

DARWIN'S NOTEBOOKS ON  
TRANSMUTATION OF SPECIES  
PART II. SECOND NOTEBOOK  
(FEBRUARY to JULY 1838)

Edited with an Introduction and Notes

BY

SIR GAVIN DE BEER.

*Pp. 75—128*

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# DARWIN'S NOTEBOOKS ON TRANSMUTATION OF SPECIES

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## INTRODUCTION

In his First Notebook on Transmutation of Species,<sup>1</sup> Darwin satisfied himself that it had occurred when populations were isolated and no longer able to prevent the variation that resulted from sexual reproduction and is normally kept in check by breeding throughout the population. In this way varieties become split off from species and eventually become species themselves, while old species become extinct, thereby increasing the separation between the surviving species, many of which after being split into daughter species become genera. This was what Darwin meant by "my theory", and it was already distinctively his even before he thought of natural selection because nobody before him had combined genetic variation, isolation, divergence, and extinction into a coherent theory of transmutation of species.

In his Second Notebook, which represents Darwin's train of thought from the beginning of February to the first half of July 1838, he was already concerned with the problem of expressing his views on paper and gave himself instructions for presenting his theory. He had even thought out how he would start: "The only cause of similarity in individuals we know of is relationship, children of one parent, races of animals—argue opening thus" (II 215)<sup>2</sup>; "The argument [that two varieties of old standing will not breed together] must thus be taken as in wild state" (II 30). In the event he started very differently as the Sketch of 1842 shows. Other instructions covered the different aspects of the argument: "Give specimen of arrangement" of species in relation to geographical distribution (II 45); Discrimination between species is empirical: "show this by instances" (II 70); "Mention persecution of early astronomers" (II 123); "Argue the case theoretically if animals did change excessively slowly whether geologists would not find fossils such as they are" (II 137); "Put note Sir W. Scott has written about" recalling images long past (II 172); John Gould's conviction that half-breed of Australian dog would be most like Australian "might be mentioned in note" (II 189). An especially awkward problem was the origin of instincts: "my theory must encounter all these difficulties" (II

<sup>1</sup> Darwin's Notebooks on Transmutation of Species. Part 1, First Notebook." *Bull. Brit. Mus. (Nat. Hist.)*, Historical Series, vol. 2, pp. 23-73, 1960.

<sup>2</sup> References are given to the number of the Notebook and the manuscript page number.

199). Most important, he felt, was the following warning which shows that he was already alive to possible objections: "I fear great evil from vast opposition in opinion on all subjects of classification, I must work out hypothesis & compare it with results; if I acted otherwise my premises would be disputed" (II 202).

Among the claims which he was already able to make for "my theory" were the following: "My theory agrees with unequal distances between species" (II 145); "My theory explains that family likeness . . . holds good" (II 138); "My theory explains a grand apparent anomaly in nature" i.e. the existence of males (II 135); "State broadly scarcely any novelty in my theory, only slight differences, the opinion of many people in conversation. The whole object of the book is its proof" (II 177).

One of the pillars of "my theory" was the principle of Community of descent and its consequences. "We now know what is the natural arrangement. It is the classification of relationship, latter word meaning descent." (II 155); "The one end of classification [is] to express relationship and by so doing discover the laws of change in organization" (II 158).

Darwin's recognition of the community of language of different species of birds in cries of distress (II 68) anticipated by 120 years the modern demonstration of the fact by electrical recordings<sup>1</sup>.

Taxonomy acquired a completely new significance as a result of "my theory", and it is remarkable how Darwin's views anticipated modern conclusions. He recognized the principle that two similar but separated populations should not be regarded as distinct species until the regions between their ranges have been studied. Populations which overlap in their ranges but maintain their distinct characters can be regarded as good species (II 126). Therefore, a traveller "will not have brought home new species until he can show range and habits" (II 127).

For Darwin, species and genera had real existence in Nature. "Genus must be a true cleft putting out of case the analogy [of its species breeding with those of another genus]. If genus does not mean this it means nothing. There should be some term used where there is series" (II 129). This is Rensch's *Artenkreis*. As for the origin of genera, "Genus only natural from death or slow propagation of forms—just same way as men not all equally related to each other" (II 138); "The death of some forms & succession of others . . . is absolutely necessary to explain genus and species" (II 167).

Darwin soon saw that the onset of sterility was an essential factor in the origin of new species: "One species may have passed through a thousand changes, keeping distinct from other, and if a first and last individual were put together, they would not . . . breed together" (II 152). The geographical equivalent of this effect of passage of time is to be found in the British Herring Gull and Lesser Black-backed Gull. Darwin, however, had no evidence to support his view. Hence: "The most hypothetical part of my theory [is] that two varieties of many ages standing will not readily breed together" (II 30). This may be compared with T. H. Huxley's caveat that Darwin had not proved his point until he could show that natural selection had led to sterility between divergent products of evolution. Darwin realized this diffi-

<sup>1</sup> cf. "Developments in the study of animal communications" by F. Marler, in *Darwin's Biological Works*, edited by F. R. Bell, Cambridge 1959, pp. 130-208.

culty even before he had formulated his theory of natural selection. Meanwhile he investigated the possibility that the half-way stage to sterility is represented by sterile hybrid offspring (II 222), and concluded that "My views which would even lead to anticipate mules is very important for Lyell said to me the fact of existence of mules appeared to him most strange . . . my theory then explains a grand apparent anomaly in nature" (II 133).

The effects of "my theory" on the position of man was already realized: man "Likes to think his origin god-like" (II 133); "Not a deity" (II 77). Comparative pathology is invoked to good effect: "Many diseases in common between man and animals" (II 174).

Darwin's abhorrence of slavery is reflected in the following: "White man who has debased his nature by making slave of his fellow black" (II 154). Sexual selection is applied to man as well as to animals: "Cock birds attract female by song (analogy of man)" (II 178). Man is compared with the orang utan (II 79), and with other Primates: "A man grinning is to expose his canine teeth (this may be made a capital argument if man does move muscles for uncovering canines), no doubt a habit gained by formerly being a baboon with great canine teeth" (II 243); "Man in his arrogance thinks himself a great work worthy the interposition of a deity. More humble and I believe truer to consider him created from animals" (II 196).

The prevailing total ignorance of the causes of variation was a constant worry to Darwin. Always bearing adaptation in mind, he could only conclude: "Till we know uses of organs clearly, we cannot guess causes of change" (II 56). He was reduced to wrestling with William Yarrell's view that the oldest variety has the greatest effect on offspring in a cross (II 1), but was careful to remind himself to "give it" as Yarrell's theory. Later, (II 121) he gave it up. The difference between sports (or mutations) which were already recognized as inherited and minor variability which was so important for transmutation by imperceptible steps led Darwin to believe that there were "Two kinds of varieties. One approaching to nature of monster, [is] hereditary, [the] other [is] adaptation" (II 4).

Darwin already realized clearly that adaptation was a phenomenon of varying efficiency and that organisms could be imperfectly adapted to their environment (I 215, 230).

In one striking passage he anticipated the principle of the phenocopy: "If puppy born with thick coat [in temperate climate it is] a monstrosity, [but if the puppy is] brought into a cold country and [a thick coat] is then acquired, then [it is an] adaptation" (II 66). Admission of possible imperfection in Nature is shown in the following: "Even a deformity may be looked at as the best attempt of nature under very unfavoured conditions as an adaptation" (II 65). He realized that the phenomenon of the ptarmigan and hare becoming white in winter are not caused by the direct effect of the environment by physical action, but are instances of adaptation (II 84), and this example shows how closely variation and adaptation were associated in his mind. "The wonderful power of adaptation given to organization. This [is] really perhaps greatest difficulty to whole theory" (II 175). The recognition of adaptations often requires ingenuity, as in the following case: "Wax of ear bitter, perhaps to prevent insects lodging there" (II 174).

It was the fact of anomalies of geographical distribution that first brought Darwin up against the problem of transmutation. He soon saw that the distribution of large mammals was significant: "There is this great advantage in studying geograph: range of quadrupeds; that either created in each point, or migrated from those quarters where we know quadrupeds have existed for ages" (II 29). Geographical distribution introduced the possibility of isolation of groups on a grand scale: "Have the Edentata and Marsupials forms been chiefly preserved where shut up by themselves without other animals?" (II 36); "How came it animals not preserved in Central S. America and yet in Africa and India?" (II 132). Related representative species in different regions interested him greatly: "Buzzards in Patagonia and in Chile a good case of replacement" (II 56); "Once grant my theory and the examination of species from distant countries may give thread to conduct to laws of change of organization" (II 70).

Darwin realized that if species had not been separated and specially created, there must have been a mechanism of evolution. Before he hit upon the principle of natural selection his views on this problem could not be very precise, but the notion of competition appears in the following passage, albeit without defined penalties for the losers: "Once grant that species and genus may pass into each other, grant that one instinct to be acquired (if the medullary point in ovum has such organization as to force in one man the developement of a brain capable of producing more glowing imagining or more profound reasoning than other, if this be granted) and whole fabric [of special creation of species] totters and falls" (II 76). The penalties make their appearance in the following: "The constitution being hereditary and fixed certain physical changes [in the environment] at last become unfit [for the organism] the animal cannot change quick enough and perishes" (II 153). He also wondered "Whether species may not be made by a little more vigour being given to the chance offspring" (II 61). Isolation is part of the mechanism: "Nature conscious of the principle of incessant change in her offspring has invented all kinds of plan to insure sterility, but isolate your species [and] her plans are frustrated" (II 53).

It has not been explained how and why Darwin adopted a mechanistic viewpoint at a time when religious orthodoxy permeated science and philosophy, but there is no mistaking it in the following passages: "Why is thought being a secretion of brain, more wonderful than gravity a property of matter?" (II 166). He even referred to mental processes as "machinery": "Animals" can reason but man has reasoning power in excess. Instead of definite instincts his is a replacement in mental machinery so analogous to what we see in bodily that it does not stagger me" (II 78). The following remark needs no comment: "Love of the deity effect of organization, oh, you materialist!" (II 166). All the more remarkable is it to find Darwin giving voice to a view which Malthus would have rejected as anathema: "Educate all classes, avoid the contamination of caste, improve the women (double influence) & mankind must improve" (II 220).

Although the Second Notebook on Transmutation of Species was started in the beginning of February 1838 and finished in July of the same year, Darwin added lists of books to be read and read at dates subsequent to July 1838. Among these books under the date 3 October, is listed Malthus on Population, which enables the

date when Darwin read that book "for amusement" to be determined with precision. The significance of this information will be pointed out in the Introduction to the Third Notebook on Transmutation of Species.

As in the other Notebooks, a number of pages (102) were cut out by Darwin in 1856 when he began to write the work of which the *Origin of Species* was an abstract.

Darwin's Second Notebook on Transmutation of Species, also known as Notebook "C", is Darwin MS 122 in the Cambridge University Library, to the authorities of which acknowledgement is warmly made for their unfailing assistance and courtesy.

