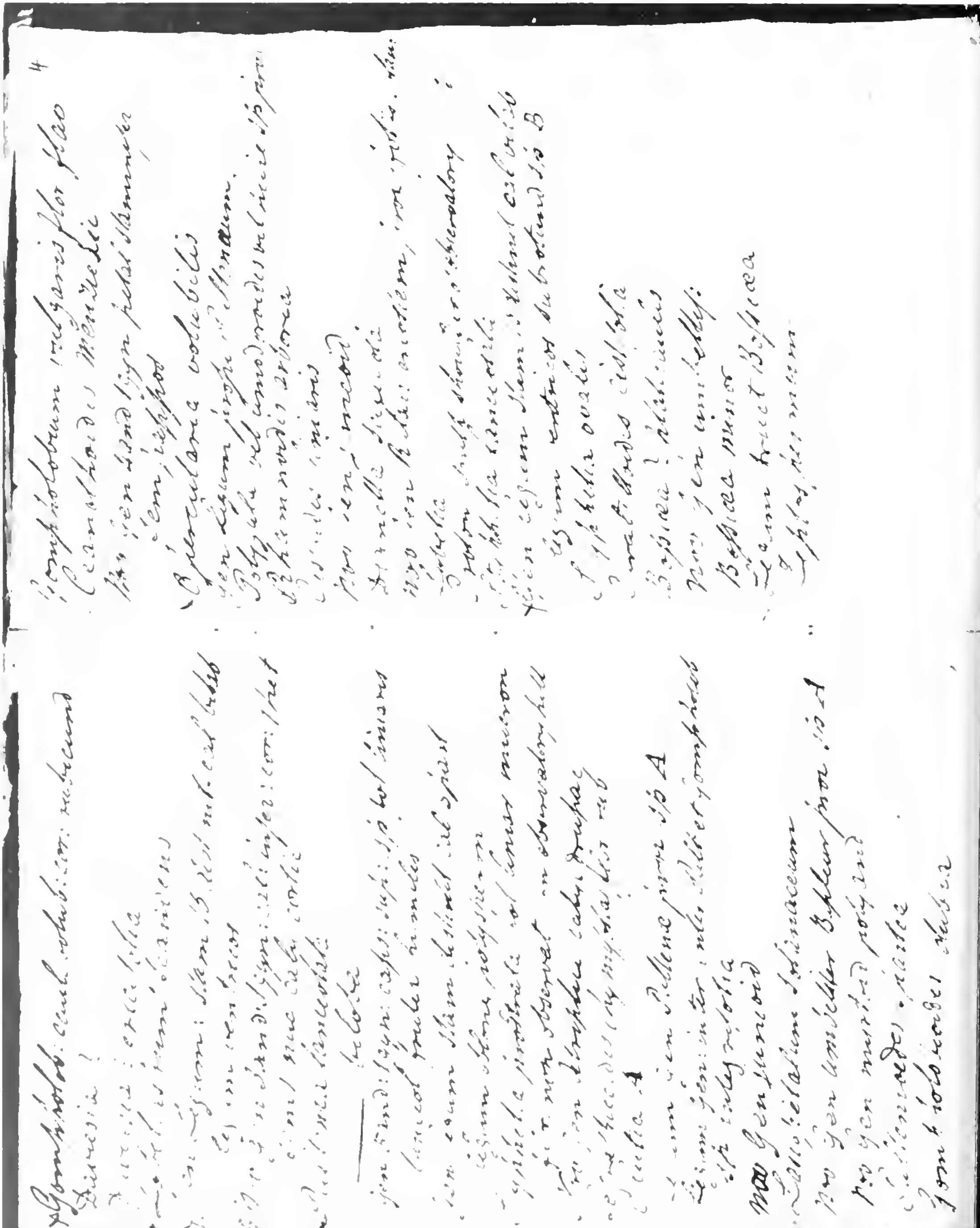


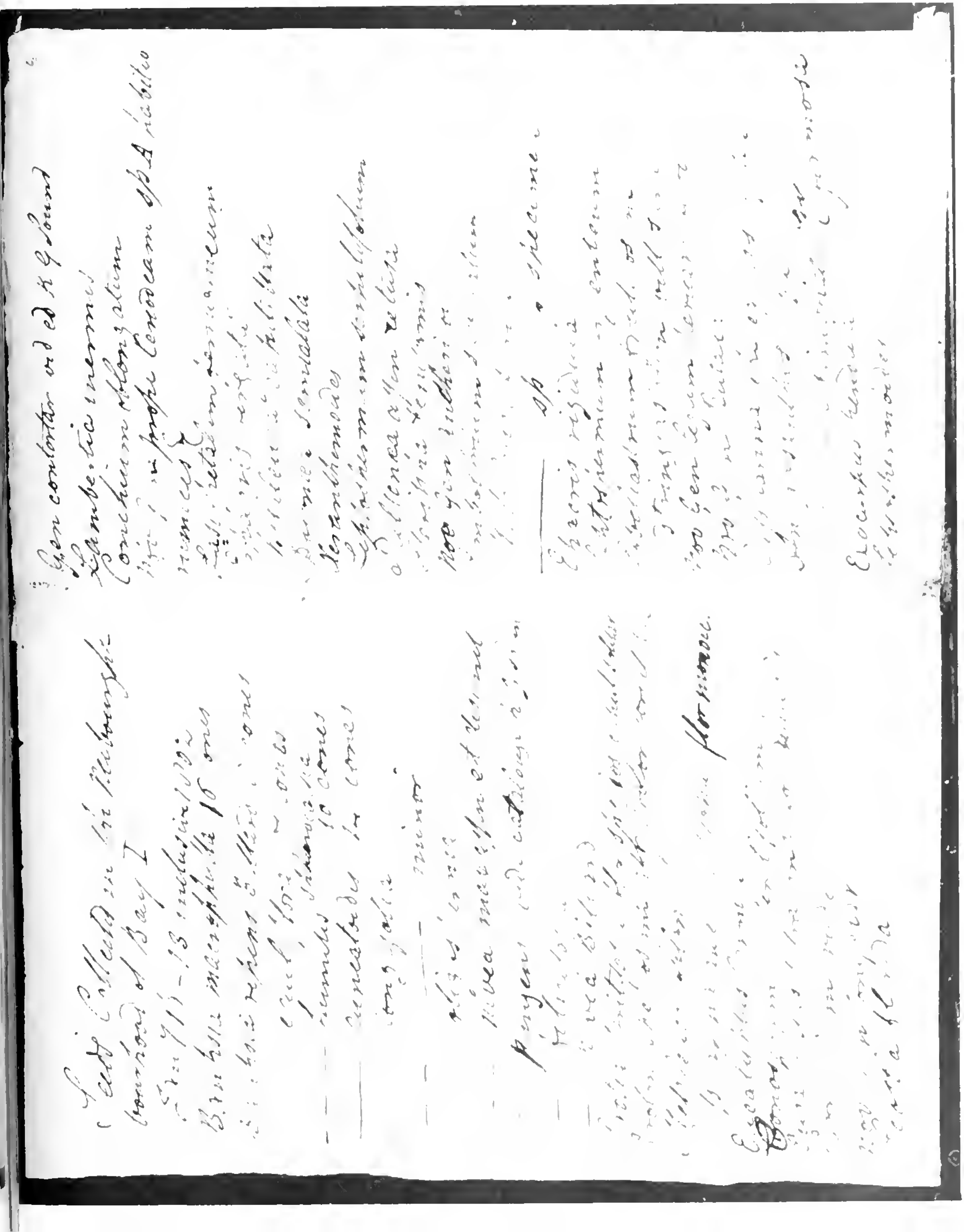
Protea conifera
— dimorpha
— nubrifolia
Embothrium ... 20 seeds
Persoonia salicifolia ...
Petrophila ...
canescens
... glandulosa
... affin
longifolia
— affin
— flavescens
Leptospermum ...
Petrophila affin ... foliis
... minoribus
... cornuta ...
... Billard...
Chorizema coccinea
— ...
— pentapetala
— ...
— affin ...
Styphelia microphylla
— ... affin

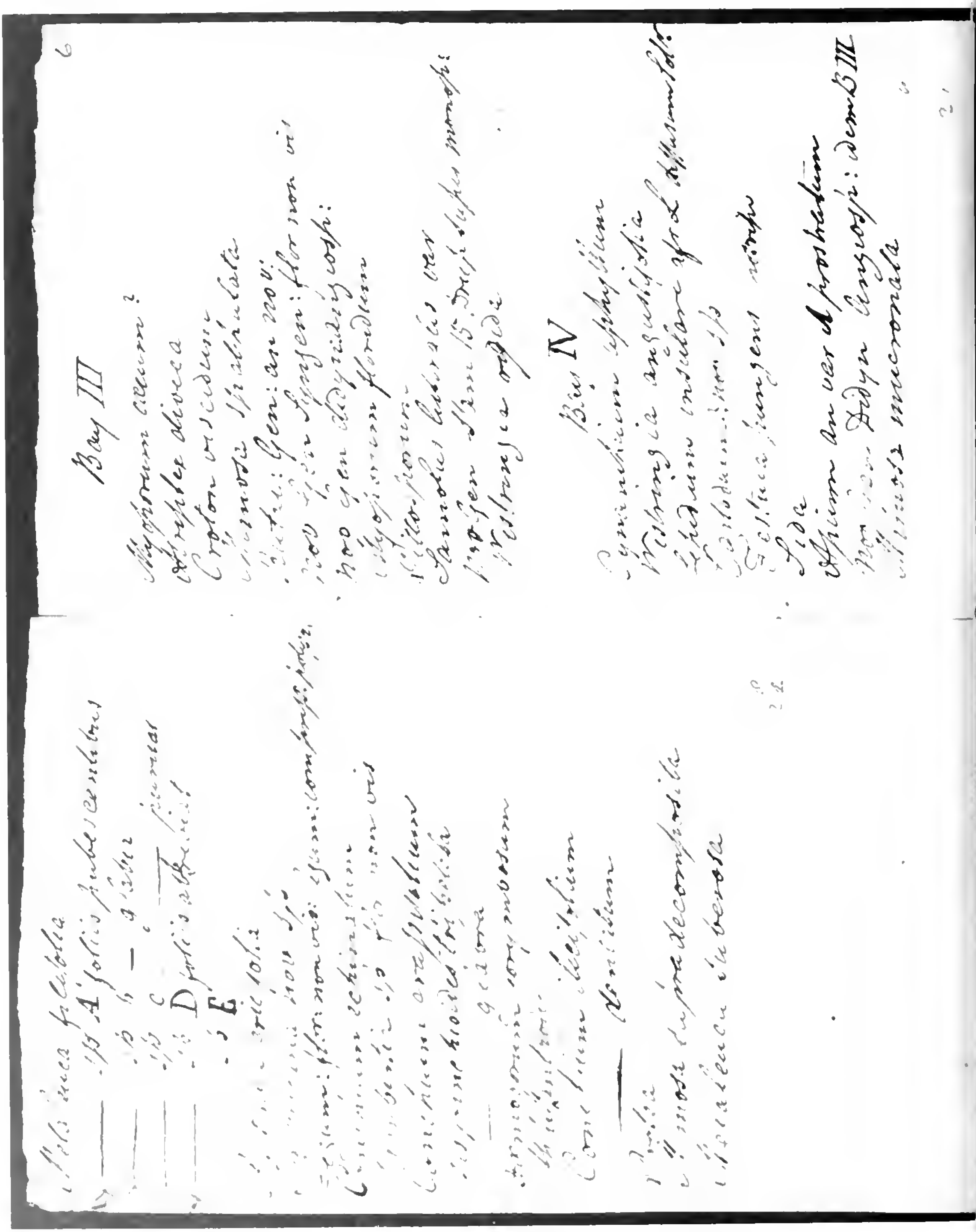
2
Styphelia longifolia
— affin lanceola
Pimelia sylvestris
— formosa
— decussata
Mimosa oblongata
truncata a B
A folus decompositis legumin-
ibus latis
B fol. bipinnatis glabris
legum marginatis
paradoxa
C fol. bipinnat. hirsut. legum:
marginatis glabris
D fol decompos: legum linearibus
E fol: filiform: legum flexuosis
microphylla
F fol. simplic: ... legum linear
F var
Glycine legum: cylindr glabr
— A
B
— C
— D
— E legumin: lin: glab:
Pultenaea retusa
A
Pimelea ... folia
Thelymitra grandiflora (?)

Lepidium dentatum = L. diffusum Br.
Centauroides scariosa
Boronia alata
Westringia rosmariniformis (?)
Lobelia azurea (?) Baud. herb
Hemianthus exaltata, ol. (? alba
Dampiera lanceolata
[illegible] oides sericola
Menyanthes cristata col.
Goodenia Baud. herb uncertain
Stylidium gramineum
Lasiopetalum ... olina
Tetratheca ... nea
Persoonia filiformis
[illegible] oides arborea
[illegible] juncea
[illegible] capitata
[illegible] hemus ... tatus
[illegible] ... nodale
[illegible] paradoxa
[illegible] ramosa
[illegible] pubescens
[illegible] pubescens
Anigozanthus lutea
Trachymene umbellata
Mesembryanthemum [illegible]
Casuarina stricta
[illegible] flexuosa
[illegible] tuberculatum

Dillwynia? ... reflexus
× Lasiopetalum purpurascens
Scaevola arborescens
× nov. gen: Didyn: Angiosp: sp A
Gen. ... oid: an nob. flor. non vidi
Gen. contort. Pand: 1 Gyn: caps. ...
latifolia
Goodenoides ambigua – ...
Pultenaea subsericea
[illegible] oides hispida
nov. Gen. junceoid: flor. capit. globos:
Dodonaea
Lasiopetalum arborescens
Lasiopetaloides ... folia
Gen. 5 andr. 1 gyn: caps. ... herba
Anthericoid: ?
Leguminosae gen: inter Pult. et Gomph. ...
[illegible] ilicifolia
[illegible] ... sericea ...
new:
Glyphelia? longifolia
Solenia? ... multifol:
Leucodendrum ... losum
[illegible] oides ... lobata
Crotonoides ... Corrolla ...
nov. gen: ... delph: multiceps ...
... fruticoso
Sisyrinchioides glabra ...
triphylla ...