I am also deeply obliged to Dr. Sydney Smith for his kind criticism and help.

*Inside front cover*

CHARLES DARWIN

written between (beginning of February & July 1838)

. . . two pigeons which cross & keep colour on wing. Effects of colour on parent. white room. How are varieties . . . ? Books about amount of difference when hybrids produced have any close species ever yet failed. About trades affecting form of man. Could you get racehorse from cart horse . . .

All good References selected Dec 13 1856. Also worked through April 23 1873. |

1 Mr Yarrell<sup>1</sup> give it as his theory tells me he had no doubt that oldest variety takes greatest effect on offspring. Thus presuming those varieties to be oldest which have long been known in any country, he states that Esquimaux dog when crossed with pointer produced offspring much nearer Esquimaux than Pointer. — He has no doubt that same thing would happen with Australian dog & any of our common  
2 varieties. He has ditto doubt that | chestnut for many generations back was crossed with Bay mare, only by a few generations, that offspring would be chestnut. — On this principle I may add, that fact of half cross with parents, going back to either parent, is lucidly explained. — Mr. Yarrell states that if any odd pigeon crossed with common pigeon, offspring must be like latter, because oldest variety. — He  
3 says of two varieties of | pigeon, although having skulls so different, that they would be called genera, yet retain marking of wings like the wild rock pigeon. — Fact analogous to Owen's<sup>2</sup> Phil. remark of Apteryx having feathers. — It is possible time being an element in the transmission of form may explain mule and pig being half way. Yet dogs sometimes like father, sometimes like mother. The fact of |  
4 great monstrosities being produced, & handed down with ease, is analogous to what occurs in plants. — All these facts clearly point out two kinds of varieties. — One approaching to nature of monster, hereditary, other adaptation. — Mr. Yarrell says, that after breeding in pigeons with very much care that it requires the greatest difficulty to rear them, eggs hatched under other birds & brought up by hand. These facts all account for |

5-14 *excised*.

15 Birds of Australia. Many in common? species? with New Guinea. — Many kinds common to New Guinea & rest of isle in E. Indi: Arch: In New Zealand a *Sturnus* of American form, a *Synallaxis*? American? p. 159 & 160 162 list of some birds of Tingetabou & New Ireland.<sup>3</sup> — Gould<sup>4</sup> will hereafter know about birds of

<sup>1</sup> William Yarrell (1784-1856).

<sup>2</sup> Richard Owen. "On the anatomy of the Southern Apteryx." Communicated April 10, 1848. *Trans. Zool. Soc. Lond.*, vol. 2, 1842, p. 257. On p. 258:—"The Apteryx presents such a singular and seemingly anomalous compound of characters belonging to different orders of Birds, . . . It seems, as it were, to have borrowed its head from the Longirostral Gallinae, its legs from the Gallinae, and its wings from the Struthionous order. It is clothed with a plumage having the characteristic looseness of that of the terrestrial birds deprived of the power of flight. . . ." Presumably Darwin heard Owen deliver this paper or discuss it beforehand.

<sup>3</sup> Jean-Benoît-Claude Quoy, et Joseph-Paul Gaimard. *Voyage de découvertes de l'Atalante. Zoologie*. Paris 1830, p. 129:—"La Nouvelle-Irlande a plusieurs genres d'oiseaux qui lui sont communs avec la Nouvelle-Guinée dont elle est si voisine."

<sup>4</sup> John Gould (1804-1881).



N. Zealand.<sup>1</sup> L'Institut 1838. A Dipus & other rongeur in Australia. — p. 67 ? American forms ? An Infusorian not extinct species.<sup>2</sup> good Résumé ditto p. 6a ??? |  
 16 Age of Deinotherium.<sup>3</sup> p. 23. Bull: Soc. Geolog. 1837-8 Tom. IX. M. D'Urville on the Distrib. of Ferns in South Sea<sup>4</sup> (Indic Polynes: vegetation far East) Ann: des Sciences Semplément. 1825.

Get Henslow<sup>5</sup> to read over the pages from about 8 to 20 of Zoologie of Coquille's Voyage to see if Lesson's remarks<sup>6</sup> on the Flora can be trusted. |

17-18 excised.

19 Coquille Voyage p. 25. Mais il n'y a pas jusqu'aux îles Macquarie et Campbell (32° S) qui n'aient également leurs espèces; et certainement on eût été bien éloigné, il y a peu d'années, d'admettre que ces oiseaux eussent leurs représentants dans de si hautes latitudes<sup>7</sup>. — ? translate ?

All Australian forms have representative (& instances given) in East Ind. Arch. — Birds of New Zealand absolutely different. — *Phalacrocorax* not found in  
 20 Australia only New Zealand — Norfolk Is<sup>8</sup> & New Caledonia | peculiar species of cassicans (? cassicans Australian form ?) p. 27. Many fish of Taïti found at Isle of France: <sup>9</sup> instance of wide range, with means of wide range says same remark with regard to shells. — But he says shells towards extremities of the continents peculiar to the different points. — Work this out. L. Jenyns<sup>10</sup> about my fish New Zealand and New Holland fish very similar. —

N.B. Lesson method of generalizing without tables of references highly unphilosophical. |

21 Consult Voyage aux terres australes<sup>11</sup> Chap XXXIX tom IV p. 223, 2d edit.

Consult Latreille Géographie<sup>12</sup> des Insectes in 8<sup>e</sup> p. 181 who says insects Indian like Plants.

<sup>1</sup> William Ogilby. L'Institut, tome 6, Paris 1838, p. 69. Zoologie: Rongeurs australiens. "L'autre animal décrit par M. Ogilby, quoique n'appartenant pas à un nouveau genre, est également intéressant en ce qu'il jette quelque lumière sur les lois de la distribution géographique des animaux. C'est une seule Corbeille (Dipus) des plaines centrales de la Nouvelle-Hollande."

<sup>2</sup> Christian Gottfried Ehrenberg. L'Institut, tome 6, 1838, p. 62. Paléontologie: Infusoires. "M. Ehrenberg lit une note sur les masses qui forment les infusoires siliceux."

<sup>3</sup> Heinrich Georg Bronn. "Sur l'âge géologique des terrains tertiaires du bassin de Mayence." Bull. Soc. Géol. France, tome 9, 1838, p. 23. — "M. Klipstein et Haug ont rapporté les coquilles contenant leur *Deinotherium* au calcaire grossier des environs de Paris."

<sup>4</sup> J. D'Urville. "De la distribution des végétaux sur la surface du globe terrestre." *Annales des Sciences naturelles*, tome 6, Paris 1825, p. 51.

<sup>5</sup> John Stevens Henslow.

<sup>6</sup> René-Primevère Lesson, et Prosper Garnot. *Voyage autour du Monde arctique sur la Corvette La Coquille*. Zoologie. Paris 1826, tome 1, pp. 12-19 are concerned with the Flora of Oceania.

<sup>7</sup> René-Primevère Lesson, et Prosper Garnot. *Ibid.*, tome 1, p. 25.

<sup>8</sup> René-Primevère Lesson, et Prosper Garnot. *Ibid.*, tome 1, p. 27. — nous avons retrouvé à l'île de France un grand nombre des poissons de Taïti.

<sup>9</sup> Leonard Jenyns, afterwards Blomfield, author of the Section on Fish in *Zoology of H.M.S. Beagle* London 1845.

<sup>10</sup> François Péron. *Voyage de découvertes aux terres australes*, seconde édition revue corrigée et augmentée par M. Louis de Freycinet, tome 4, Paris 1824, p. 223. — "Une observation très remarquable tend à contraindre l'origine que j'attribue ici aux incrustations de la Nouvelle-Hollande; c'est que de l'immense étendue de côtes dont je viens de parler, le seul point sur lequel nous n'ayons pu voir aucune de ces incrustations, le port du Roi-George, se distingue aussi de tous les autres par la nature presque exclusivement quartzenne de ses rivages."

<sup>11</sup> Pierre-André Latreille. *Mémoires sur divers objets de l'histoire naturelle du genre, de géographie ancienne et de chorologie*, Paris 1809, tome 4, p. 186. — "Quelques l'entomologie de la Nouvelle-Hollande forme un type spécial, elle se compose néanmoins, en grand partie, d'espèces analogues à celles des Moluques et du sud-est des Indes."

It would be very important to show wide range of fish & shells in tropical seas it would demonstrate: not distance, makes species but barrier. It would make strong contrast with southern regions.—It would now represent what actually has is taking place with quadrupeds.

p. 118 wild pigs of Falklands generally "red of bricks" hair.<sup>1</sup> Very stiff.

p. 120 Coati roux common near Conception.<sup>2</sup> Some tatus!!!

p. 120 Most of the dogs of Payta belong to the hairless kind said to come originally from Africa.<sup>3</sup> |

22 p. 122 *Mus decumanus* at Caroline Is<sup>4</sup> & a Roussette.<sup>5</sup>

p. 126 Isle of France. — the Tennecs [tenrecs] from Madagascar.

Monkey from Java.<sup>6</sup> —

Hairs [hares] & deer. — Procured two makis alive from there. —

Mem. Waterhouse knows of some species which escaped there. —

p. 139. *Vespertilio bonariensis* (from Buenos Ayres) holds same relation with equator that *Vesp. lasiurus* does in North Hemisphere.<sup>7</sup> — |

23-28 excised.

29 Rabbits introduced in 64 of very many colours, like the cattle which I say "are as variously coloured as a herd in England." — Black & grey varieties of rabbits thus handed down for nearly 70 years. Galapagos mouse not the same section with house mice. It is wonderful how it could have been transported? What section does the New Zealand Rat belong to. There is this great advantage in studying geograph. range of quadrupeds; that either created in each point, or migrated from those quarters where we know quadrupeds have existed for ages. — |

30 The most hypoth: part of my theory, that two varieties of many ages standing, will not readily breed together. The argument must thus be taken, as in wild state (where instinct not interfered with, or generative organs affected as with plants) no animals very different will breed together, so when two great (which can be shown probable) varieties may be made in wild state, there will be presumption that they would not breed together. — We see even in domesticated varieties a tendency to go back to oldest race, which evidently is tendency to same end as the law of hybridity, namely the |

<sup>1</sup> René-Primevère Lesson, et Prosper Garnot. *Voyage autour du Monde . . . Zoologie*, Paris 1846, tome 1, p. 118:—"Les cochons se sont également propagés sur les Îles Malouines, et principalement sur un îlot, qui est à l'entrée de la baie Française. Leur nourriture n'est ni succulente, ni même abondante: aussi leur chair maigre, quoique possédant un fumet agréable, n'a aucun rapport avec celle de nos cochons domestiques, et encore moins avec celle des sangliers. Leur poil d'une couleur extrême est généralement d'une couleur rouge de brisque . . ."

<sup>2</sup> René-Primevère Lesson, et Prosper Garnot. *Ibid.*, tome 1, p. 120:—"Nous ne vîmes guère que le coati roux, qu'on dit être commun aux alentours de Penon, quelques tatus et une sorte de chat . . ."

<sup>3</sup> René-Primevère Lesson, et Prosper Garnot. *Ibid.*, tome 1, p. 120:—"Nous observâmes que la plupart des chiens de Payta appartenaient à la race des chiens sans poil (*Canis aegyptiacus*), le chien turc de Buffon, qui est originaire d'Afrique, suivant les auteurs."

<sup>4</sup> René-Primevère Lesson, et Prosper Garnot. *Ibid.*, tome 1, p. 121:—"Notre séjour sur l'île d'Oualan nous a permis d'y remarquer que deux espèces qui y soient vraiment indigènes. L'une est la mousette Kérandron . . . Le seroulet commun (*Mus decumanus*, Mamm. Dana, 373)"

<sup>5</sup> René-Primevère Lesson, et Prosper Garnot. *Ibid.*, tome 1, p. 121:—"Les tenrecs. Ces derniers, venus de Madagascar . . . tandis que le singe (*Macaca sibirica*, Des. 32), originaire de Java, occupe les sommets escarpés de la montagne du Fouc."

<sup>6</sup> René-Primevère Lesson, et Prosper Garnot. *Ibid.*, tome 1, p. 120:—"Ces vespertiliens vivent à une égale distance de l'équateur, dans les zones tempérées des deux hémisphères du continent américain."

31-32 excised.

33 animals unite, all the change that has been accumulated cannot be transmitted; hence the tendency to revert to parent forms, & greater fertility of hybrid & parent stock, than between two hybrids. — As we see external influences first affect external (for)m, so will the internal parts be of longest (?)nt & therefore most permanent. Owe(n re)markable laws of Brains & manner of generation & primary divisions of insects.<sup>1</sup>

34 2. Relation of external conditions, & of succession: the latter is most intimately connected with important structure, which are less obviously affected by external circumstances. These therefore will be chiefly hereditary. — | If varieties produced by slow causes, without picking become more & more impressed in blood with time, then generation will only produce an offspring capable of producing such as itself. — Therefore two different varieties will produce hybrids but not varieties which are not deeply impressed on blood, will cross & produce fertile offspring. In first case it will either produce no offspring or such as not capable of producing again. |

35 The varieties of Cardoon are cases like those of Primrose & Cowslip run wild. The two species of Clemonga case of replacing species. Dr Smith<sup>2</sup> will give me some capital information.

? Carnivora of New and Old wor[ld] do not form two sections, is this not connected with wide range of animals. Follow this out where species of same genera in  
36 [...] word have not species generally wide range? Mice. — | Waterhouse's remarkable fact<sup>3</sup> of no forms peculiar to (to special districts ???) land north of 30°, may be connected with Mr Blyth's statement<sup>4</sup> of birds of Europe & America which are of different forms being migratory, also with Temmincks fact<sup>5</sup> of forms being within Tropics. — European birds at Japan connected with European forms<sup>6</sup> on Himalaya ?? — This is very remarkable when we consider number of quadrupeds in Eocene period. Have the Edentata & Marsupials forms been chiefly preserved, where shut up by themselves without other animals? But they were not shut up! |

37 Extreme southern points of S. Hemisphere fully characterized of each continent. Try amongst European quadrupeds if Africa destroyed would not then some forms

<sup>1</sup> Richard Owen. The reference appears to be to Owen's Lectures. In the *Syllabus of an elementary course of lectures on comparative anatomy* by Richard Owen to be delivered at St. Bartholomew's Hospital during April and May 1835, in the analysis of Lectures IV and V, on page 2, appear the words:—"Changes effected in the nervous and other systems during the metamorphoses of insects."

<sup>2</sup> Andrew Smith, whom Darwin met in South Africa.

<sup>3</sup> George Robert Waterhouse. *The Zoology of the Voyage of H.M.S. Beagle*, Part II. Mammalia by George Robert Waterhouse. London 1845, p. 29:—, "*Felis pajeros* :— it extends northwards as far as latitude 30°." p. 33:— "*Lepus mexicanus* is not found north of 30°." Darwin's obscure note would appear to mean "no forms peculiar to South America."

<sup>4</sup> Edward Blyth. The reference is presumably to "Further remarks on the affinities of the feathered race." *Mag. Nat. Hist. Lond.* vol. 2, 1836, p. 209:—"Many years have now elapsed since the genius of Buffon suggested the capital proposition that there is no absolute specific identity between any organism of the Eastern and Western continents, with the exception of those which inhabit very far to the north."

<sup>5</sup> Conrad Jacob Temminck. Perhaps *Histoire naturelle générale des pigeons et des Gallinacés*, Paris 1823, tome 1, p. 6:—"Il paraît que les Pigeons et les Gallinacés habitent de préférence les parages de la zone torride."

<sup>6</sup> This question is prompted by Edward Blyth: "Further remarks on the Affinities of the feathered Race." *Mag. Nat. Hist. Lond.* 2, 1836, p. 209:—"we have every grade of diversity, from the obviously distinct Japanese peacock (*Pavo muticus*), to the nearly linnet, which, apparently, differs in no respect from that of Europe."

be peculiar to it, so on & so on. — Whatever destroyed great Pachyderms in S. America destroyed great Edentata or American form. — Is the Australian Dipus an American form? The climates having grown more extreme both in N. & S. America, is only common cause I can conceive of destruction of great animals in Europe & America. |

- 38 Some portion of the world (Africa) being left more equable (yet America pre-eminently equable) might have allowed fresh species to have been formed & spread to other Africa & East India Arch. — But where these great animals had not spread then such tribes as Marsupial & Edentates increased most. Certainly Africa approaches nearest to what is supposed to have been condition of former whole world. America must have been string of islands. — |

39-44 excised.

- 45 The systematic naturalists get clear indication of circumstances in Geography to help in distinguishing empirically what is species. — The collector is directed to study localities of isl<sup>ds</sup>. — Immense importance of local faunas foundation of all our knowledge especially great continents.

Give specimen of arrangement.

Rhinoceros

3 species

Cape Town good species

Indian species so distinct that all analogy [?]

from each other

I do not know how different.

{ Sumatra } — ditto from India  
{ Java }

Some doubt from want of knowledge of times analogy from three first will give one almost certain guide. — time required to separate isl<sup>ds</sup> very long. Increase of knowledge would probably tell more certainly. Get closer species. Foxes good case on account of varieties in N. America. Mice of America. |

- 46 America & Indian deer. — Africa not. — Africa camels?? Africa Bears?? Plantigrade carnivora? — Compare rodents of two countries & monkeys. Fact of Elephant same species in Borneo Sumatra India Ceylon — perhaps show great persistency of character. Hence Elephas primigenius over so wide a range & Mastodon angustidens. — Ogilby<sup>1</sup> has facts to show that Australian dog introduced by savages into Australia. — What are they? Colonel Montagu<sup>2</sup> probably contains some facts about close species of Birds. |

47-50 excised.

<sup>1</sup> William Ogilby. "Notice of certain Australian Quadrupeds, belonging to the Order Rodentia". read December, 1857: *Trans. Linn. Soc. Lond.*, vol. 18, 1841, 121. On page 121:—"... I think, that there are strong grounds for believing that the Diago, or native dog, . . . is not an aboriginal inhabitant of the continent, but a subsequent importation, in all probability contemporary with the primitive settlement of the natives. . . ."

<sup>2</sup> George Montagu. "Observations on some species of British Quadrupeds, Birds, and Fishes." *Trans. Linn. Soc. Lond.*, vol. 7, 1804, p. 574. On page 584:—"... were it not for the strong chestnut colour the Kemish Plover is said to possess on the crown of the head, as described by Lewis, and since by Dr Latham in the Second Synopsis to the General Synopsis, we should not have hesitated in pronouncing these three birds to be only one species." Page 585:—"It is indeed remarkable that a bird bearing such strong marks as the Black-headed Gull, in all the changes, from the nestling to the adult plumage, should have ever been multiplied into so many species [i.e. "brown gull", and "brown tern"] . . . of the several, remarkable changes incident to the black-headed Gull . . . one of those mutations is the identical bird in question, the Brown Gull."

51 Instinct goes before structure (habits of ducklings & chickens young water ouzels) hence aversion to generation, before great difficulty in propagation. —

Feathers on Apteryx because we may suppose longest part of structure. — Shape of wings have altered many times, but all have had feathers, — if wing totally obliterated. — This may account for permanence in many trifling marks, — such as the bands on pigeons back. — According to this description of class is description |  
52 of ancestor of all birds, & so for birds, we thus obtain an abstract idea of a bird, an animal with skeleton of such general forms. —

The hybridity of ferns bears on my doctrine of cross-generation.

The infertility of crosses & cross is method of nature to prevent the picking of  
53 monstrosities as man does. — One is tempted to exclaim | that nature conscious of the principle of incessant change in her offspring has invented all kinds of plan to insure sterility, but isolate your species her plans are frustrated or rather a new principle is brought to bear.

If man created as now languages would surely have been homogeneous. —

There must be some sophism in Lyell's statement<sup>1</sup> that some species vary more than what makes species in other animals. — |

54 Forster on South Sea<sup>2</sup> will probably contain description of domesticated animals in those regions.

Species so far are not natural that they are either A.B.C.D.E or A.C.D.E.H. Very striking to see M. Bibron<sup>3</sup> looking over reptiles he often had difficulty in distinguishing which were species (theory admirably) yet a glance would tell from which country. — I often disputed for a moment. — Galapagos, S. American genera. —  
55 The circumstances of having | two sexes is the check to distribution of birds & animals.

Mrs. Strickland & Hamilton<sup>4</sup> found tertiary formation amongst Grecian isles (see if type continued? See to Babbage<sup>5</sup> & Virlet.<sup>6</sup> — Whewell<sup>7</sup> thinks (p. 642) anniversary speech Feb. 1838 thinks gradation between man & animals small point in tracing history of man. — granted. — but if all other animals have been so formed,  
56 then man may be a miracle, but induction leads to other view. — | Till we know uses of organs clearly, we cannot guess causes of change. — hump on back of cow! &c. &c.

<sup>1</sup> Charles Lyell. *Principles of Geology*, vol. 2, London 1832, p. 25:—"we have only to suppose that what is true of size, may also hold in regard to colour and many other attributes, and it will at once follow that the degree of possible discordance between varieties of the same species, may in certain cases exceed the utmost disparity which can even arise between two individuals of many distinct species."

<sup>2</sup> John Reinhold Forster. *Observations made during a Voyage round the World, on Physical Geography &c.* London 1778, refers only to hog, dog, and cock among the domestic animals.

<sup>3</sup> Gabriel Bibron, author of "Reptiles"; *Voyage autour du Monde exécuté pendant 1826, et 1827 sur le Bosphore*; *Zoologie*, tome 1, Paris 1841.