Melaleuca filifolia
— sp A foliis pubescentibus
— sp B — glaber
— sp C — [illegible]
— sp D foliis abbreviat
— sp E
[illegible] folia
[illegible] nov sp
Gen: flor non vis: Gen: compress: polyg.
Conchium echinatum
[illegible] sp flor non vis
Conchium crassifolium
[illegible] triloba
— [illegible]
[illegible] corymbosum
[illegible]
Conchium ilicifolium
— dentatum
Pultea
Mimosa supradecomposita
Melaleuca tuberosa

6

Bay III
Myoporum acum ?
Atriplex dioeca
Croton viscidum
Mimosa spatulata
Rutac: Gen: an nov:
Nov Gen Syngen: flor non vis
Nov Gen didyn: angiosp:
Myoporum floridum
Pittosporum
Samolus littoralis var
Pro Gen Stam 15. Diecs super monosp:
Westringia rigida

Bay IV
Cynanchum aphyllum
Westringia angustifolia
Lepidium insulare afr L diffusum Sol.
Goodenia nov sp
Festuca pungens [illegible]
Sida
Apium an var A prostratum
Nov Gen Didyn Angiosp: idem B III
Mimosa mucronata

7

Anchorage V

Pittosporum nov-sp idem Bay III
Alyxia buxifolia
Syngenes: fol lanat

Anchorage VII

Astragalus ?
Mimosa spinosissima

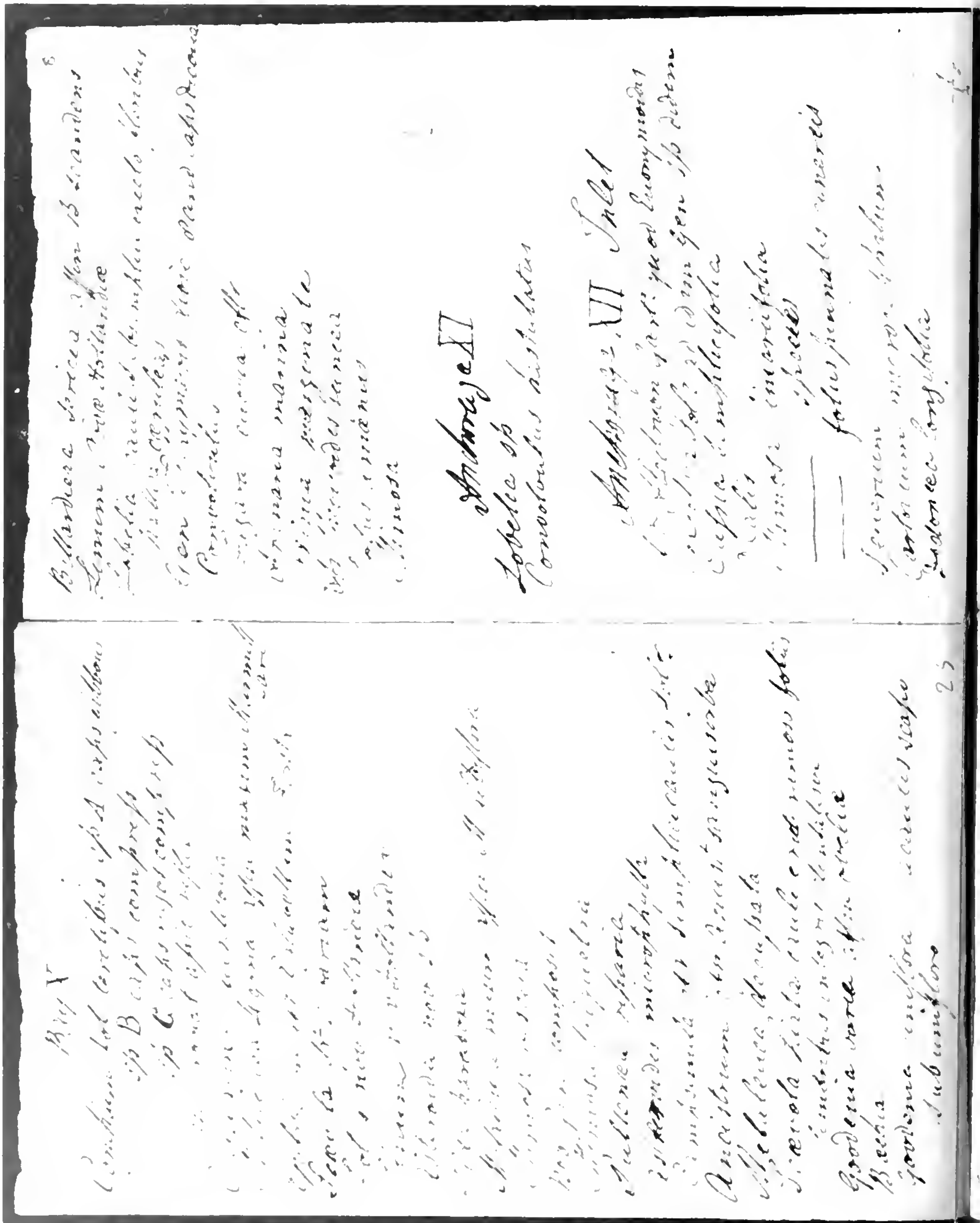
Anchorage VIII

Legum: leg 1sperm: ll not seen
Umbellat
Melaleuca ensi
... caule arbor

Memory Cove

Lasiopetalum angustifolium
Hibiscus
Legum: legum compress fol retus
Lasiopetalum rugosum
Eucalyptus lurinata
Curatelloides canescens
Cestroides urticifolia
dioica flor masc spec
Eucalyptus rudis peduncul compress
fruct multangul

Myoporum procumbens
Xeranthemoides seed not ripe
Senecio virgata
Bursaria spinosa
Mimosa spinosissima
Eucalyptus purpurascens
Cassytha nov Holland
Legum fol ternat legum plan compress
polysperm
Santalanoides odorata
Myoporum viscidum
Dodonaea alata
Lasiopetalum bracteatum few seeds
Centauroides scariosa
Ceanothoides apetala
Gnaphaloides viscida
Gnaphalium aureum probably no seed
Dodonaea an var viscosa
Eucalyptus nov sp
Melaleuca decussata
Scaevola viscida



Gen vilicum Sem only in decay
Mimosa crassifolia   one seed
Xeranthemum
Gen [illegible]
Helichrysum aridum
[illegible]
[illegible] tubulus canalus. [illegible]
[illegible]
Verbena
[illegible]
[illegible]
[illegible]

Anthisteria
Urticum canalum
Gen compositum [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] fapillis
[illegible]
[illegible]
[illegible] sureum sol?
[illegible]
[illegible]
[illegible]

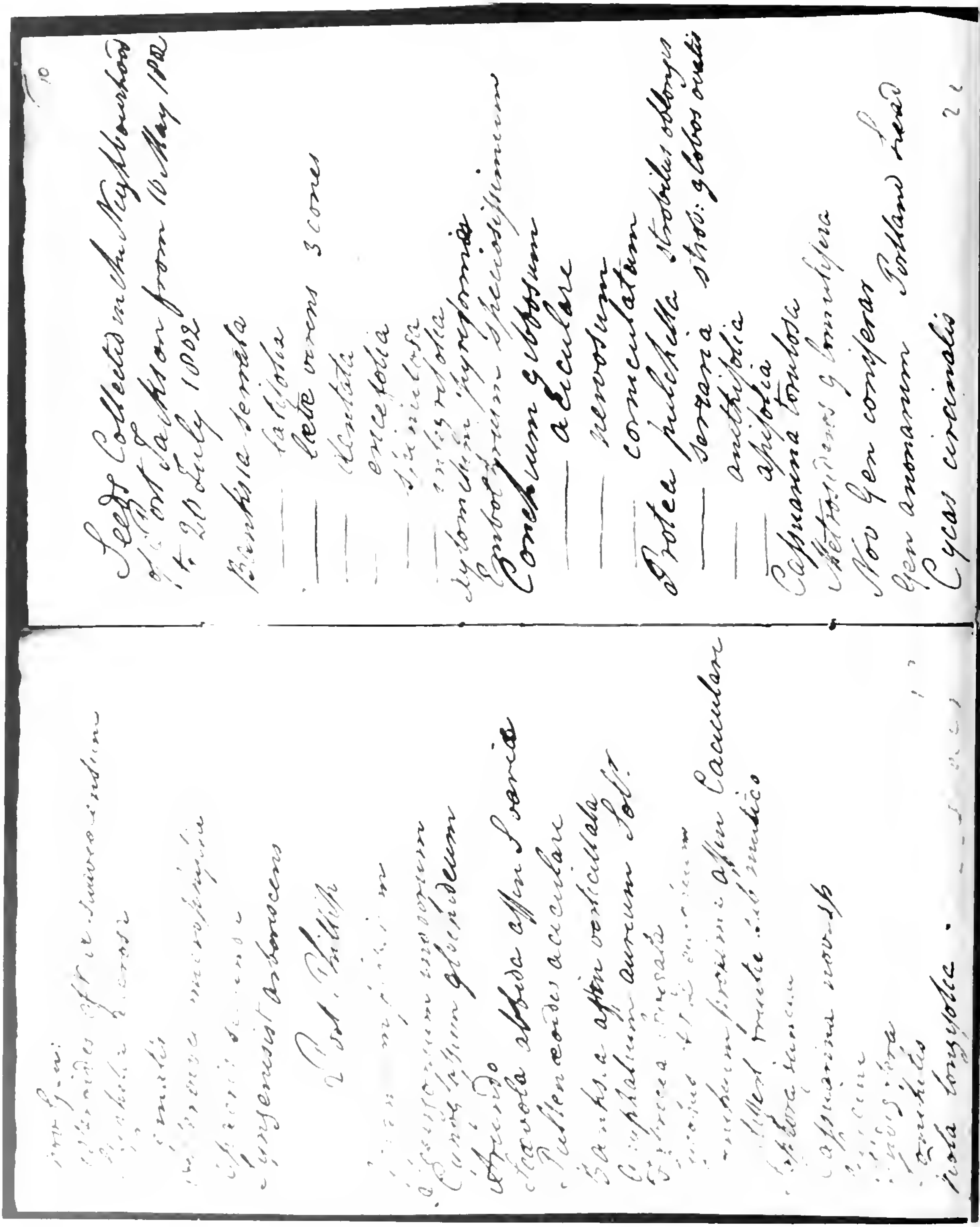
9

Kangaroo Island

Anthericum
Asteroides
Sanculoides echinata
Solanum laciniatum
Mimosa lucata
Scutellaria plebeja
Nov gen conifer
Metrosideros aff M Saligna
Dodonaea longifolia
Eucalyptus aff ? Saligna Smith
~~Dodonaea [illegible]~~ ?
Mimosa affin [illegible] [illegible]
[illegible] ?
Gen Triviem affin [illegible]
Asteroides suaveolens

Kings Island

[illegible]
Ancistrum repens.
[illegible]
[illegible]
Asteroides tenuifolia
Gahnia procera
Banksia integrifolia



Port Phillip

Scaevola albida affin S. varia

Pultenaeoides aciculare

Banksia affin verticillata

Gnaphalium aureum Sol.

affin Caculare

Casuarina nov. sp

10

Seeds Collected in the Neighbourhood
of Port Jackson from 10 May 1802
to 20 July 1802

Banksia serrata
— latifolia
— laete virens 3 cones
— dentata
— ericefolia
— spinulosa
— integrifolia
Xylomelum pyriforme
Embothrium speciosissimum
Conchium gibbosum
— aciculare
— nervosum
— corniculatum
Protea pulchella strobilus oblongis
— serrata strob: globos ovatis
— anethifolia
— apiifolia
Casuarina torulosa
Metrosideros glomulifera
Nov Gen coniferas
Gen anonamum Portland head
Cycas circinalis

Metrosideros linearis
—— citrina
Passiflora coccinea Sol.
Convallaria barbata Soland.
Leptospermum squarrosum
Myoporum [illegible]
Melaleuca viridiflora ?
Solanum cinerascens Soland.
Leptospermum juniperinum
Cassuarina
Melaleuca thymifolia
Fabricia laevigata
Melaleuca nodosa
Lambertia formosa
Persoonia linearis
Ficus australis
Trichilia octandra Soland.
Persoonia ferruginea
Melaleuca ericifolia
Sowerbia juncea not good
Hedysarum
Epacris grandiflora scarcely good
Glycine linearis

Embothrium buxifolium
Dianella
Xeranthemum aureum
Embothrium sericeum
Gen Myrtoid cal. [illegible] seed not ripe
Grewia Botany Bay ! Celtis orientalis
Gen umbellif umbellat ericifol Sol.
Cotula vaginata
Gen prope Phyllanthum
Smilax glycophylla
[illegible]
Mimosa longifolia
Osmunda barbara
Leucarpos pentandrus
Baeckea
Sida
Philydrum lanuginosum
Cynoglossum scabrum
Gen Labiatorum North Shore
Hedysarum
Melaleuca styphelodes
Smilax aculeata
Epacris secunda

Seeds Collected from [illegible] 13 June 1802

1 Banksia [illegible] a very beautifull spreading shrub rising 6 or 7 feet high not [illegible] in diameter, with [illegible] large yellow flowers in [illegible] found always on Sandy Soil sometimes [illegible] healthy though almost buried by Sand blown with the winds & lodged round the stems

2 Banksia repens grows on the sides of hills with sandy soil where it creeps with strong woody stems that in [illegible] and [illegible] its leaves & cones [illegible] ground not seen in flower I know not whether it is call'd a Shrub or perennial I [illegible] the last most proper not seen in flower or Cones

3 Banksia [illegible] — a handsome dwarf Shrub with entire leaves on dry Sandy Soil producing a number flowers of a dark purple colour all arising from the Stem frequently near the root & large cone of many

4 Banksia pumilla. very like the former in appearance & situation rather more dwarf & the leaves a little [illegible] its flowers all terminal & in cones very different 9 Cones & a bag with more

5 Banksia 5 a handsom bush 8 or 10 feet high on top of a Mountain of Granite near the Sea not seen [in] flower nor in any other situation

6 Banksia 6 somewhat resembling B pungens of King George Sound on dry sandy soil a dwarf shrub not seen in flower

7 Banksia 7 very much resembling B 5 but never exceeds 18 inches in height & grows on low sandy soil which is probably at some times flooded A handsome Shrub not seen in flower

8 Banksia 8 resembles nivea but more dwarf & larger leaves not seen in flower grows on sandy ground

9 Banksia 9 often repens or Ptero[illegible] grows on Sandy soil in tufts & [illegible] but leaves & flowers above ground not seen in flower