<sup>4</sup> Hugh E. Strickland, & William John Hamilton. "An account of a Tertiary deposit near Liscaul, in the island of Caphtalonia". *Proc. Geol. Soc. Lond.*, vol. 2, 1834, p. 243.

<sup>5</sup> Charles Babbage. "Observations on the temple of Serapis at Pozzuoli, near Naples; with remarks on certain causes which may produce Geological Cycles of great Extent". *Proc. Geol. Soc. Lond.*, vol. 2, 1833, p. 74.

<sup>6</sup> Pierre-Théodore Virlet d'Acoust. *Expéditions scientifiques de Morée*, Paris 1833-5.

<sup>7</sup> William Whewell. "Address to the Geological Society, delivered at the Anniversary, on the 16th of February 1838, by the Rev. William Whewell, President of the Society." *Proc. Geol. Soc. Lond.*, vol. 2, 1838, p. 642. On page 642:—"The gradation in form between man and other animals, a gradation which we all recognise, and which, therefore, need not startle us because it is presented under a new aspect, is but a slight and, as appears to me, unimportant feature, in looking at the great subject of man's origin."

D'Orbigny (p. 108) says<sup>1</sup> having observed *B. tricolor* in Patagonia then in Chile & lastly 12,000 feet above sea in Bolivia, he examined all species & found " beaucoup des mêmes oiseaux que nous avons déjà observés en Patagonie ou au moins des espèces très-analogues, quand ce n'étaient | pas tout à fait les mêmes ". This good case of replacement under peculiar conditions — of nearly same kind country distant.

The circumstances of ground woodpeckers, — birds that cannot fly &c. &c. seem clearly to indicate those very changes which at first it might be doubted were possible, — it has been asked how did the otter live before it had its web-feet. All nature answers to the possibility. —

My views will explain no mammalia in secondary epochs & development of lizards. |  
 58 As we have birds impressions in Red Sandstone great lizards in ditto. — Coniferous wood in Coal Measure. — highest fish in old Red Sandstone. — Nautilus in [blank] it is useless to speculate not only about beginning of animal life generally, but even about great division. Our question is not how there come to be fishes & quadrupeds  
 59 but how there come to be many genera of fish &c. &c. at present day. — | It is assumption to say generation produces young ones capable of producing young ones like itself, but? whether great assumption? not solely producing like itself, not applicable to monster.—Are monstrosity hereditary??? Does not atavism relate to this law? —

Local varieties formed with extreme slowness even when isolation from general circumstances effecting the area equably. — |

60 Animals having wide range, by preventing adaptation owing to crossing with unseasoned people would cause destruction. — Simile man living in hot countries, if continually crossed with people from cold, children would not become adapted to climate. —

Descent, or true relationship, tends to keep the species to one form (but is modified). The relationship of analogy is a divellent power & tends to make forms remote antagonist powers. — Every animal in cold country has some analogy in hot gaudy  
 61 colours so all changes may be considered in this light. — | Hence relation of analogy may chiefly be looked for in the aberrant groups. — It is having walking fly catcher, woodpecker &c &c which causes the confusion in this system of nature. — Whether species may not be made by a little more vigour being given to the chance offspring who have any slight peculiarity of structure, hence seals take victorious seals, hence deer victorious deer, hence males armed & pugnacious all order; cocks all war-like; this wars against the resemblances relationship, the dissemblances analogy, in any class those points which are different from each other, & resemble some other class, analogy. See Abercrombie<sup>2</sup> p. 172 for definition of analogy.

Zoolog. Journal.<sup>3</sup> Parrots in Macquarie is<sup>4</sup> vol. III p. 430 alluded to by Capt. King.

<sup>1</sup> Alcide Dessalines d'Orbigny. *Voyage dans l'Amérique méridionale* . . . 1826-33, tome 4, Paris 1833, p. 108; observations on *Buteo tricolor*.

<sup>2</sup> John Abercrombie. *Inquiries concerning the Intellectual Powers and the Investigation of Truth*, Edinburgh 1830, p. 171 — " 2. Relations of resemblance and analogy . . . When there is a close agreement between two events or classes of events, it constitutes resemblance; where there are points of difference, it is analogy. In the latter case, we then trace the degrees of analogy, depending upon the number of points in which the resemblance holds, and the number of points in which there is a difference."

<sup>3</sup> Philip Parker King. "On the Animals of the Straits of Magellan", *Zool. Journ.* vol. 3, London 1828, p. 430 — "Parrots as you are well aware are brought from Macquarie Island . . ."

- 62 Ditto p. 434 Table of birds from Cuba. Vigors,<sup>1</sup> nothing of much interest. | All the discussion about affinity & how one order first becomes developed & then another — (according as parent types are present) must follow after there is proof of the non creation of animals. — Then argument may be, — subterranean lakes, hot spring &c &c inhabited therefore mud wood [would] be inhabited, then how is this
- 63 effected by — for instance, fish being excessively abundant | & tempting the Jaguar to use its feet much in swimming, & every developement giving greater vigour to the parent tending so produce effect on offspring — but whole race of that species must take to that particular habitat. — All structures either direct effect of habit, or hereditary & combined effect of habit, — perhaps in process of change. — Are any men born with any peculiarity, or any race of plants. — Lamarck's willing absurd,<sup>2</sup> not applicable to plants. |
- 64 Epidemics of South Sea wonderful case of extermination of species. — Epidemic amongst trees. Plane trees all died certain year. Extreme difficulty of tracing change of species to species although we see it effected tempts one to bring one back to distinct creations. — It is only by [by] recollecting that the ground woodpecker &c fresh water animals of great Lakes are American form that one is brought to admit the
- 65 possibility | (any great change in species is reduced by atavism). Even a deformity may be looked at as the best attempt of nature under certain very unfavoured conditions. — as an adaptation, but adaptation during earliest existence; if whole life then real adaptation. The case of hereditary disease is on the same principle that cut a sheep's tail off plenty of times & you will have no tail (example probably not true) — or again healthy parents have healthy children. The other case is change during life of parent & therefore being always necessary may be called adaptation. |
- 66 With respect to my theory of generation, fact of armless parent not having armless child, shows that there is reference to more than offspring (like atavism) & shows my view of generation right? — If puppy born with thick coat monstrosity, if brought into cold country & then acquired then adaptation. — |
- 67 No Common Vultures in Australia!! Wilsons ornithology, vol. III p. 226. Wilsons Ornithology, D'Orbigny,<sup>3</sup> Spix,<sup>4</sup> &c might compare birds of N. America & South, — any how temperate regions, — crows in N. America. Study Bonapartes<sup>5</sup> list.

In the Zoological Journal<sup>7</sup> I read a curious account to show that very many birds of different kinds have been known to assist in feeding young cuckoos; as if there was storge [strong urge], which could not be resisted, when hearing cry of hunger of

<sup>1</sup> Nicholas Aylward Vigors. "Sketches in Ornithology etc." *Zool. Journ.*, vol. 3, London 1828, p. 434 | — the following 43 species occur among the birds from Cuba. . . .

<sup>2</sup> Jean-Baptiste de Lamarck. See Introduction to First Notebook, p. 31.

<sup>3</sup> Alexander Wilson. *American Ornithology*, vol. 3, London 1832, p. 226 — "The Vultures are comparatively a limited race, and exist in every quarter of the world, New Holland excepted. . . ."

<sup>4</sup> Alcide Dessalines d'Orbigny. *Voyage dans l'Amérique méridionale* . . . tome 4, 2e partie, Paris 1833.

<sup>5</sup> Johann Baptiste von Spix. *Travels in Brazil in 1817-20*, London 1824.

<sup>6</sup> Charles-Louis Bonaparte. *A Geographical and Comparative List of the Birds of Europe and North America*, London 1828.

<sup>7</sup> John Blackwell. "Facts relating to the natural history of the Cuckoo", *Zoological Journal*, vol. 4, 1849, p. 324. — "In the Gentleman's Magazine for April 1805 two instances are recorded of young cuckoo having been occasionally fed by large numbers of birds of the same species as their foster parents. . . ."

68 little bird. In same way Wilson<sup>1</sup> | (p. 5) describes many kinds of birds uniting together in pursuit of Blue Jay, when birds hears cry of distress of other parents. — Shows community of language.

Desert country is as effectual as a cold one in checking beautiful colours of species. — Mem. St. Jago; solitary Halcyon bird of passage. — *M. coronata* of Latham, wrong. Mr. Yarrell says that some birds or animals are placed in white rooms to give tinge to offspring. Darkness effect on human offspring. — | White snow, — the fine green of vegetation, — ? account for colour of bird in district which they frequent!!  
69 Wilsons' American ornithology<sup>2</sup> a mine of valuable facts, regarding habits range & all kinds of information, instinct. Swainson's remarks in *Fauna Borealis*<sup>3</sup> must be studied. There is capital talk of extent of all species. Accumulate instances of one family sending out structures into many genera. — like *Synallaxis* or *Marsupial* animals  
70 of N. America. | Hence it is universally allowed that the discrimination of species is empirical. Show this by instances.

Once grant my theory & the examination of species from distant countries may give thread to conduct to laws of change of organization! The little turtle without its parent running to the water is a good instance of innate instinct, better than child sucking or even duckling & fowls.

When talking of races of man, — black men, black bull finches from linseed, — notably effects of climate on some antecedent race perhaps not one now existing. |  
71-72 excised.

73 Study the wars of organic being. — The fact of guavas having overrun Tahiti, thistle Pampas show how nicely things adapted. — The aberrant varieties will be formed in any kingdom of nature where scheme not filled up (most false to say no passages; nature is full of them. — Wading birds partially webbed &c &c) — & in round of chances every family will have some aberrant groups, — but as for number five in each group absurd. — The mere fact of division of lesser & more power (2. typical 3. subtypical) | where power arbitrary, leaves door open for Quinarians to deceive himself. — Give the case of *Apterix* split, depress & elevate & enlarge New Zealand, a division of nature of *Apterix*, many genera & species.

The believing that monkey would breed (if mankind destroyed) some intellectual being though not MAN, — is as difficult to understand as Lyells doctrine of slow movements<sup>4</sup> &c &c. |

75 This multiplication of little means & bringing the mind to grapple with great effect produced is a most laborious & painful effort of the mind (although this may appear an absurd saying) & will never be conquered by anyone (if has any kind of prejudices) who just takes up & lays down the subject without long meditation. — His best chance is to have [pondered] profoundly over the enormous difficulty of

<sup>1</sup> Alexander Wilson. *American Ornithology*, London 1832, vol. 1, p. 5:—"The cries of the distressed parent seem bring together a number of interested spectators, (for birds in such circumstances seem truly to sympathize with each other) and he [blue jay] is sometimes attacked with such spirit as to be under the necessity of making a speedy retreat."

<sup>2</sup> Alexander Wilson. *Ibid.*

<sup>3</sup> William Swainson. *Fauna Borealis-Americana: or the Zoology of the Northern parts of British America*. Part II, the Birds, London 1832.