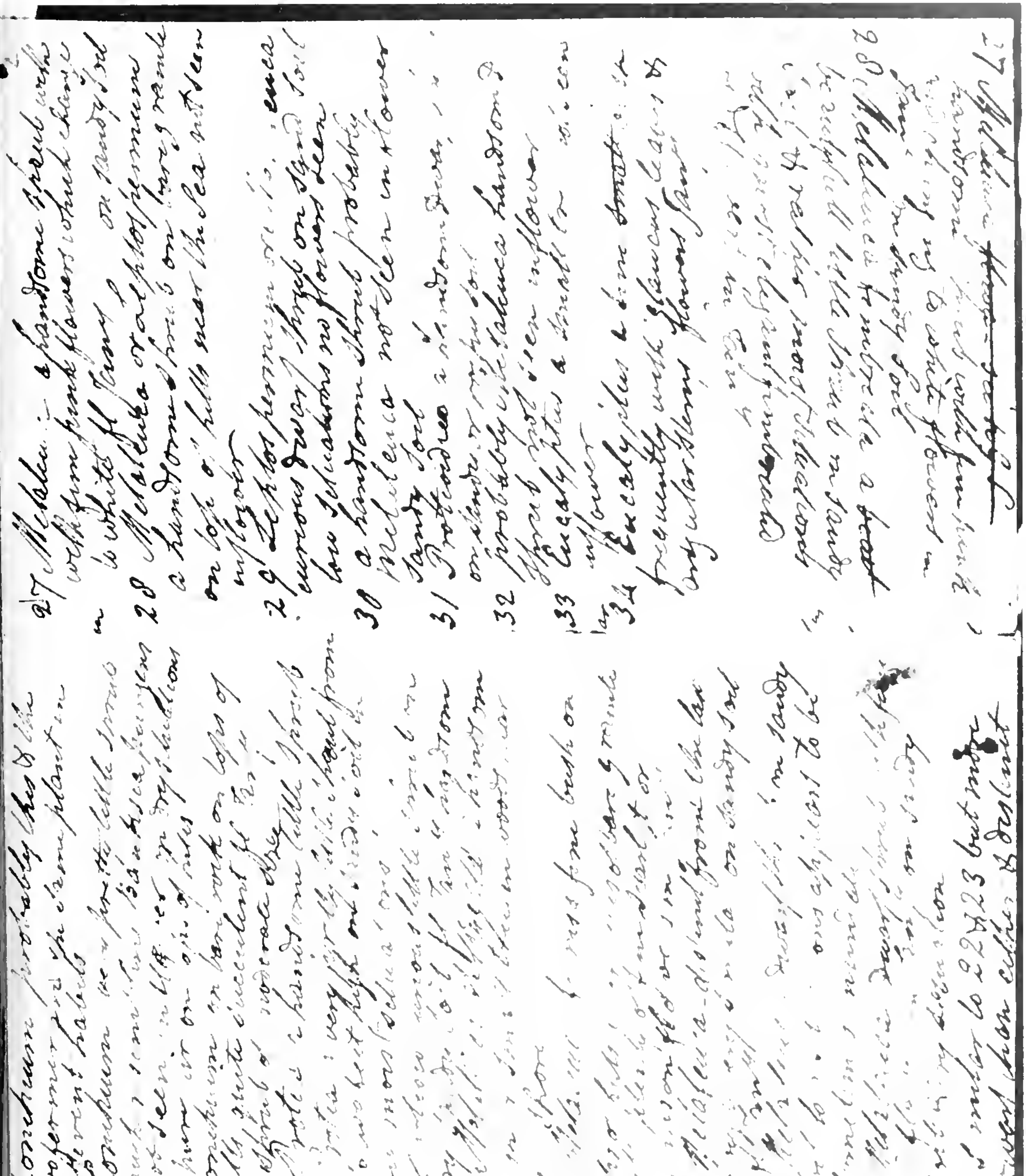
10 Banksia 10 a very handsom little shrub about 1½ foot high much resembling formosa grows on sandy soil in situations considerably above the level of the Sea

11 Banksia nivea var appears a variety of B nivea K G Sound this is the handsomest plant

12 Banksia pungens it does not appear different from that of K G Sound of [illegible] flowers are yellow

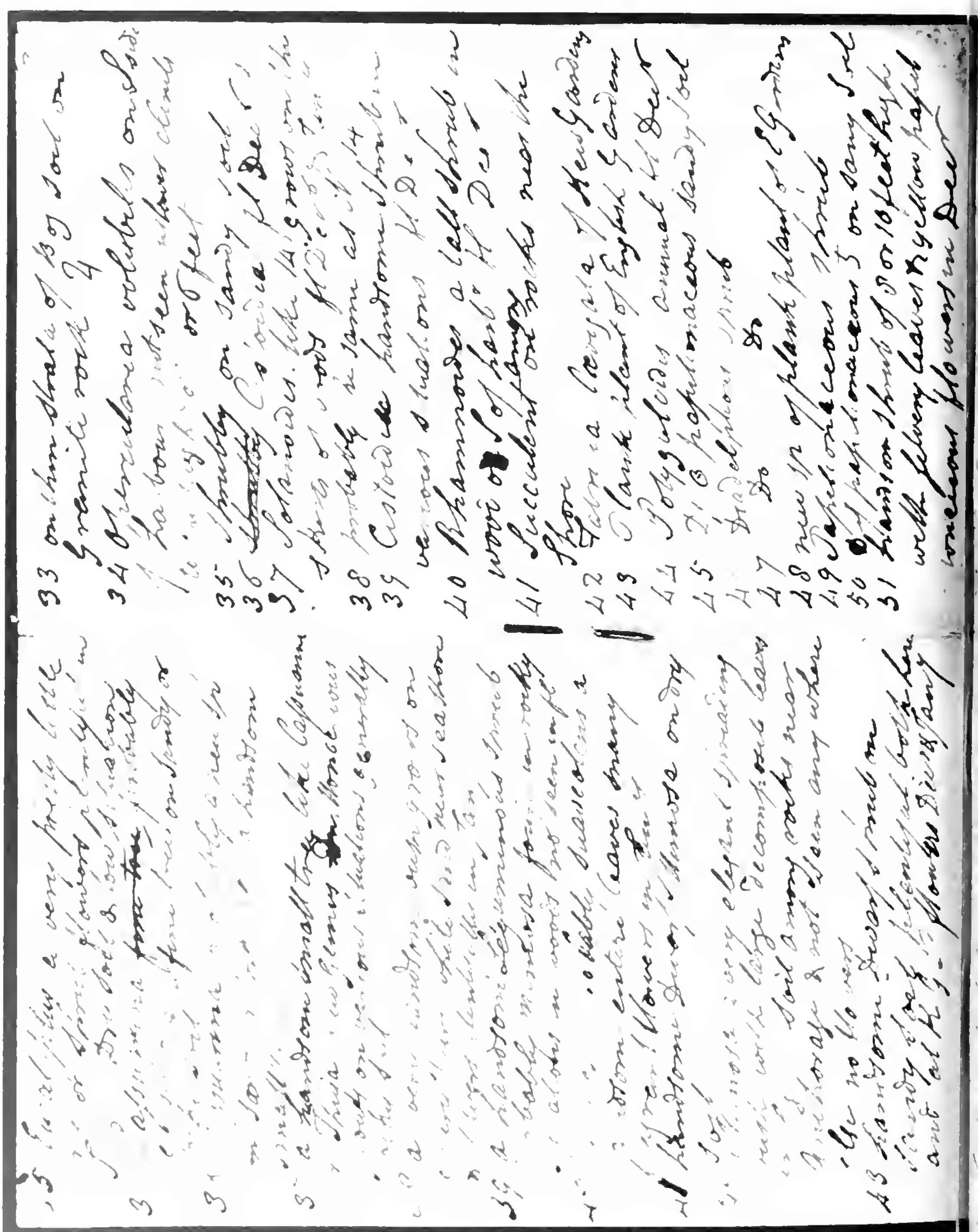
13 Conchium on sandy soil in low moist situations a shrub of 3 or 4 feet high & long glaucous leaves not seen in flower

14 Conchium very like the former but more dwarf on very barren rocky land



15 Conchium probably this & the two former are the same plant in different habits
16 Conchium a [illegible] pretty little shrub much [illegible] Banksea [illegible] not seen in [illegible] in dry situations [illegible] on [illegible]
17 Conchium on bare rock on tops of hills quite succulent fl [illegible] a shrub of moderate size
18 Protea a handsome little shrub
19 [illegible] a very pretty little shrub from two feet high on sandy soil in [illegible] moist situations
20 [illegible] curious little shrub on dry sandy soil fl Jan[illegible] handsom
21 Melal[illegible] handsom [illegible] in [illegible] woods near [illegible] shore
22 [illegible] fine bush on tops of hills [illegible] bare granite [illegible]
23 Melaleuca distinct from the last [illegible] on sandy soil [illegible]
24 Melaleuca dwarf [illegible] on sandy soil [illegible] to be [illegible]
25 Melaleuca dwarf shrub [illegible] on sandy [illegible]
26 Similar to 22 & 23 but more dwarf than either & distinct

27 Melaleuca a handsome shrub with with fine pink flowers which change to white fl Jan[illegible] on sandy soil
28 Melaleuca or Leptospermum a handsome shrub on bare granite on tops of hills near the sea not seen in flower
29 Leptospermum [illegible] curious dwarf shrub on sand soil low situations no flowers seen
30 a handsome shrub probably Melaleuca not seen in flower sandy soil
31 Proteoidea a handsome dwarf [illegible] on sandy or [illegible] soil
32 probably Melaleuca handsome shrub not seen in flower
33 Eucalyptus a small tr[illegible] not seen in flower
34 Eucalyptus a [illegible] ~~small~~ [illegible] frequently with glaucous leaves & angular stems flowers Jan[illegible]

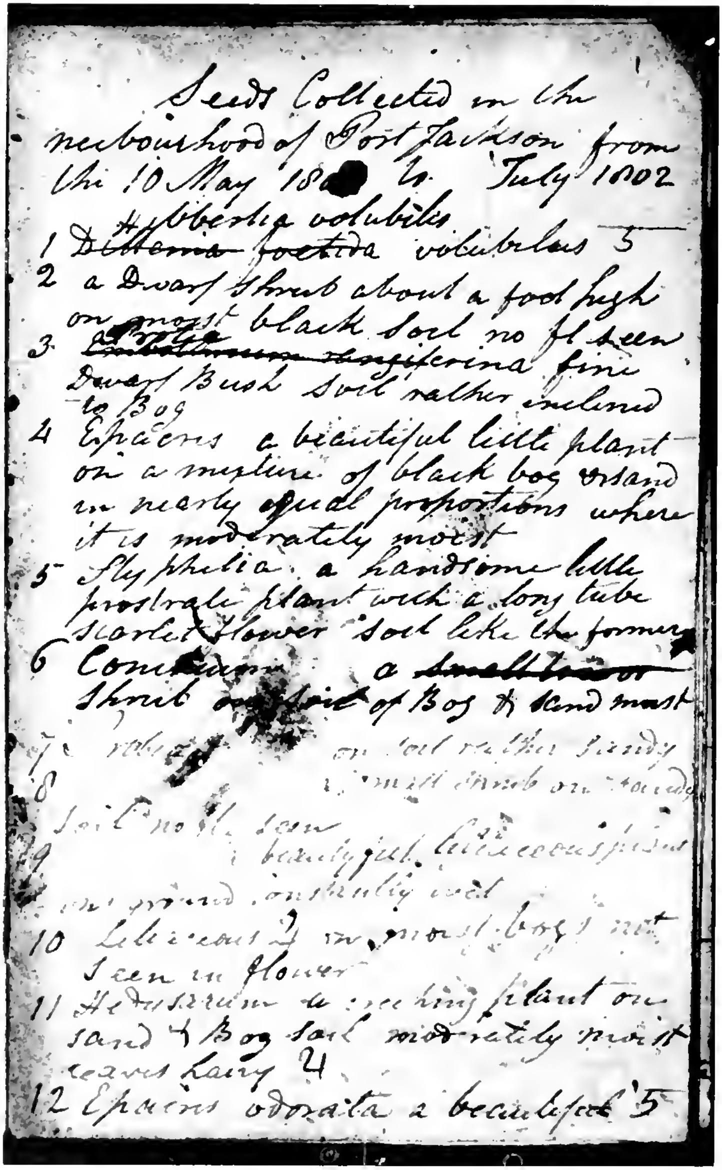


5 ... a very pretty little ... flowers plentiful in ... Dry Soil & low situation
3 ... probably ... fine tree on sandy or ... soil
3 ... probably a new sp ... handsom small
5 a handsome small tree like Casuarina Thuja ... Genus ... on various situations generally ... soil
... a ... growing on ... near sea shore
59 a handsome Leguminous shrub probably Mimosa ... in rocky ... no seen in fl
... probably suaveolens a ... entire leaves many ... flowers in ...
1 handsome Dwarf Mimosa on dry soil
... Mimosa very elegant spreading ... with large decompound leaves ... soil among rocks near anchorage & not seen any where else no flowers
43 handsome Dwarf shrub on sandy ... plentiful both here and at ... flowers Dec & Jany

33 on thin strata of Bog soil on Granite rock 4
34 Operculorea volubilis on S side of Harbour not seen in flower climbs ... or 6 feet
35 Shrubby on sandy soil
36 ~~Shrubby~~ C ... fl Dec
37 Solanoides like 14 grows on the skirts of woods fl Dec ...
38 probably the same as N 14
39 Cistoides handsome shrub in various situations fl Dec
40 Rhamnoides a tall shrub in woods ... of harb fl Dec
41 Succulent among rocks near the Shore
42 ... of Kew Gardens
43 ... plant of English Gardens
44 Polygaloides annual fl Dec
45 ... papilionaceous sandy soil
4 Diadelphous shrub
47 Do Do
48 new sp of ... plant of E Gardens
49 Papilionaceous shrub
50 ... papilionaceous ... on sandy soil
51 handsome shrub of 8 or 10 feet high with silvery leaves & yellow papilionaceous flowers in Decr

4

52 handsom papelionaceous & sebery leaves
53 Dwf papel~ shrub in woods no flowers
54 handsom little papel~ shrub
55 Do grows in woods
56 curious papel~ shrub
57 hands~ a little shrub on sandy soil various situations
58 beautiful papel~ plant probably pinnated leaves
59 handsom papel~ plant
60 papelionaceous plant small grows in wet bogs
61 Goodenia grows on sandy soil & forms a handsome bush with many blue flowers is shrubby fl Decr & Jany
62 a pretty little shrub on top of hills several ... in flower
63 Supposed Lobeliastrum handsome little perennial or Annual on moist soil fl Decr
64 a shrub on top of hill at Observatory not seen in flower
65 handsome liliaceous plant in moist soil fl Decr
66 Dwarf Deocious plant on barren soil
67 Gramen ~~...~~ perennial
68 Course Grass or Juncus fl Decr
69 Lobeliastrum a handsom perennial appears bulbous fl Decr on sandy soil
70 Clutiodes a little shrub on sandy soil
71 a handsome shrub resembling melaleuca in moist situations & fl Decr
72 a dwarf shrub on top of sandy hills near Sea coast fl Decr
73 a small plant appears perennial on shady situations on sides of hills
74 a handsome Dwarf bell flowering plant perennial with a red flower
75 the same as last with a white flower both grow on hills a little in shade of rocks or trees with a light vegetable soil
76 a Dwarf Syngenesious shrub on sides of hills in dry situations fl Decr
77 Annual Syngenesious plant on sandy soil
78 several seeds mixt by accident



Seeds Collected in the
neibourhood of Port Jackson from
the 10 May 18[illegible] to July 1802
Hibbertia volubilis
1 ~~Dillenia~~ foetida volubilus 5
2 a Dwarf Shrub about a foot high
on ~~moist~~ black soil no fl seen
3 ~~a Pinna~~ ~~[illegible] [illegible]iferina~~ fine
Dwarf Bush soil rather inclined
to Bog
4 Epacris a beautiful little plant
on a mixture of black bog & sand
in nearly equal proportions where
it is moderately moist
5 Styphelia a handsome little
prostrate plant with a long tube
scarlet flower soil like the former
6 Conchium a ~~small tree or~~
Shrub ~~on soil~~ of Bog & sand moist
7 [illegible] on soil rather sandy
8 [illegible] small shrub on sandy
soil no fl seen
9 [illegible] beautiful little conspicuous
on ground instantly wet
10 Liliceous [illegible] in moist bog not
seen in flower
11 Hedysarum a creeping plant on
sand & Bog soil moderately moist
leaves hairy 4
12 Epacris odorata a beautiful 5

on Sand & Bog soil very Situation
13 Lobelia ♃ a pretty little plant
probably ♃ in various Situations
generally Sand & Bog Soil
14 Nov Gen monoic on Sand &
Bog Soil a dwarf plant
15 Hedysarum a pretty little creeping
♃ on Sand & Bog soil about Stones
and tree roots on moist & bushy
16 Lobtlaspermum juniperinum
on stoney ground with bog Soil &
moist Situation
17 [illegible] a [illegible]
little plant [illegible] & Bog Soil
[illegible] scarce
18 Lobeliastrum a perennial
on sandy Soil
19 Embothrium sericeum latifol.
on moist bog Soil
20 Stackhousia probably ⊙ on
moist bog Soil
21 Boronia polygonifolia dwarf seldom above
6 inches high on mixture of Sand
and bog Soil moist probably ♃
22 Curious papilionaceous plant
on Moist bogs dwarf probably ♃
23 Banksia inter Serra et Serrata

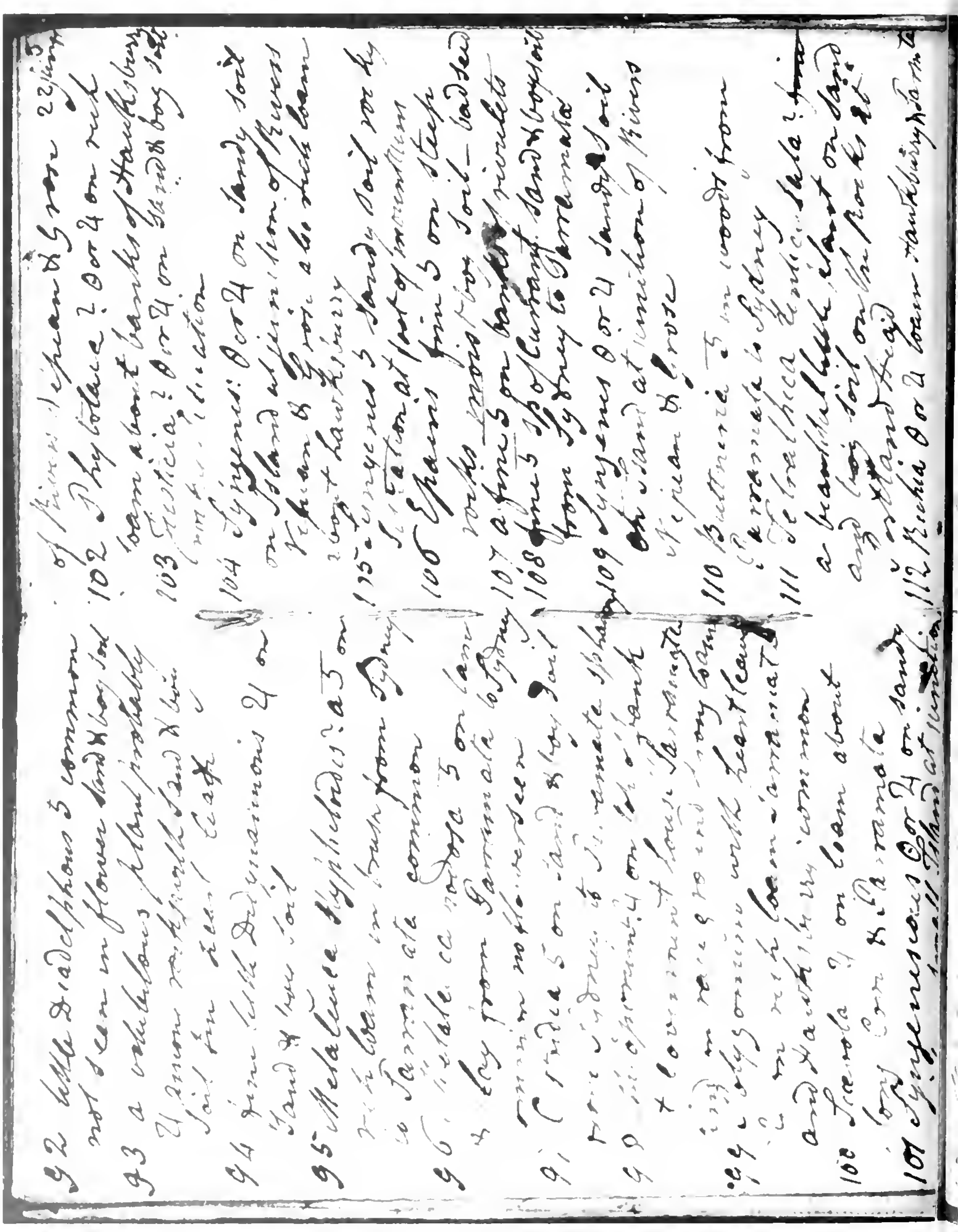
2
a Bush of moderate size in various
Situations generally mixtr. of Sand
and bog Soil rather moist
24 a pretty little Shrub
amongst rocks with Bog Soil
25 Syngenes. on clay Soil ♃
26 Viola on clay Soil probably
♃
27 Umbellif: on Sand & Bog Soil
probably ♄
28 Lambertia formosa on Sand
& Bog Soil ♄
29 Pimelia linifolia fine little ♄ on
Sand & Bog Soil
30 Banksia on low moist
Situations clay or Bog Soil a
fine low Shrub
31 Banksia Serrata on Soil rather
Sandy a tree
32 Metrosideros Citrina? on
moist Situations
33 Nov Gen affin Cassuarinae
a fine Tree among rocks
tolerable moist
34 Gen myrtoid fine little plant
on Sandy Bog Soil

35 Melaleuca myrtifolia on moist situations fine little plant
36 Solanum incrassum a shrub among rocks light [illegible]
37 Veronica a fine little [illegible] 4 on strong loam or clay
38 Lysinema capil[illegible] 4 on marshes
39 [illegible] on sandy soil
40 Umbellifer an 8 on various situations
41 Embothrium speciosissimum a fine shrub on sandy soil moist shady situation from 1 to 10 feet high
42 Sebaea [illegible] 3 sandy soil
43 [illegible] 5 sand & bog soil moist
44 [illegible] 5 sand & bog soil moist
45 Persoonia 3 sand & bog soil
46 Conospermum 3 sand & bog soil rather moist
47 Conium 3 sand & bog soil
48 Leptospermum [illegible] 5 moist bogs
49 Leptospermum from 5 8 feet high moist [illegible] soil [illegible] 18 inches high [illegible]
50 Melaleuca a tree sandy soil moist situations
[illegible] 5 [illegible] loam & sand

Do
52 Dichondra repens 4 sand & bog
53 Boronia polygonifolia 5 sandy moist bogs
54 Melaleuca 5 sand & bog soil [illegible]
55 [illegible] on [illegible] loam about Constitution hill
56 [illegible] 4 on moist [illegible] Richmond hill
57 [illegible] adelphious 8 [illegible] [illegible] about Richmond
58 [illegible] on [illegible] loam [illegible] rocks [illegible] Richmond hill
59 [illegible] on [illegible] loam about Constitution hill
60 [illegible] in marshes about Richmond hill
61 [illegible] rich loam Constitution hill
62 Prunella violacea on rich loam common from Parramatta to Richmond hill
63 [illegible] 8 & 4 on rich loam Richmond hill
64 [illegible] fine 4 high grounds at Richmond hill

65 Convallaria ? fine 5 on rich
loam about Richmond hill
66 probable Glycine 5? now volubles
on rich ? Sandy Richmond hill
67 probable Colutea a time on rich
loam Richmond hill
68 a ♃ aquatic in water on rice
ground from Toongabee to Hawkesbury
69 Styphelia ? fine 5 Sand & boy
Soil from ? to Parramatta
70 a Syngenesious plant on black
boy Soil near Sea Shore bor ♃
71 Gen similar to Tetrathica
? fine 5 Sand & boy soil
rather moist
72 Dwarf 5 sandy boy Soil moist
no flower seen Palmers house
73 Syngenesious ♃ various situations
Sand & boy Soil
74 Persoonia 5 Sand & boy Soil
75 ? various situations. ? Balm
76 a fine fern boy Soil moist
Shady Situation 5
77 5 Sand & boy Soil white flowers

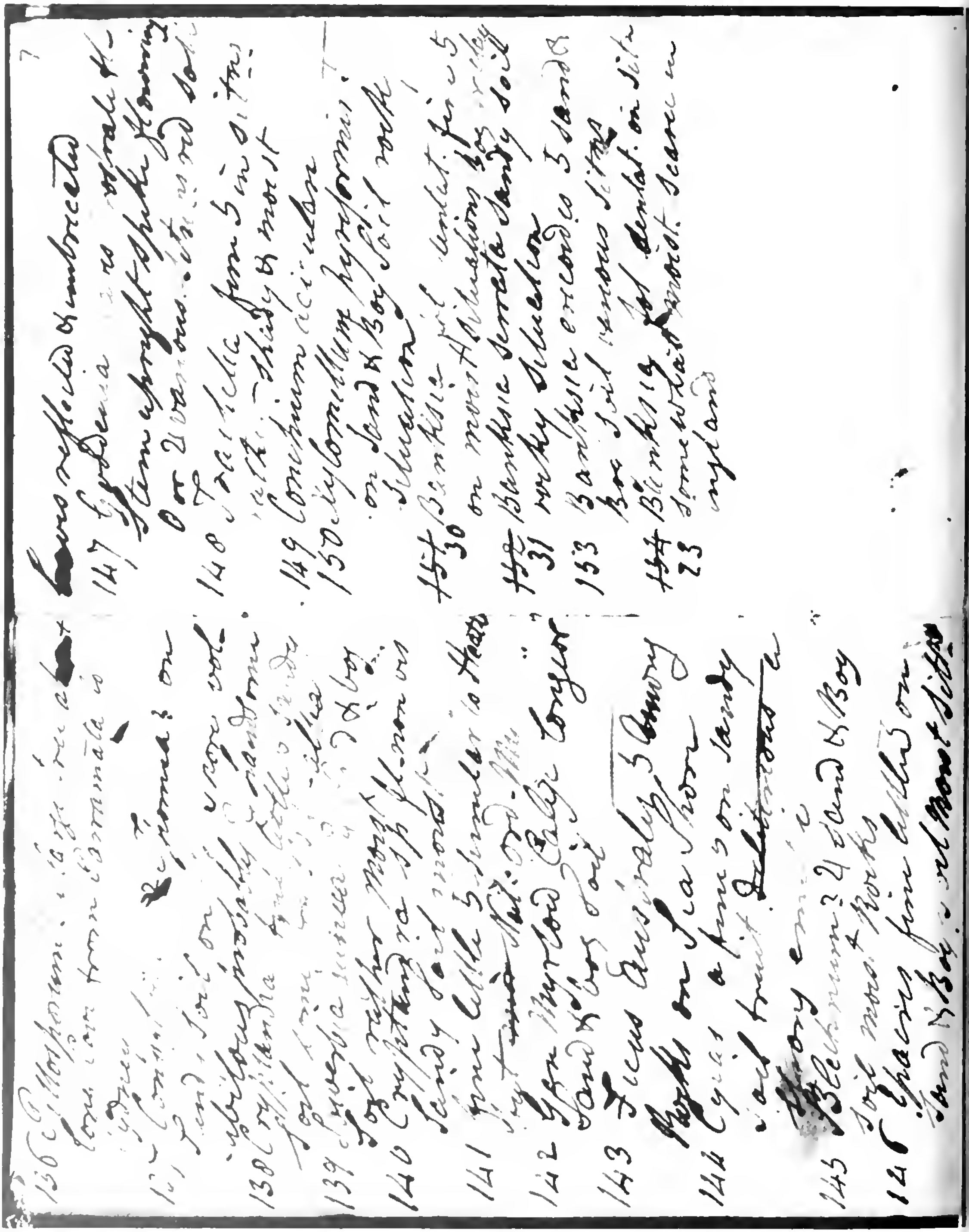
78 Leptospermum fine little 5.
moist boy Soil with Shade
79 Styphelia elegant 5 Sand &
boy Soil
80 fine volubilous 5 probably Sudap
or Conviensia Sand & boy Soil
81 fine ? ♃ Sand & boy
82 fine 5 Nat. Currant. Sand & boy
83 5 like Embothrium? Sand & boy.
no flowers seen
84 ☉ probable Biddens various sit.
85 fine tuberous rooted umbelliferous
♃ on Sand & boy Soil
86 ♃ Myoporum 5 Sand & boy Soil
87 5 in Swamps on margin of
harbour Nat. Mangrove
88 fine 5 volubilous foliis pinnatis
in English Gardens no fl. seen
89 fine 5 in English Gardens
no flowers seen
90 Casuarina 5 Sand & boy Soil
91 Opercularia umbellata ♃
on Sandy Soil various situations
Gryllandra 5 on Sand & boy Soil