<sup>4</sup> Charles Lyell. The reference is to the production of great effects as a result of slow action over great periods of time, which is the basis of the *Principles of Geology*.



reproduction of species & certainly of destruction; then he will choose & firmly believe in his new faith of the lesser of the difficulties. |

- 76 Once grant that species and genus may pass into each other, — grant that one instinct to be acquired (if the medullary point in ovum has such organization as to force in one man the development of a brain capable of producing more glowing imagining or more profound reasoning than other, if this be granted!) & whole fabric totters & falls. — Look abroad, study gradation, study unity of type, study geographical distribution, | study relation of fossil with recent. The fabric falls!
- 77 But man — wonderful man "divino ore versum coelum attentior" is an exception. — He is mammalian, — his origin has not been indefinite. — he is not a deity, his end under present form will come, (or how dreadfully we are deceived) then he is no exception. — He possesses some of the same general instincts all & feelings as animals. They on other hand can reason — but man has reasoning powers in excess, instead of | definite instincts — this is a replacement in mental machinery so analogous to what we see in bodily, that it does not stagger me. — What circumstances may have been necessary to have made man! Seclusion want &c & perhaps a train of animals of hundred generations of species to produce contingents proper. — Present monkeys
- 79 might not, — but probably would, — the world | now being fit, for such an animal — man, (rude uncivilized man) might not have lived when certain other animals were alive, which have perished. Let man visit Orang-outang in domestication, hear expressive whine, see its intelligence when spoken (to), as if it understood every word said — see its affection to those it knows, — see its passion & rage, sulkiness & very extreme of despair; let him look at savage, roasting his parent, naked, artless, not improving, yet improvable and then let him dare to boast of his proud preeminence. — Not
- 80 understanding language of Fuegian puts on par with monkeys. | Gould seems to think that many species when close come from different localities as my Funaire — some genus of yellow and brown breasted bird in Australia &c &c — but of course they might be blended, if archipelago turned into continent &c &c.

- There is beautiful gradation of forms in Australia leading on one side into shrikes & at the other into crows. Yet all forming, according to Gould,<sup>1</sup> good genus. |
- 81 Gould seems to doubt how far structure & habits go together. This must be profoundly considered. — Structure may be obliterating, whilst habits are changing, or structure may be obtaining, whilst habits slightly precede them — From this view habits must form most important element in considering to which tribes — structure
- 82 without corresponding habits clearly showing true affinity, for instance | tail of ground woodpecker, — but tail of some ducks aberrant from habit. —

Gould<sup>2</sup> I see quite recognizes habits in making out classification of birds.

- Birds vary much (more than shells) owing to variety of station inhabited by them.
- 83 Timor. Australian forms amongst birds | Java, not so much. — Peculiarities of structure as six-fingered people are sometimes hereditary — yet these not adaptations — they are counteracted by nature by crossing with other varieties, but accidental<sup>3</sup> changes after

<sup>1</sup> John Gould. "Character of two new species of birds constituting a new genus, *Aptosis*." *Proc. Zool. Soc. Lond.*, Part IV, 1836, p. 73. — "He stated them to approximate, in his opinion, in nearly an equal degree to the genus *Lanius*, *Ficedula*, and *Lanirocorax*."

<sup>2</sup> John Gould. The reference is to Gould's treatment of species in *The Birds of Europe*, London 1837.

<sup>3</sup> This word crossed out in MS.

birth do not effect progeny. Many dogs in England must have been lopped off & sheep's tails cut yet there is no record of any effect. — New Hollanders have gone on boring their noses &c &c. This congenital changes show that grandson is determined, when child is, — | shows that generation implies more than mere child, but that child should produce like children. Lyell has story from Beck<sup>1</sup> about six fingered children hereditary.

84 With respect to question which is adaptation, — examine ptarmigan, hare becoming white in winter of Arctic countries few will say it is direct effect, according to Physical laws, as sulphuric acid disorganizes | wood, but adaptation. — Albino however is monster, yet albino may so far be considered as adaptation, as best attempt of nature colouring matter being absent. — Again dwarf plant on alpine district & dwarf plant from seed, one adaptation other monsters. —

85 The only way of judging whether structure is owing to habits or hereditary is to see whether a large family has it, & one member of that | family having it with very different habits. — Thus bill & nostril of Puffinuria I think we may clearly attribute to hereditary origin & not adaptation to its habits. — Few will dispute that it is possible to have structure without habits — after seeing beetle with wings beneath soldered wing-cases — yet these wings may be of some use. — Nature | is never extravagant though clearly not of the use to which wings are generally applied. — Therefore argument not destroyed even if their shrivelled wings could be shown to be of some use. If we only had Puffinuria Garmottii & no other species — as we have only Ornithorhync[h]us, then we should never know how much structure was connected with habits, & how much hereditary. The circumstance of aberrant groups being small it is truism, for if not so not aberrant. — |

86 Tanioptera rufiventris is instance of bird belonging to family with peculiar coloured plumage, where colours have changed in accordance to habits. — one is tempted to suppose from beholding the ground. — Why do beetles & birds become dull coloured in sterile countries. —

Could insist much upon knowing to what type a bird belongs. — I conceive without knowing from which country many birds come it would be impossible to classify them. — I would |

87-98 *exist.*

99 element geographical distribution is. — ? Pelagic forms — similar birds?? —

We must always bear in mind proofs of most equable climate both in S. & N. Hemisphere just anterior to present. ? cause of destruction of great animals?

Show independency of shells to external features of land by seeing how many species common to Patagonia & Tierra del Fuogo & forest. Insert Parrots in Macquarrie Isd.<sup>2</sup> Coast very good. Study D'Orbigny<sup>3</sup>, & range in West Guyaquil & Peru. |

<sup>1</sup> Charles Lyell. The 5th edition of the *Principles of Geology* has three references to Dr J. Beck of Copenhagen, quoted for geological observations. The present reference appears to be to a personal communication to Lyell.

<sup>2</sup> Philip Farley King. "On the Animals of the Straits of Magellan", *Zoological Journal*, vol. 3, London 1828, p. 230.—"Parrots as you are well aware are brought from the Macquarrie Island . . ."

<sup>3</sup> Alcide Dessalines d'Orbigny. *Voyage dans l'Amérique méridionale*, Paris 1833.

200 Henslow<sup>1</sup> in talking of so many families on Keeling seemed to consider it owing to one of each being fitter for transport. ? may it not be explained by mere chance? — or [is] it like each great class of animals having its aquatic aerial &c type? — This of consequence became applicable to N. Hemisphere.

N.B. Examine Abridged Flora with this view. Tristan D'acunha. St. Helena &c &c Juan Fernandez. |

201-108 excised.

203 After reading "Carus on the Kingdoms of Nature, their life & affinity"<sup>2</sup> in Scientific Memoirs I can see that perfection may be talked of with respect to life generally. — When unity constantly develops multiplicity (his definition "constant manifestation of unity through multiplicity") this unity, — this distinctness of laws from rest of universe (which Carus considers big animal) become more developed in higher animals than in vegetables.

p. 243 radiate animals plants turned inside out,<sup>3</sup> have portion of organ of generation!! Mem. Agassiz (1 No. Annals of Nat. Hist.) spiral structure in Echinodermata. <sup>4</sup> |

204 Agassiz says Infusoria are insecta<sup>5</sup> —

G. R. Treviranus Biologie<sup>6</sup> referred to as compilation of action of organic nature on inorganic.

It is very remarkable as shown by Carus<sup>7</sup> how intermediate plants are between animal life & "inorganic life", animals only live on matter already organized. —

This paper might be worth consulting if any metaphysical speculations are entered on upon life. namely Carus. |

205-118 excised.

219 alone, but on all the general arguments —

Lamarck was the Hutton of Geology, he had few clear facts, but so bold & many such profound judgment that he foreseeing consequence was endowed with what may be called the prophetic spirit in science. The highest endowment of lofty genius.<sup>8</sup>

<sup>1</sup> John Stevens Henslow. Personal communication.

<sup>2</sup> Karl Gustav Carus. "On the Kingdoms of Nature, their Life and Affinity", *Scientific Memoirs selected from the Transactions of Foreign Academies of Science and Learned Societies and from foreign Journals*, edited by Richard Taylor, vol. 1, 1837, p. 223.

<sup>3</sup> Karl Gustav Carus. *Ibid.*, vol. 1, 1837, p. 243. — "We may now see why in the Medusa, the Sea-Star, the Echinus, and other inferior kinds of animals, the aperture of the mouth is turned downwards and the alimentary duct upwards . . ."

<sup>4</sup> Louis Agassiz. "Preliminary of a Monograph of the Radiata and Echinodermata", *Ann. Nat. Hist.* vol. 1, 1838, p. 30.

<sup>5</sup> Louis Agassiz. Reference extracted.

<sup>6</sup> Gottfried Reinhold Treviranus. *Biologie oder Philosophie der lebenden Natur für Naturforscher und Ärzte*, Göttingen, 1802-1812.

<sup>7</sup> Karl Gustav Carus. "On the Kingdoms of Nature . . ." *Scientific Memoirs* edited by Richard Taylor, vol. 1, 1837, p. 234. — "The animal stands in the same relation to the vegetable kingdom as organized bodies in general do to the unorganized. . ."

<sup>8</sup> This remarkable sentence lacks a word, for as it stands it makes no sense since no man but Hutton was the "Hutton of Geology". It seems that the sentence should read:—Lamarck was the French Hutton of Geology, referring to Lamarck's *Hydrogéologie, ou recherches sur l'influence générale des eaux sur la surface du globe terrestre, sur les causes de l'existence de l'air et de la mer, de son déplacement, de son transport successif sur les différents points de ce globe, enfin sur les changements que les corps organiques éprouvent sous l'influence de la nature et de l'air de cette surface*. Paris 1802. In this work Lamarck put forward the view that Nature had unlimited time at her disposal.

Using geographical distribution of animals, I use (new step in induction) as key-stone of ancient geography species tell of Physical relations in time, form & distribution tells of horizontal barriers — |

- 120 Mr. Yarrel — says<sup>1</sup> my view of varieties is exactly what I state, — or picking varieties unnatural circumstance.

L<sup>3</sup> Orfords had breed of greyhounds fleetest in England lost courage at end of chase would not run up hill.<sup>2</sup> (Bull-dogs are used because they have no scent. J. M. Wynne.<sup>3</sup>) He took thorough bred bull-dog & crossed & recrossed till there was a dash of blood with whole form of greyhound, — picking out finest of each litter & crossing them with finest greyhounds. —

- 121 Sir J. Sebright<sup>4</sup> first got<sup>5</sup> point on hackles on Bantams by crossing with common Polish cock is that not old variety & then recrossing offspring till size diminished, but feathers continued by picking chicken of each brood. — These bantam feathers | at last got dusky, then took white Chinese Bantam crossed & got some yellow & others yellower & white varieties by picking the yellow ones & crossing with dark bantam produced old variety. —

The pigeons which have such different skulls, but same marks on wings are Blue Pouter & small Bald Heads Mr. Yarrell will mention in his work.<sup>6</sup>

I am sorry to find Mr. Yarrell's evidence about old varieties is reduced to scarcely anything, — almost all imagination — He says he recollects all half Bred cattle of L<sup>4</sup> Darnleys were most like parent Brahmin bulls — Mr. Y. is inclined to think that the male communicates the *external* resemblances [more] than the female. |

- 122 The expression hybrid & fertile Hybrids may be used to varieties as well as species.