92 little Diadelphous 5 common not seen in flower sand & bog soil
93 a volubilous plant probably 4 among rocks with sand & bog soil fine [illegible] leafe
94 fine little Didynamious 4 on sand & bog soil
95 Melaleuca styphelodes? a 5 on rich loam in brush from Sydney to Parramata common
96 Melaleuca nodosa 5 on sand & bog from Parramata to Sydney common no flower seen
97 [illegible] 5 on sand & bog soil from Sydney to Parramata [illegible]
98 [illegible] 4 on [illegible] bank [illegible] Government house Parramatta [illegible] loam
99 Polygonum with heart leaves [illegible] on rich loam Parramata and Hawkesbury common
100 Scaevola 4 on loam about [illegible] & Parramata
101 Syngenesious 0 or 4 on sandy [illegible] small Island at junction of Rivers Nepean & Grose 22 June
102 Phytolacca? 0 or 4 on rich loam about banks of Hawksbury
103 Justicia? 0 or 4 on sand & bog soil [illegible]
104 Syngenes: 0 or 4 on sandy soil on Island at junction of Rivers Nepean & Grose also rich loam about Hawksburry
105 Syngenes 5 sandy soil rocky situation at foot of mountains
106 Epacris fine 5 on steep rocks moist bog soil – bad seed
107 a fine 5 on banks of rivulets
108 fine 5 sp of Currant sand & bog soil from Sydney to Parramata
109 Syngenes 0 or 4 sandy soil on Island at junction of Rivers Nepean & Grose
110 Buttneria 5 in woods from Parramata to Sydney
111 Tetratheca [illegible]lata? ~~fine~~ a beautiful little plant on sand and bog soil on the Rocks at Portland Head
112 Richia 0 or 4 loam Hawksburry Farm [illegible]

113 Sida? 5 [illegible] banks of [illegible] near [illegible] Head
4 Convolvulus [illegible] on sandy soil
[illegible]
115 [illegible]
116 [illegible] 5 on loamy soil [illegible]
[illegible]
121 [illegible]

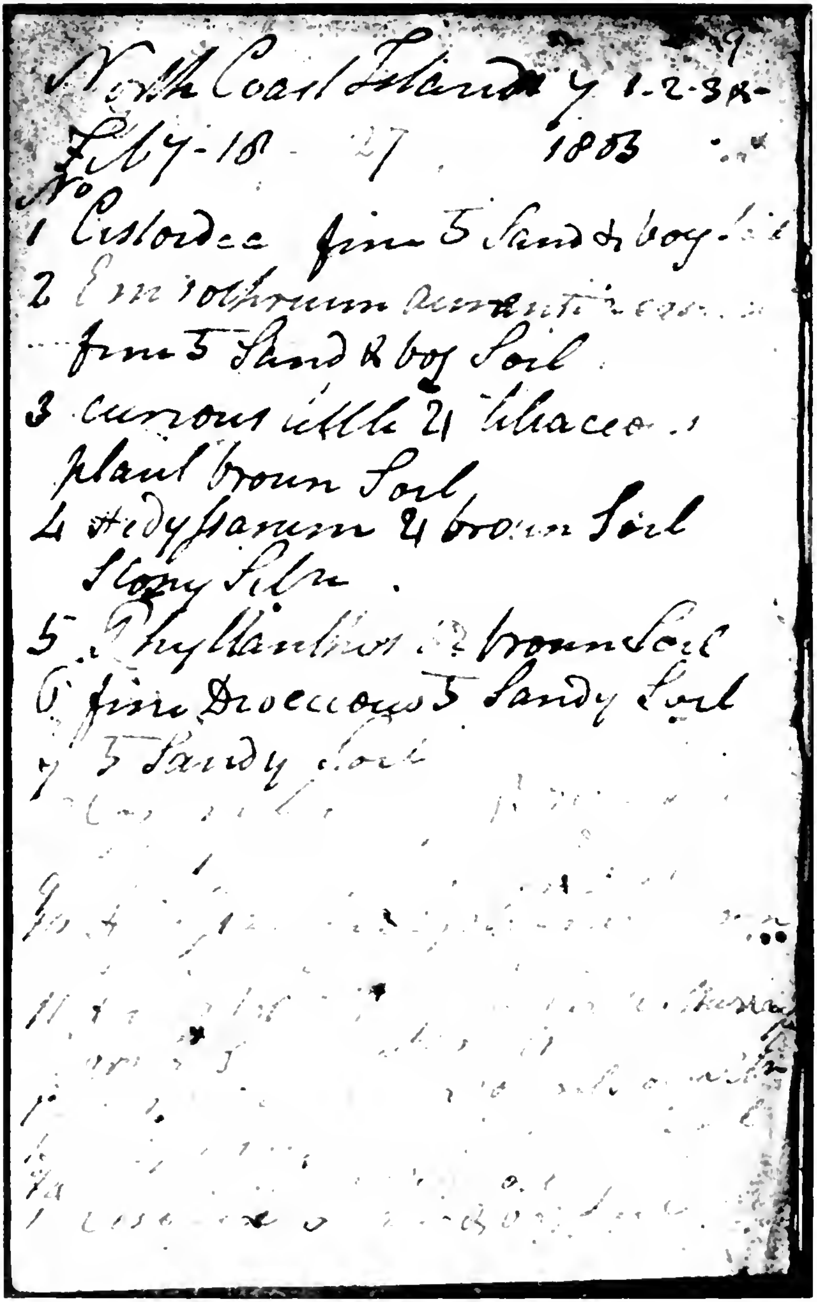
125 Corypha Cabbage Palm tree
5 [illegible] Island Head
[illegible]
128 [illegible] Metrosideros [illegible]
5 [illegible] soil moist [illegible]
129 Syngenesia [illegible] plant
on sandy [illegible] soil [illegible]
131 Epacris [illegible] elegant 5
Sand & [illegible] Soil on moist rocks
[illegible]
133 Melaleuca ericifolia 5 on moist [illegible] Botany Bay
134 a [illegible] on rich soil & shady situation on banks of Georges River
135 ~~[illegible]~~ Persoonia [illegible]
small! 5 on sandy [illegible] soil
very plentifull


136 Pittosporum. large tree about [illegible] from Parramata to Sydney
137 Conval[illegible] Epacris? on Sandy Soil on [illegible] very vol-ubilous probably [illegible] handsome
138 Cryptandra fine little [illegible] Soil [illegible]
139 Euphorbia [illegible] Sand & bog Soil rather moist
140 Cryptandra sp fl-non vis Sandy Soil moist
141 fine little S similar to Heath [illegible] ~~and~~ Nat: Ord - [illegible]
142 Gen Myrtoid Calyx longior Sand & bog Soil
143 Ficus Australis S among Rocks on Sea Shore
144 Cycas a fine S on Sandy Soil fruit ~~deliterious~~ [illegible]
145 Blechnum? 2 Sand & Bog Soil moist Rocks
146 Epacris fine little on Sand & Bog soil moist Situat
leaves reflected & imbricated
147 Goodenia [illegible] ovate Stem upright Spike flowering 0 or 2 various [illegible] red [illegible]
148 Trachelia fine S in situat rocky shady & moist
149 Conchium acicularis
150 Xylomelum pyriformis on Sand & Bog Soil rocky Situation
~~151~~ 30 Banksia fol dentat. fine S on moist situations bog or clay
~~152~~ 31 Banksia serrata Sandy soil rocky Situation
153 Banksia ericoides S sand & Bog Soil various Situat
~~154~~ 23 Banksia fol dentat. on Situat somewhat moist. Scarce in inland

Seeds Collected in ~~native~~ the
neighbourhood of Port Jackson
from 10 May to 12 July 1802

No 1 Banksia with longovate
dentated leaves on moist ~~[illegible]~~
swampy situations clay or
bog soil Dwarf 5 Cones
2 Banksia serrata Sandy
Soil Rocky Situation 8 Cones
3 Banksia ericoides Sand & bog
soil 1 Cone
4 Banksia Sand &
bog Soil neither moist 7 Cones
5 Banksia
Dwarf 5 Sandy soil moist situ
3 Cones
6 Banksia
Sandy Soil rocky situation
13 Cones
7 Xylomelum pyriforme
Sandy soil Rocky Situation
6 Cones
8 Conchium gibbosum
9 —— nervosum
10 —— fol teretes fructus minus
Sand & bog Soil Rocky Situation
11 —— aciculare

12 Tristania
Situations rather shady & moist
among rocks
13 Protea Sand & bog soil
14 —— Sand & bog soil
15 Embothrium Spec of specimen
Sand & bog soil rather shady
moist situations
16 Protea Sand & bog Soil
17 Protea
Sandy soil Rocky Situn


North Coast Islands 9 1-2-3&-
Feby-18 - 27 1803
No
1 Cistoidee fine 3 Sand & bog ...
2 Eriothrum aurentiacea ...
fine 3 Sand & bog Soil
3 curious little 21 liliaceo[us]
plant brown Soil
4 Hedysarum 2 brown Soil
Stony Hills
5 Phyllanthus 2 brown Soil
6 fine Droceaous 3 Sandy Soil
7 3 Sandy Soil

List of Seeds collected on the
East and North Coasts of New
Holland from the 30 July 1802
To the 4 March 1803

+ Abrus precatorius. Keppel Bay
+ Acer Coen River
+ Aeschynomene lomentacea
+ — litteralis Port I
+ Achyranthes erubescens Gulf of Carpentaria
+ — — var b Bay III
—— canica Island g. h
+ — aspera — Port I
Achyranthoides capitata Island h
Aira hispida Island a
Areca moschata Keppel Bay
Alpinia galanga Port II N Tr
Alternanthera nodiflora Broad Sound
Alyxia obtusata Port I & Broad Sound
—— subspicata Groote Eyland
—— ruscifolia Sandy Cape Br Sound
+ Ammannia subsucculenta Island a
+ Anthericoides clavata Island h
Arbor Radulifera Rumphi: Broad Snd
+ — fol decomposit umbellifer Br Snd
— — fol opposit fruct oliveform
flor ig not Broad Sound
Asteroides tridentata Keppel Bay

+ Asteroides alba — Shoal Bay
+ —— —
+ Banksia latifolia — Port II
+ —— dentata — Bay III
+ —— varia — Port I on Cone
+ Bauhinia B — Arnheim North Bay
—— var. Broad Sound
+ Bidens littoralis. — Port I
+ Bignonia floribunda. — Keppel Bay
Bombax ricinifolia — Arnheim N Bay
+ Borago erecta. var. — Island a
+ Boronia cineria — Point S
+ —— parviflora — Island g
+ Bradleya — Groote Eyland
Bryonia vittata — Broad Sound
—— rubra — Broad Sound
+ Buphthalmum triplinervium — Port I
+ Butonicoides crenata — Island h
syn. Eugenia crenata Banks & Sol[r]
+ Cacalia — Port II
+ Campanula ramosa — Broad Sound
+ —— Cape Townsend Island
+ Capparis umbellata — Island a
—— No 12 — Island h
+ Cardiospermum hallicacabum — Broad S[d]
+ Carissa B — Island s
+ Caryota — Northumberland Islands
Syn. Palma oleracea Banks et Soland[r]
+ Callophyllum inophyllum — Northum[d] Islands

2

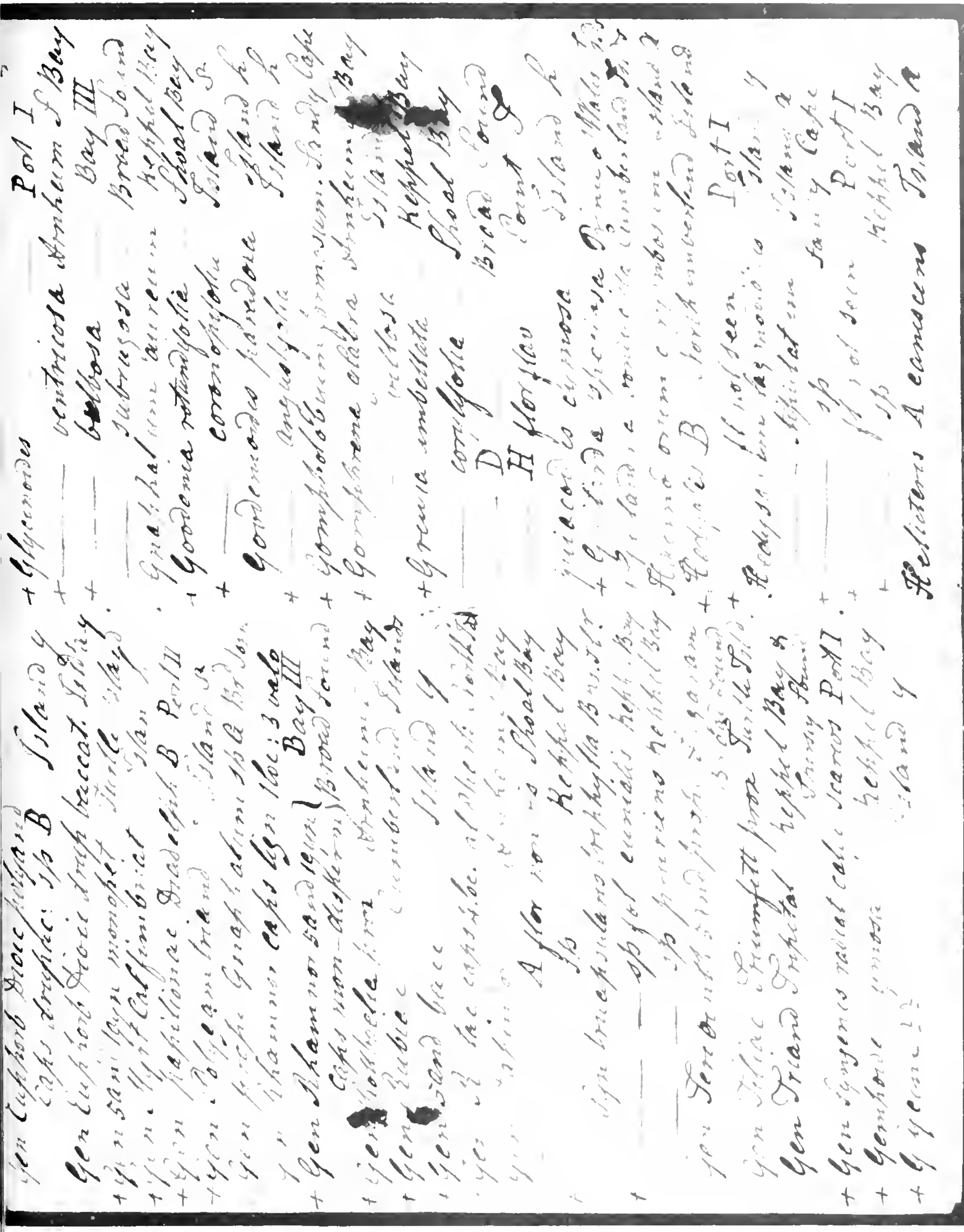
Cassia hirsuta — Arnheim South Bay
+ —— glauca — Island s
+ —— E — Broad Sound
—— No 59 — Broad Sound
+ —— fruticulosa — Island a
+ —— fl not seen — Thirsty Sound
+ —— fl not seen — Keppel Bay
+ Casuarina equisetifolia — Port I
Ceanothoides alba — Port I
+ —— tomentosa — Shoal Bay passage
Celtis rigida — Island b
—— glabella — Island b
+ —— orientaloides — Arnheim S Bay
+ Cenchrus uniflorus — Northumber[d] Islds
—— sp alt — Arnheim S Bay
+ Cissus mollis — New Years Islands
+ Cistoides pedunculata — Island y
—— tetragyna — Island y s
—— lepidota — Island h
—— —— var. angustifol — Island y
—— oblongata. — Island y
+ —— aphylla — Island y 2 seeds
+ —— K — Groote Eyland
+ Cleomea varia — Point S
Clutioides buxifolia — Island a
+ Commelina siliculosa — Island y
+ —— anthericoides — Island y
+ —— sp. alt — Bay III
Conchium arborescens — Island a
Convallarioides angustifolia — Port I

+ —— hastulatus — Island h
+ —— brasiliensis Sandy Cape
+ —— —— var. multiflor Island h
+ —— C Island h
—— laxiflorus. Island u
+ —— mollis Broad Sound
+ —— micranthus Keppel Bay
+ —— fetus Keppel Bay
+ —— erectus Island a
+ —— fl not seen Keppel Bay
—— fl not seen Facing Island
+ Conyzoides longiflora Bay III
+ —— dentata — Island a
+ —— sp alt Point S
+ —— Port I
+ Cordia Sebestena Point T
Corypha minor Island h
—— humilis. Island S
Crepsa indica Island h
+ Crotalaria calycina Island y
+ —— virgata Arnheim S Bay
+ —— sp — Port I
+ —— sp Keppel Bay
+ —— sp —— Island a
Crotalarioides arborescens Keppel Bay
Croton biglandulosum Island b
—— G — Island s
+ Curatellowes angustifolia Bay III
—— cistifolia Island y & Bay III

+ Cylista reticulata Shoal Bay
+ Cynanchium — Keppel Bay
+ —— —— Island a
+ Cyperus —— Shoal Bay
+ Cytisoides angustifolia. Island h
+ Davalia — Port II
+ Daviesia umbellata. Shoal Bay passage
+ Digitata grandis Port II
+ Didynam Angiosp — Island h
+ Dianella coerulea Arnheim S Bay
Diospyros caenosa — Bay III
+ —— pubescens Island y
+ —— laurina Jan 4. 1803
+ —— L Island y
—— myrtifolia Island a
+ —— revoluta Prince of Wales Islds
Dolichos giganteus Groote Eyland
+ —— littoralis — Island y Shoal Bay
+ —— sp — Island h
Dodonaea villosa Islands b & h
—— pinnata Point S
—— suaveolens — Broad Sound
+ —— hermaphrodita Port I
+ —— cinerea — Sandy Cape or port I
Dracaena terminalis Northumb Islds
+ Drocera monogyna Island y
—— indica Banks & Sol. Port I
—— petiolaris Arnheim S Bay

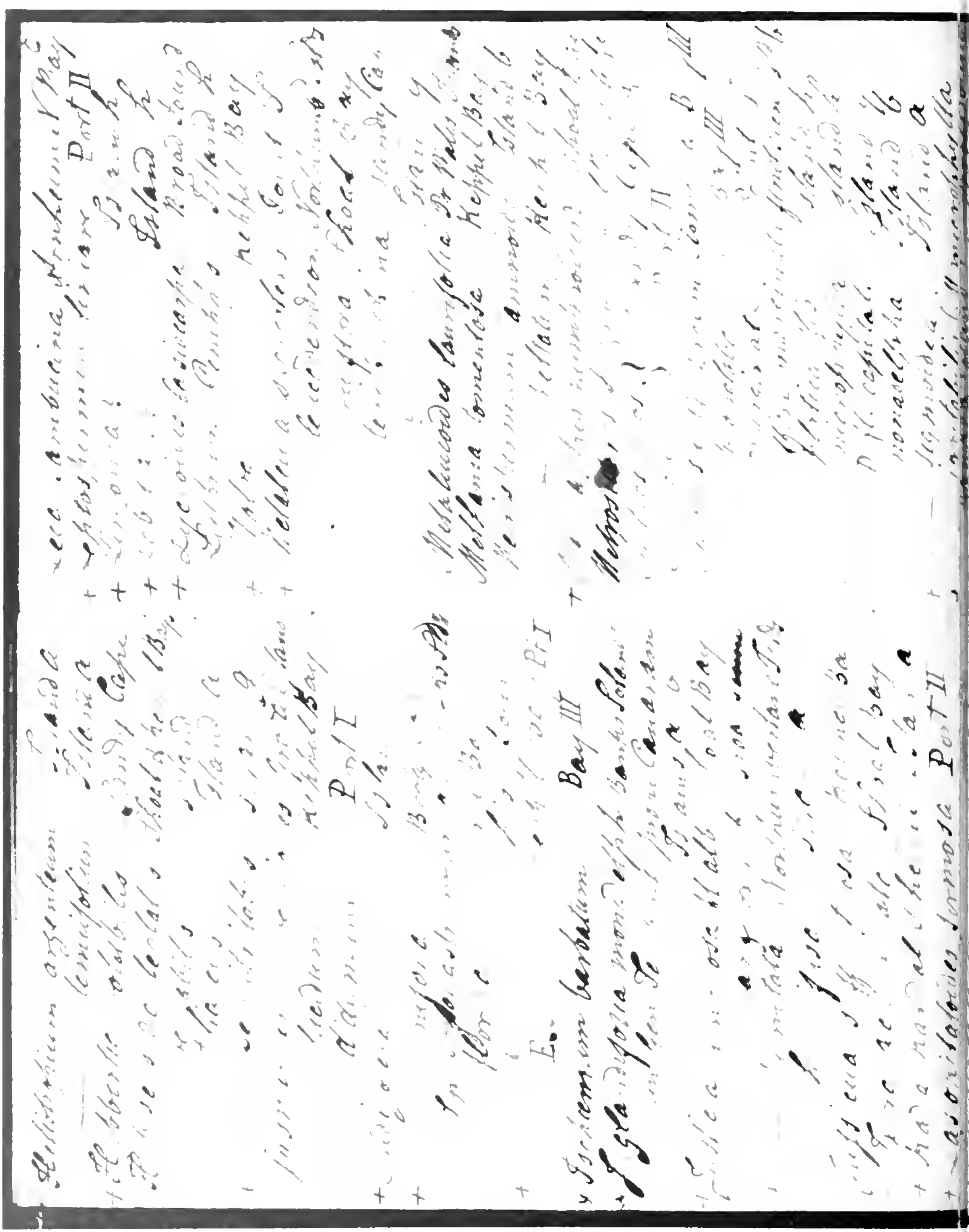
Drupae fl ignot — Port I
Embothrium oblongatum Bay III
— huncens Sand Is & Bay III
— aurantiacum Islands g-y
— diffusum Island h
— var flor rub Island y
+ — refractum Island h
— Xylocarpum Island y
+ Banksianum flor rub Port I
+ — var. fl. alb Shoal Bay
— barbatum Shoal Bay passe
— mimosoides Island a
+ Erinus albiflorus Island a
+ Epidendrum (not harrisetii) Port I
+ Eriostemum parvifolium Shoal Bay
Erithaloides polygamia Island a
Erythroxylon A Point J
Erythrina fulgens Island z
Eucalyptus hispida Island a
+ — collina Northumber Isl^ds
— cinerina Port I
— imperforatus Bay III
— spectabilis Island a
— fl not seen Port I
Port II
+ Eugenia
Eupatorium Port I Keppel Bay
— mollissimum Sandy Cape
+ ...

Euphorbia diffusa Broad Sound
+ — D Port I
+ — Broad Sound
+ — Island a
+ Evolvulus decumbens Island a
Excoecaria Agallocha Island a
Exocarpos latifolia Island h
Fusana Novae Hollandiae Groote Eyland
+ Ficus scabrosa Islands a c
Filago redolens — Broad Sound
— capitata — Broad Sound
Flagellaria indica Island l
+ Frutex subaphyllus 4 gon (Keppel
ramosissimum flor non vis) Bay
Fusanoides atropurpurea Groote Eyland
& Arnhem N Bay
Gardenia foveolata Island h
Gen Acram Cumberland Islands
Gen Annonar Keppel Bay
Gen aurantiar — Groote Eyland
Syn. Quiaccoides cymosa Banks Sol^r
+ Gen Asphodelorum Island y
Gen Dioic apetal bacc Pr Wales Isl^ds
& Arnhem S Bay
Gen Dioic apetal dodecand
anther 4locular. Island y
+ Gen Dioic Triand apetal
drup nuc monosp inf Island y
Gen Euphorb Dioic polyand Island a



Gen Euphorb Dioic polyand
Caps drupac: sp B Island y
Gen Euphorb Dioic drup baccat. Isl Bay
+ Gen [illegible] monopet Turtle Island
+ Gen Myrt Cal fimbriat Island [illegible]
+ Gen papilionac Diadelph B Port II
+ Gen Polygam triand Island [illegible]
Gen [illegible] Gnaphalium [illegible] Br Sound
Gen Rhamnos caps lign 1loc: 3 valv
+ Gen Rhamnos [illegible] Bay III
Caps non-dehiscens Broad Sound
+ Gen [illegible] Arnhem Bay
+ Gen Rubiac Cumberland Islands
+ Gen [illegible] bacc Island y
Gen [illegible] caps [illegible] Northumberland Isd
Gen [illegible] Arnhem Bay
A flor [illegible] Shoal Bay
sp Keppel Bay
[illegible] tricapsularis triphylla Br. Sd
+ — — sp fol cuneatis Kepp. Bay
— — sp [illegible] Keppel Bay
Gen Terebinth [illegible] Broad Sound
Gen Tiliac Triumfetta prox Turtle Isd
Gen Triand Tripetal Keppel Bay & Sandy Point
+ Gen Syngenes radiat calic scarios Port I
+ Gemhorae [illegible] Keppel Bay
+ G [illegible] Island y

+ Glycinoides Port I
+ — — ventricosa Arnhem S Bay
+ — — bulbosa Bay III
— — subrugosa Broad Sound
Gnaphalium aureum Keppel Bay
+ Goodenia rotundifolia Shoal Bay
+ — — coronopifolia Island [illegible]
Goodenioides [illegible] Island h
— — angustifolia Island h
+ Gompholobium formosum Sandy Cape
+ Gomphrena glabra Arnhem Bay
— — villosa Island [illegible]
+ Grewia umbellata Keppel Bay
— — corylifolia Shoal Bay
— — D Broad Sound
— — H flor flav Point [illegible]
[illegible] cymosa Island h
+ G[illegible] speciosa Prince of Wales Isd
+ [illegible] Cumberland Isd
[illegible] corymbosum Island [illegible]
+ Hedysarum B Northumberland Island
+ — — fl not seen Port I
Hedysarum lagopodioides Island y
— — stipulatum Island [illegible]
+ — — sp Sandy Cape
+ — — fl not seen Port I
+ — — sp Keppel Bay
Helicteres A canescens Island a



Heliotropium argenteum Island a

Port I

Ischaemum barbatum Bay III

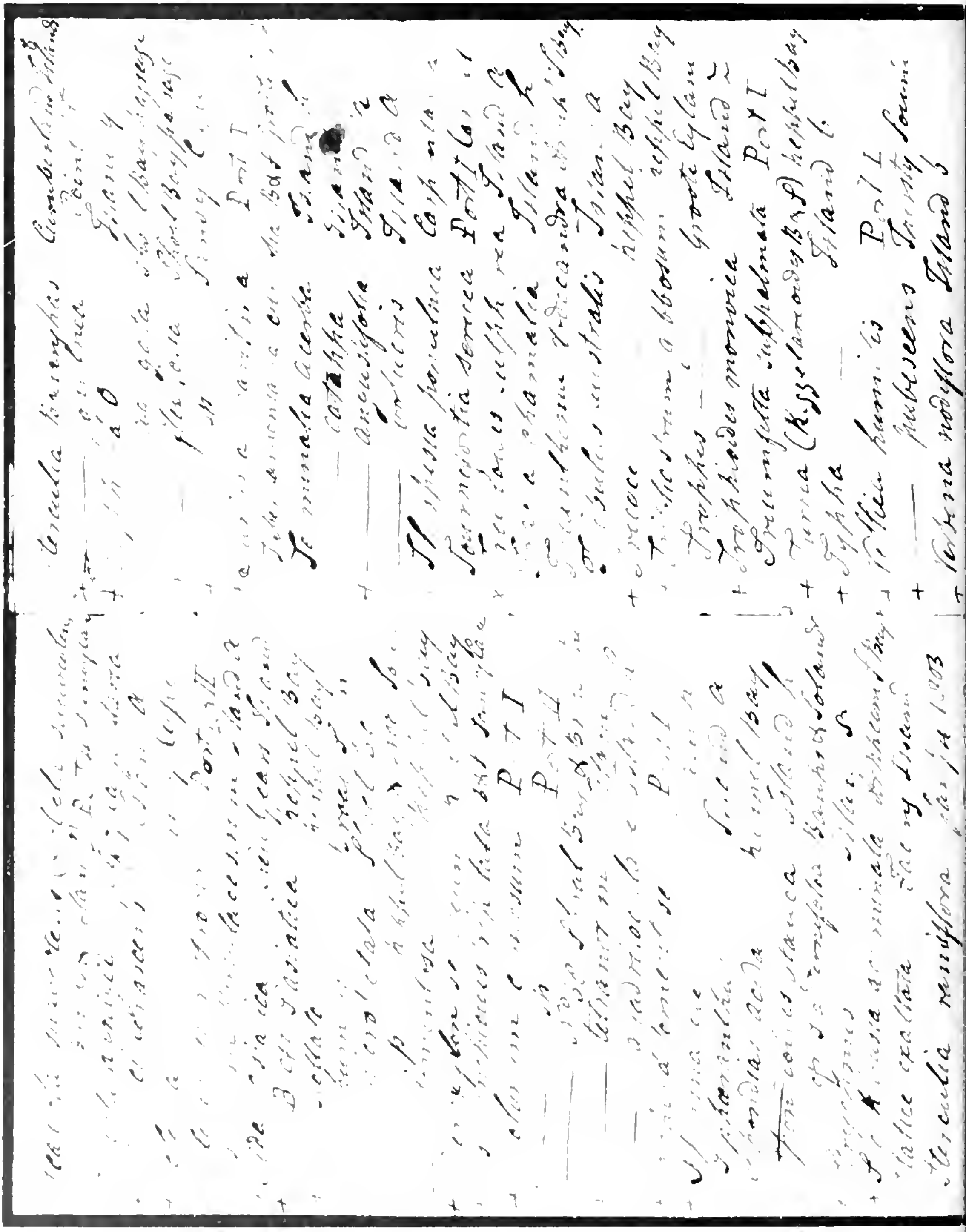
Metalucoides laurifolia Pr Wales

Melaleuca tomentosa Keppel Bay

Port II

+ Mimosa falcata Keppel Bay
Mimusops glabella Shoal Bay
Molugo Turtle Island or J
Modeca Dioica Groote Eyland
Morinda citrifolia Cumberd Islds
Murraya varia Island Z
+ Myoporum cæcum Port I
Myristica dactyloides? Groote Eyland
Myrobalanus salicifolia Jany 1st 1803
Myrtoid flor non vis Cumberld Islands
Nov Gen Campanulae habit Cassiones
Nov Gen Meliae monadelph 5 and. Port II Groote Eyld
Nov Gen. Myrtoid fruct drup sps B Island Z 4
Nov Gen Myrt (Mentzelioides floribunda Banks et Soland) Port I
+ Nov Gen Rubiae 5 and bacc Jany 1st 1803
Nov Gen Syngenes. Island a
Nov Gen Viticum 4 and stigma dichotom Broad Sound
Nov Gen Viticum prox Lantanum Northumberland Islands
Cynanchum suffruticosum Northumbd Islds
— micranthum Broad Sound
Oestrum flor non vis Broad Sound
+ Opercularia umbellata var Port II
Ornitrophe pubescens Island Z
Panax Shoal Bay passage
+ Panicum gr Psemiaristatum Island Z