As formation of species gradual so may we suppose that something intermediate, between no offspring & ordinary offspring. — This gradation is infertile offspring without organs of generation? | By profound study of local variation laws of change whether beak (as it appears to me) colour of plumage & laws which might probably be reduced. |

- 123 What the Frenchman did for species between England and France I will do with forms. —

Mention persecution of early Astronomers, — then add chief good of individual scientific men is to push their science a few years in advance only of their age, (differently from literary men,) must remember that if they believe & do not openly avow their belief they do as much to retard as those whose opinion they believe have endeavoured to advance cause of truth. | It is of the utmost importance to show that habits sometimes go before structure. — the only argument can be a bird practising imperfectly some habit, which the whole rest of other family practise with a peculiar structure, thus Tyrannus sulphureus if compelled solely to fish, structure would alter. —

- 124 It is a difficulty how a different number of vertebrae are produced when (& in all

<sup>1</sup> William Yarrell.

<sup>2</sup> cf. *Variation of Animals and Plants under Domestication*, vol. 1, London 1868, p. 68.

<sup>3</sup> Wynne. Unidentified.

<sup>4</sup> See John Sebright, *cf. Variation of Animals and Plants under Domestication*, vol. 1, London 1868, p. 127.

<sup>5</sup> A small drawing at this place in MS.

<sup>6</sup> William Yarrell. *A History of British Birds*, London 1837-43.

such structures) there cannot be gradation. See what Eytens young pigs<sup>1</sup> — if vertebra much lengthened or there may be tendency to divide which often enough |  
 125 repeated would cause an unequal number of vertebrae —

? When two very close species inhabit same country are not habits different. (Mem. Gould's willow wren)<sup>2</sup> but when close species inhabit different countries habits similar? law? probable — ∴ if habits & structure similar would have blended together. Mem. Mr Herbert's<sup>3</sup> law, *Habits determining fertility*. |

126 Scheme for abolishing specific names & giving subgenera true value — as in

*Opetiorhynch[us] fuliginosus* (a) Falklands  
 (b) T. del Fuego differ from  
 (c) Chiloe  
 (d) Chile

*rupestris* — good species.

?*O. modulator* + *O. patagonicus*. till neutral ground ascertained call them varieties but two ostriches good species because interlock.

It is reverting to old plan but reason now assigned for doing so. There should be mark to every species only known by analogy genera of course distant analogy  
 127 from every country & class tells us that. | Analogy to be guide in islands species. — each describer giving his test namely differ as much as those (naming them) which are found together. —

If two species come over to this country without range or habits ascertained, put them as (a) (b) until data be given.—This will aid in preventing the chaos, — will point out what to observe, — will aid us in physiology. tell traveller what to observe, — if he knows he has done least part, — that he will not have brought home new species until he can show range & habits. —

Take instance of most disputed shells such as *Cyrena*. |

128 This is reform which probably will be slow but must take place. — Such a classification would answer every purpose & would present many ideas of causes of change. — The mark of analogy would be empirical because as soon as two species were placed in different subgenera, then it would be useless, but the formation of subgenera is empirical & is judged solely by comparison with other genera in other families. — it will however be much surer, when false species banished by this  
 129 test. — | Excepting where as Andrew Smith,<sup>4</sup> Richardson<sup>5</sup> & Vaillant,<sup>6</sup> & D'Orbigny<sup>7</sup> has travelled this will be most difficult.

Sub genera so far may be eliminated where every species of a section is confined to one continent & every species [of another section] to another. then those sections

<sup>1</sup> Thomas Campbell Eytens. "Notice of some osteological peculiarities in different skeletons of the Genus *Sus*," *Proc. Zool. Soc. Lond.*, vol. 2, 1837, p. 23.

<sup>2</sup> John Gould. *The Birds of Europe*, vol. 2, London 1837, pl. & p. 121. (unnumbered). Description of Willow-wren, Chiff-chaff, and Wood-wren, including the differences in their songs and habits.

<sup>3</sup> The Rev. The Hon. William Herbert.

<sup>4</sup> Andrew Smith. *Report of the Expedition for exploring central Africa from the Cape of Good Hope . . . 1834, under the superintendance of . . . A. Smith*, Cape Town, 1836.

<sup>5</sup> Sir John Richardson. *Fauna Boreali-Americana; or the Zoology of the northern parts of British America*, London 1839-57.

<sup>6</sup> François Levaillant. *Voyage . . . dans l'intérieur de l'Afrique, par le Cap de Bonne Esperance dans les années 1780-83*, Paris 1790.

<sup>7</sup> Alcide Dessalines d'Orbigny. *Voyage dans l'Amérique méridionale*, Paris 1833-47.

& subgenera are analogical, because we do not know whether nearest species of each might not breed.<sup>3</sup> — Genus must be a *free cliff* putting out of case the analogy. — If genus does not mean this it means nothing. — There should be some term used, when there is series. |

130 Could I not give Catalogue of Mammalia arranged according to my own methods.

*Dasyurus* being found fossil in Australia, & only one tree species (Mitchell's<sup>4</sup> authority) in Australia & several in Van Diemen's land is most important as showing former connection of two continents and death of form in one. The caves are at a

131 height of more than 1000 ft. & many hundred miles | from the sea, associated with teeth of seals and dugong, therefore immense age since breccia accumulated. — Surely ask Owen to see whether species same, excessive improbability. Mem. in Cliff's list a rat said to have been found!! rodents old inhabitants most important!! like *Dipus* of present day?? | Major Mitchell does not think that dog was found in Van Diemens land. —

V. P<sup>6</sup>. Number of Geographical Journal to discover whether dog found at Swan River. |

132 The change in England from Rhinoceros elephants &c in the most modern period, compared to Faunas of these countries, greater than *Toxodon*, *Macrauchenia* &c compared to America — the wonder is that the European forms were able to escape to some more fitting country. If *Toxodon* had been found in Africa the wonder [would] have been same for S. America & Europe. — the difficulty is how came it animals not preserved in Central S. America & yet in Africa & India?? — & Indian Isl<sup>5</sup>.<sup>4</sup> |

133 Sir J. Sebright pamphlet<sup>6</sup> most important showing effects of peculiarities being long in blood. Fully supported by Mr. Wilkinson<sup>7</sup>, — milking hereditary, development of important organ (see mark on pages), — crosses of diff: breeds succeed, yet seems to grant that difficult & other go back to either parent. — thinks difficulty in crossing race — bad effects of incestuous intercourse. — excellent observations of sickly offspring being cut off so that not propagated by nature. — Whole art of making varieties may be inferred from facts stated. — |

134 Shows instinct (Sir J. Sebright admirable essay) hereditary journey wild ducks. — lose as well as gain instincts. Wild & tame rabbit good instance — instincts of many kinds in dogs as clearly applicable to formation of instincts in wild animals many species in one genus external circumstances in both cases effect it. — Sir J. Sebright excellent authority because written on dog. Barking — applies it to national character. — |

<sup>1</sup> This paragraph up to here is marked by a query in the margin.

<sup>2</sup> Sir Thomas Livingstone Mitchell. *Three expeditions into the interior of eastern Australia, with descriptions of the recently explored regions of Australia Felix, and of the present colony of New South Wales*, London 1838, vol. 1, p. 363 (Owen's identification of fossil specimens of *Dasyurus* *leserticus*.) The caves and their contents were first reported by Major T. L. Mitchell: "An account of the limestone caves at Wellington Valley, and of the situation, near one of them, where fossil bones have been found." *Proc. Geol. Soc. Lond.*, vol. 1, 1831, p. 321.

<sup>3</sup> William Cliff. "On the succession of types of fossil mammals from Australian caves closely allied to living macropids". *Edinb. New Phil. Journ.*, vol. 10, 1831, p. 354. The source where Darwin found this reference was no doubt Charles Lyell's *Principles of Geology*, vol. 3, London 1833, p. 144.

<sup>4</sup> The words " & Indian Isl<sup>5</sup>" added in pencil.

<sup>5</sup> Sir John Sebright. *Observations upon the Instinct of Animals*, London 1836.

<sup>6</sup> J. Wilkinson. "Remarks addressed to Sir J. Sebright", London 1836.

135 N.B. If two species were excessively old they would not make hybrids, whereas two newer ones even if more different might do so, — is this true?? My views which would even lead to anticipate mules is very important for Lyell said to me the fact of existence of mules appeared to him most strange. — This even might be said — my theory thus explains a grand apparent anomaly in nature. —

Many animals not breeding at all in domestication throws great difficulty in way of ascertaining about hybrids, — & is very remarkable fact, show influence of mind. |  
 136 It is not difficult to see that it is less repugnant to nature to produce one offspring unlike itself, than to produce that capable of producing itself alike. — in one case it changes one, in other it changes thousands in futurity. — This is right way of viewing it. — Variety when long in blood gets stronger & stronger, so that though by great effort one unlike can be produced, yet to produce whole generation unlike would go against the tendency it tries to go back to grandfather, but if too unlike its own parent this impossible (Hence we might expect even if two males bred or two certain  
 137 varieties, they would go back to grandfather which is | true) & infertility is consequence. —

The simple expression of such a naturalist "splitting up his species & genera very finely" show how arbitrary & optional operation it is, — show how finely the series is graduated. —

Dr Beck<sup>1</sup> doubt of local varieties should be remembered. Therefore do not consider it as proved that they are varieties (though that would be best).

Argue the case theoretically if animals did change excessively slowly whether?  
 138 geologists would not find fossils such as they are. — | My theory explains that Jewily likeness, which as in absolute human family is undescrivable yet holds good, so does it in real classification. The relation of all cock birds in Gallinaceous having tendency to [. . ?] or peculiar tails, strange.

?? Genus only natural from death or slow propagation of forms — just same way as all men not all equally related to each other. I cannot help thinking good analogy might be traced between relationship of all men now living & the classification of animals. — talking of men as related in the third & fourth degree. — |

139 A species must be compared to family entirely separated from any degree; the tailor [tailer] in each branch would be analogous to each other &c &c. — v. p. 140.