Passiflora coccinea Keppel Bay
+ Paspalum formosum Northumb Islds
+ Pappophorum pallidum Groote Eyland
Pavetta variabilis Turtle Island
+ Pedalioides tribulus Arnheim N Bay
Persoonia adversa Sandy Cape
——— elliptica — Sandy Cape
——— falcata — Island h
+ Phaseolus ——— Port I
Phyllanthus canescens Shoal Bay
+ ——— prostratus Arnheim S Bay
——— H — Island y
+ ——— cinerius Groote Eyland
Phyllanthoides rugosa Island h
——— fruticosa Keppel Bay Islds
+ Pimelia cornucopiæ Shoal Bay
+ ——— puniceа Arnheim North Bay
Pisonia grandis — Turtle Island
Pittosporum insulare Port I Shoal Bay
Platylobium glaucum Island h
+ Polygala densifolia Island y 3
+ Portulaca sedifolia Arnheim S Bay
+ Poa multiflora Arnheim S Bay
Premna integrifolia Island h
Pultenoides epiphylla Island h & S
+ ——— ventricosa — Port II
+ ——— liniaris — Port I
Restio ——— Island h
Rhamnus laevigatus Island a
Rottboelia prox gen Arnheim N Bay
Rutoides emarginata Keppel Bay



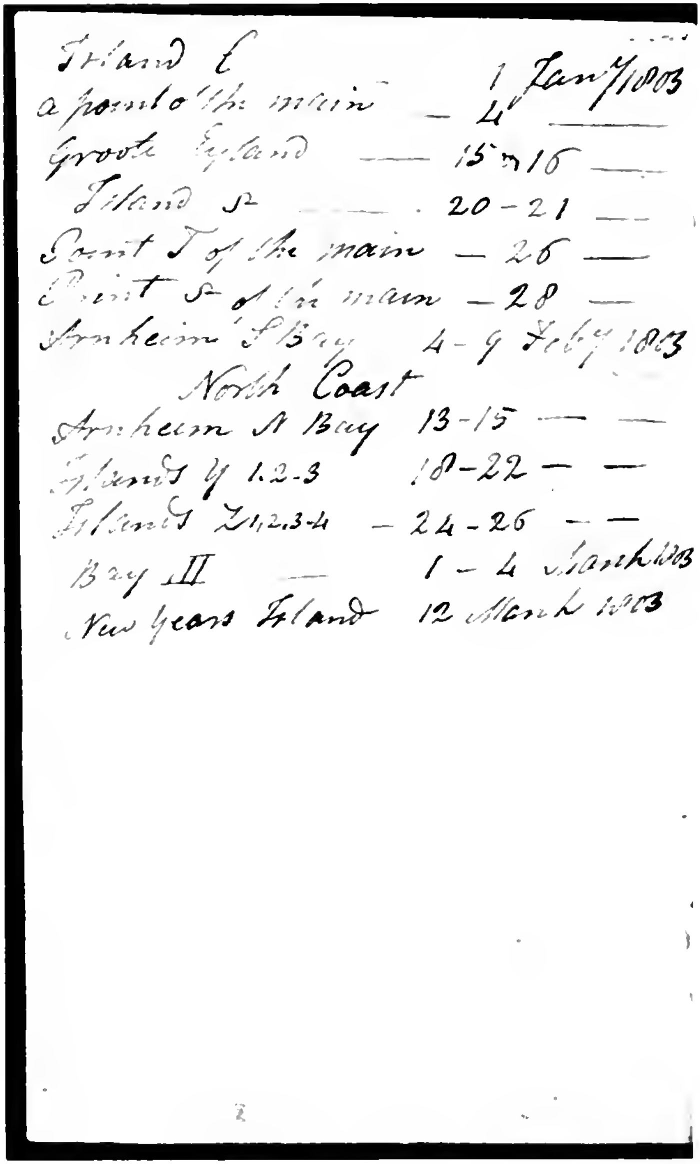
Viciodes virgata — Island h
— aurantiaca — Island h
+ f — formosa — Island a
+ — A — Port II
+ — argentea — Keppel Bay
+ — F — Keppel Bay
+ Umbellata — Shoal Bay passage
Viola angustifolia Islands a & l
+ — var Island g
+ — dentata — Island h
Vitex trifolia — Island ?
— arborea Arnheim's Bay
— simplicifolia Port I Cumb Islands
+ Vitis pedata Island s
— biglandulosa Keppel Bay
— trifolia Sandy Cape
+ — ternat cfr V trifolia diversa
+ Keppel Bay
Volkameria inermis Shoal & Keppel Bay
— colorata Keppel Bay & Broad Sd
— sp Northumberland Islands
— insectorum Port I
+ Waltheria indica — Port II
+ Xanthorrhea hastilis Port II
— var nan Port I
+ Xeranthemoides candida Port I
Xyris spicata Island a
— complanata Island h
+ Zeiria (cfr Z lanceolatum of Port Jackson) Sandy Cape
Zizyphus Arnheim South Bay

N.B. Those marked with a cross (+) are all included in this package of those which have not this mark prefixed there are duplicates which will be forwarded by first ~~opportunity~~

As some of the parcels are only dated it becomes necessary to subjoin the Dates of our different anchorages

Sand Cape — 30 to 31 July 1802
Port I & Facing Island 5 - 8 Augt —
Keppel Bay — 9 - 16 — —
Port II — 21 - 22 — —
Shoal Bay & passage and Cape Townsend Island } 26 August to 4 Septr 1802
Thirsty Sound — 5-6 — —
Broad Sound — 9 - 26 — —
Cumberland Islands {29 Septr to 3 Octr —
Northumberland Islands 16 October —
Prince of Wales Islands 2 Novr

Gulf of Carpentaria
Islands a b c — 17 to 28 Novr 1802
Turtle or Island f 4 Decr —
Islands g h — 16 to 26 Decr —



Island E — 1 Jany 1803
a point o' the main — 4 ——
Groote Eyland —— 15 & 16 ——
Island S —— 20-21 ——
Point T of the main — 26 ——
Point S of the main — 28 ——
Arnheim S Bay 4-9 Feby 1803
North Coast
Arnheim N Bay 13-15 — —
Islands Y 1.2-3 18-22 — —
Islands Z 1,2,3-4 — 24-26 — —
Bay II — 1-4 March 1803
New Years Island 12 March 1803

1

Seeds Collected on the Island of
Timor from 1 — 8 April 1803

No
1 Phyllanthus O brown Soil
2 Scabrita Scabra 5 brown loam
3 Smithia Sensitiva 5? brown loam
4 Convolvulus O rocky Situation
5 Celosia O brown loam
6 Ammomum? 4 brown loam
7 Hibiscus? fine 4 brown loam
8 Leea 5 brown loam Some Shade
9 Unnona? fine 5 brown loam
10 Indigofera O Rocky Situation
11 Mimosa 5 brown loam
12 Mimosa 5 brown loam
13 Hedysarum 4 brown Soil Shade
14 Thunbergia fragrans 4 brown loam
15 Cissus? Vitis? 5 brown Soil
16 Clerodia an elegant 5 brown Soil
17 Mirabilis Jalapa O brown loam
18 Erinus O brown loam
19 Crotalaria
20 Vitis? 5 brown Soil fol lob tomentos
21 Cleome O brown Soil —

Island C	1 Jany 1803
a point o' the main —	4 ——
Groote Eyland ——	15 & 16 ——
Island S ——	20-21 ——
Point T of the main —	26 ——
Point S of the main —	28 ——
Arnheim's S Bay —	4-9 Feby 1803

North Coast

Arnheim N Bay	13-15 —— ——
Islands Y 1.2-3	18-22 — —
Islands Z 1,2,3-4 —	24-26 — —
Bay II ——	1-4 March 1803
New Years Island	12 March 1803

1

Seeds Collected on the Island of
Timor from 1 — 8 Aprile 1803

No 1 Phyllanthos ⊙ brown Soil
2 Scabrita Scabra ♄ brown loam
3 Smithea Sensitiva ♄? brown loam
4 Convolvulus ⊙ rocky Situation
5 Celosia ⊙ brown loam
6 Ammomum? ♃ brown loam
7 Hibiscus? fine ♃ brown loam
8 Leea ♄ brown loam Some Shade
9 Unnona? fine ♄ brown loam
10 Indigofera ⊙ Rocky Situation
11 Mimosa ♄ brown loam
12 Mimosa ♄ brown loam
13 Hedysarum ♃ brown Soil Shade
14 Thunbergia fragrans ♃ brown loam
15 Cissus? Vitis? ♄ brown Soil
16 Clenvia an elegant ♄ brown Soil
17 Mirabilis Jalapa ⊙ brown loam
18 Erinus ⊙ brown loam
19 Crotalaria
20 Vitis? ♄ brown Soil fol lob tomentos
21 Cleome ⊙ brown Soil

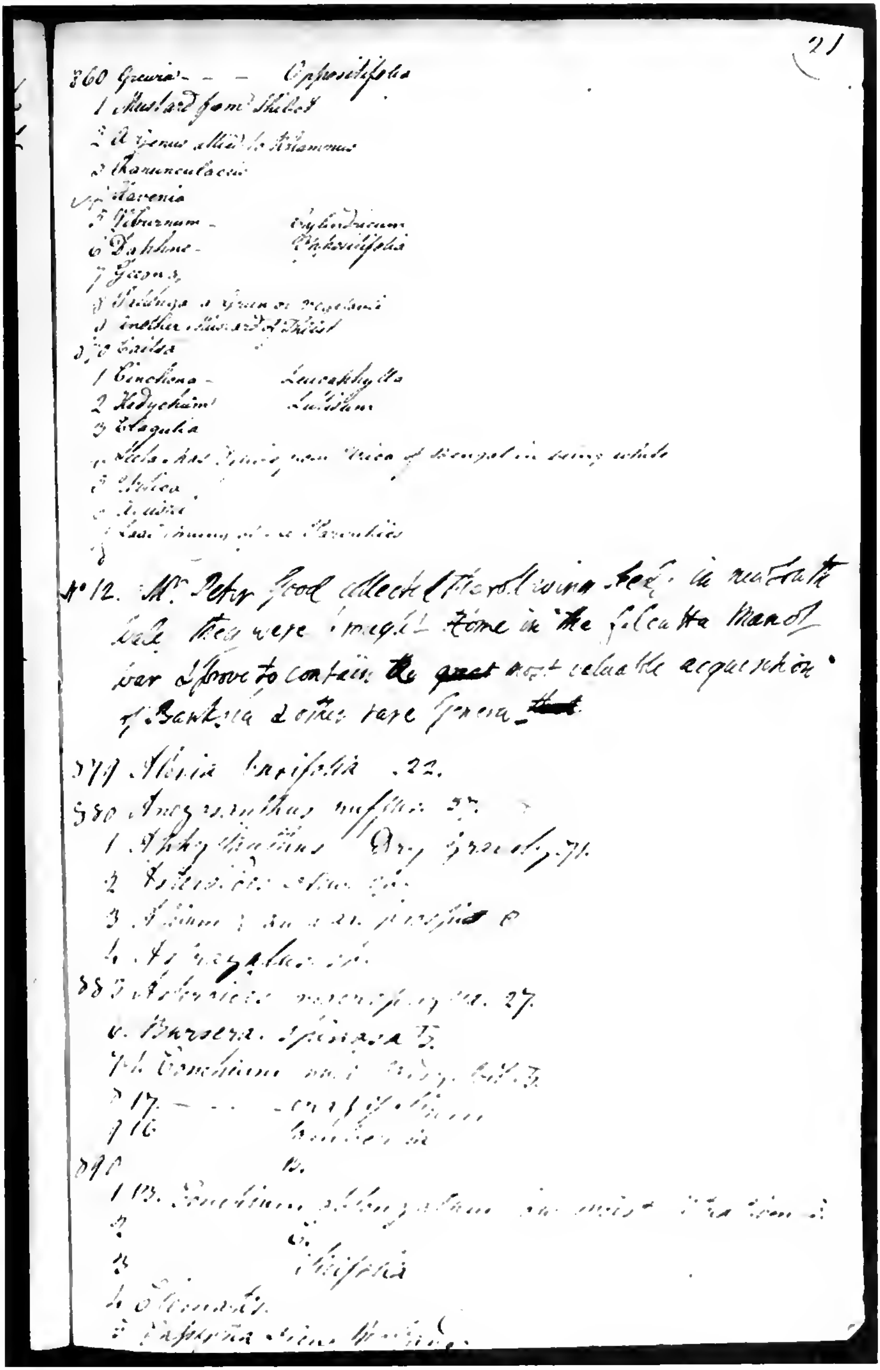
22 Ipomoea ☉ brown loam
23 Convolvulus ☉ brown loam
24 Canna indica
25 Hedysarum ☉? ♃? brownloam
26 Phyllanthus 5 brown loam
27 Sida 5 brown loam
28 Commelina ♃ brown loam
29 Chorchorus? ♃ brown loam
30 Ophiorhiza mungos ♃ brownloam
31 a Syngenesious ♃ moist situation
32 Cassia brown loam
33 Indigofera 5 brown loam
34 Hedysarum ♃ brown soil
35 ——— ♃ brownloam shade
36 Annona squamosa 5 brownsoil
37 Sesamum indicum? ☉ brownsoil
38 Callicarpa 5 brown loam
39 Hedysarum ♃ brown loam
40 Bryonia? ☉ brown loam
41 Jatropha Curcas 5 brown loam
42 Lausonia inermis 5 brownsoil
43 Malvaceous ♃ brown loam
44 Bryonia? ☉ brown loam
45 Cleome ☉ Sandy soil fl alb
46 Indigofera ♃ gravelly soil
47 Tournefortia scandens 5 brown
48 ☉ brown loam
49 Cardiospermum? 5 brown loam
50 Poinciana pulcherrima
51 Bazella ☉ brown soil
52 Tabernamontana 5 brownsoil
53 Amaranthus ☉ brown loam
54 Bignonia fol decomposit 5
55 ——— fol integris 5 brown soil
56 Borassus flabelliformis
57 Crateva marmelos 5

List of Seeds sown in vicinity
of Spring & various other situations
of the Island on the 2d – 4 & 5 April
1802

Orange
Lemon
Cherry
Melon Rock & Cantelouple
Cucumber
Gourd
Onion
Leek
Turnip
Beet
Radish
Cress
Mustard
Lettuce
Cabbage
Savoy
Spinach
Sea Kail

Facsimile of Records of the Receipt of Seed at Royal Gardens, Kew

Royal Botanic Gardens, Kew. Archives Inwards book, 1805–09, ff. 21–67. Folios 21, 22, 29, 31, 51, 52, 65 & 66 are reproduced in facsimile.


21

860 Grewia – – – Oppositifolia
1 Mustard from Thibet
2 A Genus allied to Rhamnus
3 Ranunculaceae
4 Hovenia
5 Viburnum – cylindricum
6 Daphne – Oppositifolia
7 [illegible]
8 [illegible] a Genus or [illegible]
9 another Mustard of Thibet
870 [illegible]
1 Cinchona – Leucophylla
2 Hedychium Luteum
3 [illegible]
4 [illegible]
5 [illegible]
6 [illegible]
7 [illegible]
8

No. 12. Mr Peter Good collected the following seeds in [illegible] [illegible] they were brought home in the Calcutta [illegible] war & prove to contain the ~~great~~ most valuable acquisition of Banksia & other rare Genera ~~that~~

[illegible] [illegible] .22.
880 [illegible] 25.
1 [illegible] 71.
2 [illegible]
3 [illegible]
4 [illegible]
885 [illegible] 27.
6 [illegible]
7 [illegible]
8 17 – – [illegible]
9 16 [illegible]
890 [illegible]
1 13 [illegible]
2
3 [illegible]
4 [illegible]
5 [illegible]

22/
896 36 Casuarina equisetifolia Dry sandy situation 5.
7 " Cartadium Nov. sp. 0
8 " Crotonoides oticifolia
9 " Centaurioides ocarisea
900 " Ceanothoides capulata
1 " Cercodia linearis
2 " Cynanchium aphyllum N. S. 5.
3 " Conospermum taxifolium
4 " Dodonaea alata.
905 " — — viscosa
6 62 — — — pinnatifida
7 " Eucalyptus turbinatus
8 " — rudis
9 " — nov. sp.
910 33 — — nov. sp.
1 74 Epacris virgata Sandy Soil 5.
2 68 Embothrium lobulatum 5.
3 " Epilobium sp. E. glabellum.
4 56 Exocarpus pendula. Billard. 5.
915 " Festuca pungens.
6 " Gnaphalium aureum x
7 " — — — viride x
8 70 Goodenia scapigera Gravelly, sand.
9 69 — coccinea 4.
920 55 Haemadorum corymbosum 4
1 46 Imbricaria nov. sp. 5.
2 79 Leptospermum serpillifolium
3 29 — Sandy Soil 5.
4 28 — argenteum hilly elevated situation
925 53 Leptospermoides Rather Moist
6 54 Lobeliastrum gramineum Sandy. 2
7 52 — fruticosum alpine 5.
8 " Linum —
9 " — — N. Holland.
930 " Lasiopetalum bracteatum
1 66 — ferrugineum 5.
2 " Lilies nov. N. Holland.

29

1135 42 Gen leguminos. Stam. Decem. Distinct. cal. bilab.
Legum ventricos Heather moist.

655 Gen legum. inter Gompholob. et Pultenaea
[illegible] foliis integris Shady woods. T.

752 Gen. legum. Pulten. [illegible]

857 Legum gen. Bossiaea affinis. T.

878 Seeds Mixed.

1140 17. 3

1 " Dry sandy soil

2 " Sandy soil.

3 22 Gen. legum. caps. [illegible]

4 7. [illegible] head. T. No. 14 [illegible]

1145 Dodonaea [illegible]

1146 ——— [illegible]

1147 ——— [illegible]

1149 ——— [illegible]

1150 ——— oligosperma [illegible]

1151 ——— [illegible]

1152 [illegible]

1153 ——— [illegible]

1154 ——— [illegible]

1155 [illegible]

1156 [illegible]

1157 [illegible]

1158 [illegible]

1159 [illegible]

1160 Conchium [illegible]

1 ——— [illegible]

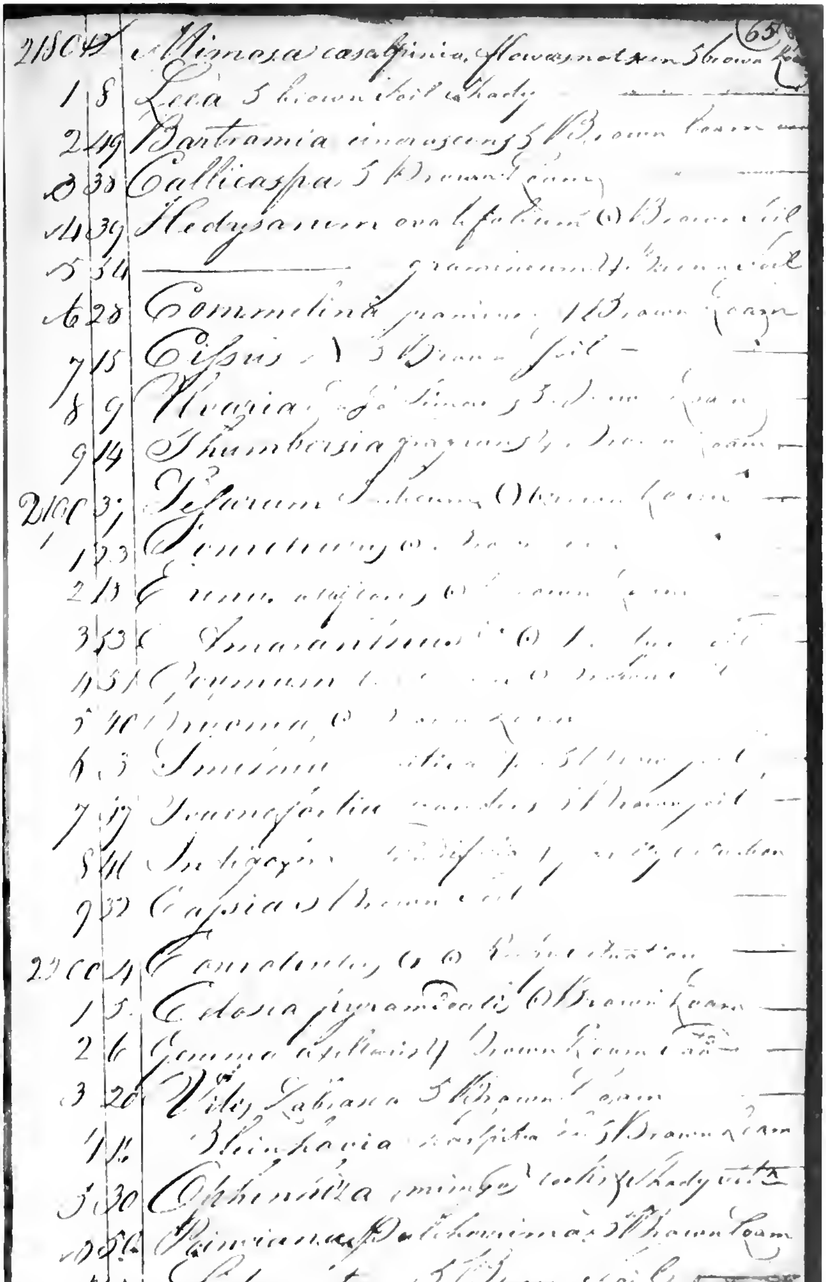
2 Eucalyptus [illegible]

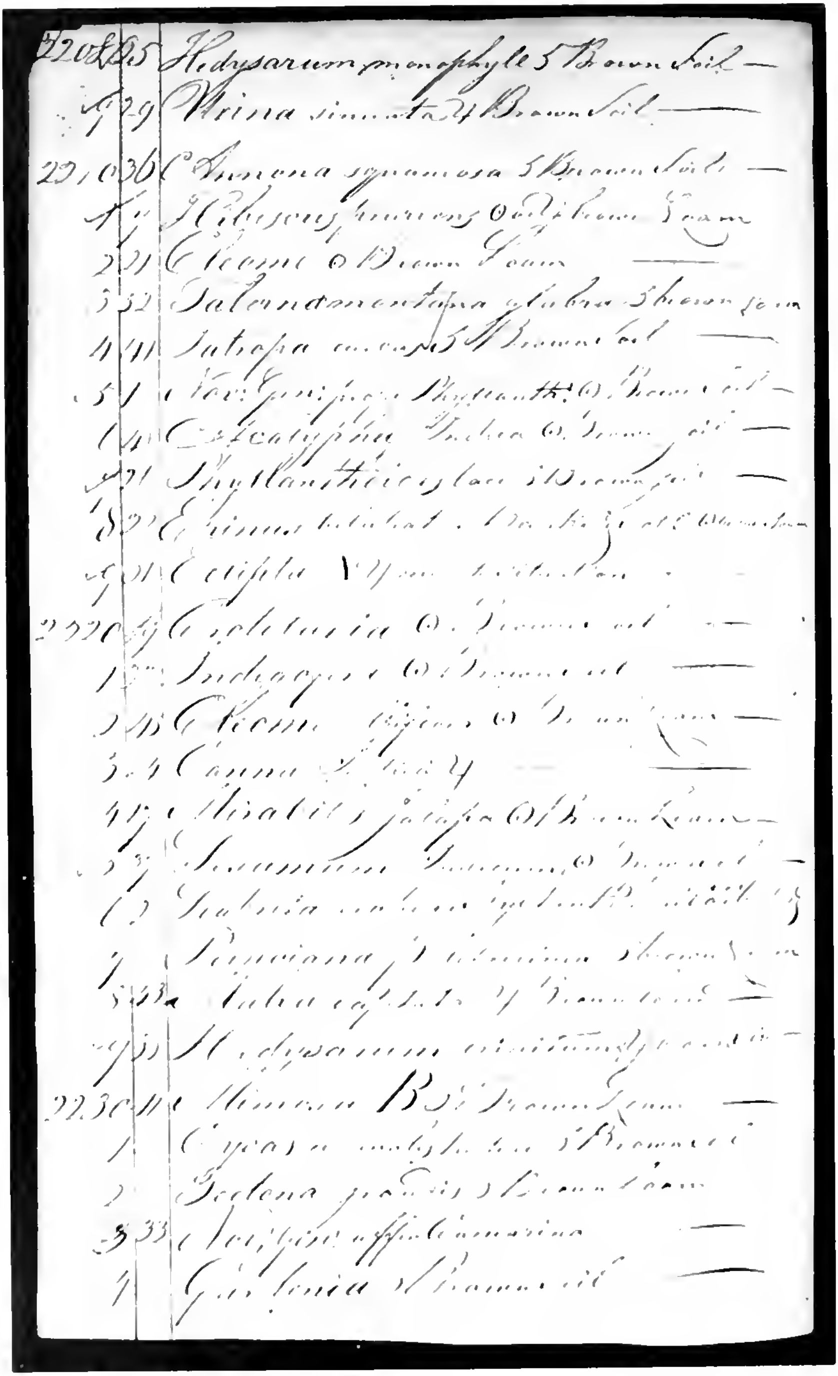
3 ——— " [illegible]

4 ——— ——— [illegible]

5 ——— [illegible]

53 1826 26 Passiflora coccinea [illegible]
7 Stylidium [illegible]
8 4 Embothrium [illegible]
9 20 [illegible]
11.30 [illegible]
1 [illegible] Sida [illegible] Sandy [illegible]
2 [illegible]
3 [illegible] Boronia [illegible]
4 — [illegible]
5 [illegible] Convallaria [illegible]
6 4 [illegible]
7 [illegible]
8 — Stylidium [illegible]
9 [illegible] Epacris [illegible]
14.30 [illegible]
1 [illegible]
2 — Casuarina
3 — [illegible]
4 [illegible] Epacris [illegible]
5 — Boronia [illegible]
6 Stylidium [illegible] situation
7 — [illegible]
8 [illegible] Xyris complanata [illegible] marshes
9 34 [illegible] Sandy [illegible] moist
1830 Embothrium [illegible]
1 [illegible] Boronia [illegible]
2 [illegible] Anthericum [illegible] Loam


2180 47 Mimosa caesalpinia [illegible] 5 brown loam
1 8 Leea 5 brown soil & shady
2 49 Bartramia [illegible] 5 brown loam
3 38 Callicarpa 5 brown loam
4 39 Hedysarum ovalifolium (.) brown soil
5 34 ——— gramineum [illegible] brown soil
6 28 Commelina gramin[illegible] brown loam
7 15 Cissus [illegible] 5 brown soil
8 9 Uraria [illegible] brown loam
9 14 Thunbergia [illegible] brown loam
2190 37 Sesamum [illegible] brown loam
1 23 [illegible]
2 15 [illegible] brown loam
3 53 [illegible]
4 51 [illegible]
5 40 [illegible] brown loam
6 5 [illegible] brown soil
7 17 Tournefortia [illegible] brown soil
8 41 Indigofera [illegible]
9 32 Cassia brown soil
2200 4 [illegible]
1 5 Celosia pyramidalis (.) brown loam
2 6 [illegible] brown loam
3 20 Vitex [illegible] 5 brown loam
4 1 [illegible] 5 brown loam
5 30 [illegible] shady
6 50 [illegible] brown loam
7 [illegible] Sida [illegible] 5 brown soil


2208 Hedysarum monophyle 5 Brown Soil
9 29 Urena sinuata 4 Brown Soil
2210 36 Annona squamosa 5 Brown Soil
1 Hibiscus 0 Brown Loam
2 Cleome 0 Brown Loam
3 32 Jatropha 5 Brown Soil
4 41
5 1 Nov. Genus Phyllanthus 0 Brown Soil
6 41 Acalypha 0 Brown Soil
7 Phyllanthus 5 Brown Soil
8
9 Eclipta
2220 Crotalaria 0 Brown Soil
1 Indigofera 0 Brown Soil
2 Cleome 0 Brown Loam
3 Canna 4
4 Mirabilis jalapa 0 Brown Loam
5 Sesamum 0 Brown Soil
6 Galenia
7 Poinciana
8
9 Hedysarum
2230 Mimosa 5 Brown Loam
1 Cycas 5 Brown Soil
2
3 33
4 Gardenia 5 Brown Soil

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Index