I should think meaning of circular arrangement was only so far true as avoided linear arrangement the central twigs dying, affinities would be in broken circles — which in each group is quite fatal. — Relations of analogy being those last obtained less firmly fixed & therefore most subject to change. — may account for certain organs not being fixed in some genera which are most fixed in others. |

140 In analogy it is not the relation to bear to each other but to some external contingency. — Affinity is the sum of all the relations, analogy is the close relationship in some one. — Imagine the men to have greater powers of change yet, as external conditions over whole world similar & constitution of men originally similar, limits of change would be same. Yet each family might have its own character. — We

<sup>1</sup> Presumably Dr Heinrich Henrichsen Beck of Copenhagen who is referred to three times in Lyell's *Principles of Geology*, 5th edition, London 1837, as an authority on shells.

<sup>2</sup> This word crossed out in MS.

here suppose these changes of adaptation greater than those hereditary ones which would elapse, during time such changes |

141-142 excised.

143 When one reads in Ehrenberg's Paper on Infusoria<sup>1</sup> on the enormous production — millions in few days — one doubt that one animal can really produce so great an effect. — the spirit of life must be every where ambient & merely determined to such points by the vital laws. — So that all characters originally may must have had the character of analogical. —

Gould says it is only in large groups where you have representations. — The serial type in each family is relation to elements & not habits as shown by frigate Bird & flying Hawk. |

144 Gould<sup>2</sup> seemed to think, that widow bird replaced Birds of Paradise — if such fantastic sexual ornaments have so intimate a relation to two continents as to be called into existence in two continents our ignorance is indeed profound & such it appears. — Is there not some statement about diversity of form in aberrant circles — explained by such not having been long in blood? — |

145 My theory agrees with unequal distances between species some fine & some wide which is strange if creator had so created them. — People will argue & fortify their minds with such sentences as "oh turn a Buccinum into a Tiger" — but perhaps I feel the impossibility of this more than any one. — no turn the Zebra into the Quagga, let them be wild in same country with their own instinct (even though fertile<sup>3</sup> hybrids produced when compelled to breed) & then all that I want is granted. —

For at Galapagos make ten species of Orpheus, one of which has very short legs & long tail, short much curved beak. Other very long beak with short [tail]; let them only have progeny with species & there will be two genera. — let short billed one be exaggerated & all rest destroyed, far remote genera will be produced. |

146 As we know from Ehrenberg<sup>4</sup> there are fossil (see scientific Memoirs & L'Institut) that there are Tertiary fossil Infusoria of same forms with recent & we have nothing to do with CREATION. —

The end of formation of species & genera is probably to add to quantum of life possible with certain preexisting laws. — If only one kind of plants not so many. — |

147-148 excised.

149 Mr Blyth<sup>5</sup> remark that a resemblance between some forms in birds is visible when young but not when old, — thus speckled form of young blackbird good remark if general. —

<sup>1</sup> Christian Gottfried Ehrenberg. "Recherches sur les Infusoires", *Annales des Sciences Naturelles*, seconde série, tome 1 Zoologie, Paris 1834, p. 207. — "La force reproductrice des animaux infusoires est plus développée que dans aucune autre classe d'animaux".

<sup>2</sup> John Gould. The widow bird, which is a weaver, inhabits South Africa while the Birds of Paradise inhabit Australia. Gould's opinion was probably a personal communication to Darwin.

<sup>3</sup> This word crossed out in MS.

<sup>4</sup> Christian Gottfried Ehrenberg. "Paläontologie: Infusorien fossiles du tripodi d'Oran". *L'Institut*, tome 3, 1837, p. 130. "Remarks on the real occurrence of fossil Infusoria, and their extensive diffusion" *Scientific Memoirs*, vol. 1, 1837, p. 400.

<sup>5</sup> Edward Blyth. "Further remarks on the affinities of the feathered race; and upon the nature of specific distinctions". *Mag. Nat. Hist. Lond.*, vol. 2, 1836, p. 303. On p. 307. — "The black bird has when young, a spotted breast; and, in fact, the characters of its nestling plumage alone forbid its alienation from the spotted thrushes. Where, indeed, can we trace the line of separation between *Méruia* and *Philomela* even? . . ."



Where any structure is general in all species in group we may suppose it is oldest, & therefore least subject to variation, — & good for generic divisions Ought genus to be founded on such characters as do not vary in the species of it : where does such occur?

Now some such characters rule are used by naturalists in their test of value of character. Therefore value of organ vary in different group & not known in single ones — viz. Macleay letter<sup>1</sup> to Fleming<sup>2</sup> p. 32 " where it (mode of generation) varies according to the species, it is manifestly of less importance as affording natural characters than among those groups, where it remains less subject to Variation ". Macleay's Rule is converse : value of character depends on non-variation & not on extension? these go together? |

150 Dr A. Smith<sup>3</sup> know lots of instances of replacement of one species by another, supply place in each others economy. Dr S. showed that savages are not born with any capacity for observation of tracks &c &c. Dr S. has some remarkable crochets about instincts whenever instinct is mentioned some definition must be given.

It would not be difficult to arrange children of same parents in a circle, — hermaphrodite & father & grandfather must be introduced & made young, father must be left out of case, that difference occurring. — |

151 It will be necessary to show hybridity from few forms, parents of all species not possible in some detail. the relation to islands close species on these isld &c will probably upset it. — The space which one branch of the tree of life occupied after its decay, will be occupied by the vigorous shoots from each branch no : because decay in that space is effect of unfavourable conditions (hence rise & depression of importance in each group & connection of even distant ones) the characters will be first those of analogy but will grow into affinity, but whether ever arrive at true

152 affinity doubtful. | A species is only fixed thing with reference to other living being. — One species may have passed through a thousand changes, keeping distinct from other, & if a first & last individual were put together, they would not according to all analogy breed together. — The bottom of the tree of life is utterly rotten & obliterated in the course of ages. —

As species is real thing with regard to contemporaries — fertility must settle it. — |

153 Changes in structure being necessarily excessively slow they become firmly embedded in the constitution, which other marked difference in the varieties made by of nature & man. —

The constitution being hereditary & fixed, certain physical changes at last become unfit, the animal cannot change quick enough & perishes. — Lyell has shown<sup>4</sup> such Physical changes will be unequally rapid with respect to their effects.

The Egyptian animals domesticated?? & therefore most especially under care of man, & external circumstances not variable. — |

<sup>1</sup> William Sharp Macleay. " A letter on the dying struggle of the *Dicotyles* system ". London 1850, p. 32.

<sup>2</sup> John Fleming, author of the *Philosophy of Zoology*, Edinburgh 1823.

<sup>3</sup> Andrew Smith, author of : *Report of the Expedition for exploring central Africa, from the Cape of Good Hope . . . 1824, under the superintendance of . . . A. Smith*. Cape Town 1829.

<sup>4</sup> Charles Lyell, *Principles of Geology*, vol. 2, London 1832, p. 128 — " Rate of the change of species cannot be uniform, however regular the action of the inorganic causes."

- 154 Animals have voice so has man. Not rather but *Asiater*; hence if sickness death, unequal life — stimulated by same passions, brought into the world same way, animals expression of countenance. They may convey much thus. Man has expression. — animals signals, (rabbit stamping ground), man signals. — animals understand the language. They know the cry of pain as well as we. —

It is our arrogance, to raise on the same shelf to look at common ancestor scarcely conceivable in savages precludes (?) any but instinct (?) feeling. Has not the white man, who has debased his nature by making slave of his fellow Black, often wished to consider him as other animal. — it is the way of mankind & I believe those who

- 155 soar above such prejudices yet have | justly exalted nature of man. like to think his origin godlike, at least every nation has done so as yet. —

We now know what is the natural arrangement. It is the classification of relationship, latter word meaning descent. —

A tree is taken by Fleming<sup>1</sup> as emblem of dichotomous arrangement which is false.

- 156 There is same difficulty in arranging animals in paper as drying plant, all brought in one plane. | Fleming Quarterly review says<sup>2</sup> nat: lam: of willows contains many Linnaean genera. — How are the character which unite these of older standing that constant number of stamens in order or in next family?

In considering fossil animals, what relation in classification in books, ought they to hold. —

Birds having web-feet when we see scarcely any traces of passage a difficulty but after all a slight one.

It will be necessary from manner Fleming treats subject to put in alternative of man created by distinct miracle. |

- 157 Macleay letter<sup>3</sup> to Dr. Fleming Philosophical Magazine & Annals 1830 (?) "if she has put man on the throne (*of reason*), she has also placed a series of animals on the steps that lead up to it" p. 30, between mammalia & fishes, one penguin, one tortoise, shows hiatus but not saltus. When Linnaeus<sup>4</sup> put whale between cow & hawk a frolicsome saltus p. 29. hiatus & saltus not syn[onymous]. — Linn: Transact.<sup>5</sup> vol. xiv. — p. 24. Lamarck bears to Cuvier that relation of theoretical astronomer to plain observer<sup>6</sup>. |

- 158 Macleay<sup>7</sup> seems to limit Lamarck definition of relations to settling the relative importance of the organs in same state in different animals. These questions may be all disputable, but the one end of classification to express relationship & by so doing discover the laws of change in organization. But the classification must chiefly rest

<sup>1</sup> John Fleming. *The Philosophy of Zoology*, vol. 2, Part III, p. 156 contains Fleming's views on classification. The reference to a tree is probably taken from William Sharp Macleay: "A Letter on the dying struggle of the Dichotomous System, (London 1830), p. 8: "Man in this system may be compared to the trunk of a tree, Dominies and D.D.s to the branches, and John Fleming to the bud or leaf on the spray".

<sup>2</sup> John Fleming. Reference retraced.

<sup>3</sup> William Sharp Macleay. *A Letter on the dying struggle of the Dichotomous System*, London 1830, p. 20.

<sup>4</sup> William Sharp Macleay. *Ibid.*, p. 29. The reference is to: Carolus Linnaeus: *Systema Naturae*, Holmiae 1758. The last entry among the mammals on page 77 is Delphinus in the group Cete, after which immediately come the birds the first of which on page 85 are the Accipitres, beginning with Falco.

<sup>5</sup> William Sharp Macleay. "Remarks on the identity of certain general laws which have been lately observed to regulate the natural Distribution of Insects and Fungi", *Trans. Linn. Soc. Lond.*, vol. 14, 1825, p. 42.

<sup>6</sup> William Sharp Macleay. *A Letter on the dying struggle of the Dichotomous System*, London 1830, p. 14.

<sup>7</sup> William Sharp Macleay. *Ibid.*

on these same organs — habits, range &c &c — and the value of those organs when changed in different animals, — whether variation in eye of vertebrate afford better character than variations in eye of mollusc.

Macley rests his whole groundwork of analogy on its concurrence in parallel parts of his series, i.e. cannot be discovered till circles completed.<sup>1</sup> |

159-162 excited.

163 N.B. *Pyrrholauda* (bird of St. Jago) of brown colour lives on ground, colour of habitation must have some effect. — Maldonado as good forests for beautiful birds. —

Hereditary ambling horses (if not looked at as instinctive) then must be owing to hereditary power of muscles. — Then we SEE structure gained by habit.

Talent &c in man not hereditary because crossed with women with pretty faces.

164 When horse goes a round the minute gets into the road at right angles how pleased it is just like man, emotions very similar. — Geolog. Transact. vol. V Birds bones in strata of Tilgate forest.<sup>2</sup> | Seeing common gull in garden at Zoolog. Soc. its pale ash grey back like a black bird washed, whilst tips of primaries black, by examining series I cannot doubt laws of change will be known. — It appeared to me that half [breed] between fowls & pheasants is most like pheasant. I think so because viz. 3/4 bred (hence hybrids in this case have bred). White & common pheasants have crossed. — |

165 The attachment of dogs to man not altogether explained by F. Cuvier,<sup>3</sup> — Mem. Hensleigh's<sup>4</sup> objection. — it is more, he cuts the matter short by saying man cannot be companion but master. — Hereditary tameness as well as wildness — cf. Sir J. Sebright.<sup>5</sup> — Love of man gained & hereditary, problem solved.

Habits become important element in classification because structure has tendency to follow it, or it may be hereditary & strictly point out affinities. conduct of Gould,<sup>6</sup>

166 remark of D'Orbigny<sup>7</sup> point out importance of habits in classification. — | Thought (or desires more properly) being hereditary it is difficult to imagine it anything but structure of brain hereditary, analogy points out to this. — Love of the deity effect of organization, oh you materialist! — Read Barclay<sup>8</sup> on organization! Avitism<sup>9</sup> in mental structure a disposition & avitism in corporeal structure are facts full of meaning. — Why is thought being a secretion of brain, more wonderful than gravity a property of matter? It is our arrogance, it our admiration of ourselves. — |

167 The idea of foetus being of one both sexes is strongly supported by wonderful fact of bees changing the sex by feeding. — no it is developing a hybrid female it is a wonderful relation going through all nature. — Makes hermaphroditism one step

<sup>1</sup> William Sharp Macley. "Remarks on the identity of certain general laws which have been lately observed to regulate the natural Distribution of Insect and Fungi", *Trans. Linn. Soc. Lond.*, vol. 14 Part III, 1828, p. 48.

<sup>2</sup> Gideon Murray. "On the Bones of Birds discovered in the Strata of Tilgate Forest in Sussex", (*read 10 June 1833*) *Trans. Geol. Soc. Lond.*, vol. 3, 1830, p. 173.

<sup>3</sup> Frédéric Cuvier. "Essay on the domestication of mammiferous animals . . ." *Edinb. New Phil. Journ.*, vol. 4, April 1828, p. 297.

<sup>4</sup> Hensleigh Wedgwood (1803-1851). Brother of Darwin's wife.

<sup>5</sup> Sir John Sebright. *Observations upon the instincts of Animals*, London 1826.

<sup>6</sup> John Gould. *The Birds of Europe*, London 1837.

<sup>7</sup> Alcide Dessalines d'Orbigny. *Voyage dans l'Amérique méridionale*, tome 4, 3<sup>e</sup> partie, Paris 1833.

<sup>8</sup> John Barclay. *An Inquiry into the opinions, ancient and modern, concerning life and organization*, Edinburgh 1821.

<sup>9</sup> Avitism means relating to ancestors.

in series — in plants we have a step between monoecious & dioecious plants in animals it may be difficult to imagine how sexes were separated. — in plants we have some flower monoecious and other dioecious. Some flower hermaphrodites and others not???

The death of some forms & succession of others (which is almost proved, elephant has left no descendant in Europe, Toxodon in S. America) is absolutely necessary to explain genera & classes. If extinct forms were all fathers of present, then there  
158 would be | perfect series or gradation. — It is easy to see if South America grew very much hotter, then Brazilian species would migrate southward being ready made, — and so destroy individuals, whereas in Falkland Is<sup>d</sup> they would change & make new species. — Alpine species being destroyed at Falkland Is<sup>d</sup>. — even at Falklands some probably would stand change better than others<sup>1</sup>. — Mem. Lyell hypothesis of change in Sicily.<sup>2</sup> — Splendid Harmony these views — did Lamarck connect extermination of some forms with his views.<sup>3</sup> — as genera are large probably only few of extinct |  
160 forms have generated species & of 100 extinct species the greater number probably have no descendants on earth. —

The more complicated the animal the more subject to variation, therefore sexes in two animals : — When sexes are united (which probably is first stage) the tendency to change cannot be great, otherwise it would be unlimited.

We absolutely know the tendency is greater in Mammalia than in shells? univalves or bivalves. — |

170 Any man No. VI Magazine of Zoology & Botany p. 566 wants to see absurdity of Quinary arrangement let him look at abstract of Swainson<sup>4</sup> on classification. " Let anyone ever with a very superficial knowledge like myself of real affinities i.e. structure of the whole animal let him read Mr Swainson's on the Classification of animals & observe the character of the demonstrations offered of the singular views there offered, & he must be a zealous man in the cause if his faith not staggered." I confess no dissertation against these views could possibly have had & brought so much conviction to my mind. — |

171 Reflect much over my view of particular instinct being memory transmitted without consciousness, a most possible thing see man walking in sleep. — an action becomes habitual is probably first stage, & an habitual action implies want of consciousness & will & therefore may be called instinctive. — But why do some

<sup>1</sup> These eleven words on p. 160 of the MS. are marked to appear here.

<sup>2</sup> Charles Lyell. *Principles of Geology*. vol. 2, London 1830, Chapter VI in which Lyell proved by means of the fossil Mollusca of Sicily that the climate of the Northern Hemisphere had deteriorated.

<sup>3</sup> Jean-Baptiste-Pierre-Antoine de Monet de Lamarck. *Philosophie Zoologique*, tome 1, Paris 1809, p. 77. — " Or, si quantité de ces coquilles fossiles se rencontrent avec des différences qui ne nous permettent pas, d'après les opinions admises, de les regarder comme des analogues des espèces voisines, mais que nous considérons, s'ensuit-il nécessairement que ces coquilles appartiennent à des espèces réellement perdues? Pourquoy, d'ailleurs, seraient-elles perdues, dès que l'homme n'a pu opérer leurs destructions? Ne seroit-il pas possible au contraire, que les individus fossiles dont il s'agit appartiennent à des espèces encore existantes, mais qui ont changé d'état et ont donné lieu aux espèces actuellement vivantes que nous en trouvons voisines. Les considérations qui suivent et nos observations dans le cours de cet ouvrage rendroient cette conclusion très-probable." (p. 93 of 1875 reprint). Lamarck therefore did not connect his views with "extermination of some forms."

<sup>4</sup> William Swainson. *Review and Critical Analysis*. " 1. On the Geography and Classification of Animals. By William Swainson. 2. Classification of Quadrupeds. By William Swainson." *Mag. Zool. Nat.*, vol. 1, 1837, p. 343. On p. 366 — " We have no hesitation, however, in stating our conviction, that Mr. Swainson's theory, in regard to the analogies of this order, is the true one. . . . "

actions become hereditary & instinctive & not others. — We even see they must be done often to be habitual or of great importance to cause long memory. — structure is only gained slowly. Therefore it can only be those actions which many successive generations are impelled to do in same way. — The improvement of reason implies diversity & therefore would banish individual but general ones might yet be transmitted. — |

- 173 Memory springing up after long intervals of forgetfulness, — after sleep strong analogies with memory in offspring. or simply structure in brain people & senses recollecting things utterly forgotten — Some association in such cases recall the idea it is scarcely more wonderful that it should be remembered in next generation.

(N.B. What are those marvellous cases where you feel sure you have heard conversation before, is strong association recalling up image which had been past — so great an anomaly in structure of brain not probable), put note Sir W. Scott has written about it.<sup>2</sup> If we saw a child do some action which its father had done habitually we should exclaim it was instinct, even if savage taken & was given a great coat & this he put on & we afterwards could understand (language better instance) he had done this without reflection or consciousness of reasoning to tell back from front &c or use of button holes it would | be instinctive. — My view of instinct explains its loss? if it explains its acquirement. — Analogy a bird can swim without being web footed yet with much practice & led on by circumstance it becomes web footed. Now man by effect of memory can remember how to swim after having once learnt, & if that was a regular contingency the brain would become web-footed & there would be no act of memory. — There is no correlation between individual objects as Ichneumon & caterpillar though our ignorance may make us think so, but only between laws.<sup>3</sup> |

- 174 Many diseases in common between man & animals. Hydrophobia &c cowpox, proof of common origin of man. — different contagious diseases, where habits of people nearly similar. Curious instance of differences in races of men. —

Wax of Ear, bitter perhaps to prevent insects lodging there. Now these exquisite adaptations can hardly be accounted for by my method of breeding, there must be some cor[r]elation, but the whole mechanism is so beautiful. The cor[r]elations are not, however, perfect, else one animal would not cause misery to other. — else smell of man would be disagreeable to mosquitoes. |

- 175 We never may be able to trace the steps by which the organization of the eye passed from simpler stages to more perfect preserving its relations. — the wonderful power of adaptation given to organization. — This really perhaps greatest difficulty to whole theory. —

There is breed of tailless cats, near Bath, Lonsdale<sup>4</sup> ditto says sheep could not live for some time at New York instance of the fine relation of adaptation of animals & the country they inhabit, — & the first one that bred one was diseased in its loins

- 176 & all were so afterwards (forgets authority). — | Lonsdale is ready to admit permanent small alterations in wild animals & thinks Lyell has overlooked argument

<sup>1</sup> This sentence in square brackets in MS.

<sup>2</sup> William Lonsdale was Curator of the Geological Society's collections. The information about tailless cats was probably a personal communication.

that domesticated animals change a little with external influence, & if those changes permanent so would the change in animal be permanent. — It will be easy to prove persistent varieties in wild animals, but how to show species. — I fear argument must rest upon analogy & absence of variates in a wild state — it may be said argument will explain very close species in cold near continent, must we resort to quite different origin when species rather further. — Once grant good species as | carrion crow & rook formed by descent or two of the willow wrens &c &c & analogy will necessarily explain the rest. —

177 Lonsdale says<sup>1</sup> he has seen in old Book last Bear in England killed in year 1000, reference to succession of types<sup>2</sup> different species; Horses &c.

State broadly scarcely any novelty in my theory, only slight differences, the opinion of many people in conversation. The whole object of the book is its proof, its limiting the allowing at same time true species & its adaption to classification & affinities its extension. — | Von Buch Travels p. 302 account of trees<sup>3</sup> ceasing to grow far N. become stunted, altered & low fertility — more sickness?? because offspring too unlike?? Memoir of Charles D'Orbigny on Plastic Clay of Paris<sup>4</sup> contains many genera of Pachydermata or & other mammals, otter, civet cat, rodents. — (Pachyderm in Portland stone of Alps!!!? No) p. 15 (Lyll's pamphlet).<sup>5</sup>

Is man more hairy than woman because ancestors so, or has he assumed that character, — female & young seem most like mean character the others assumed. — Daines Barrington<sup>6</sup> says cock birds attract females by song do they by beauty, analogy of man if so war not |

179-188 excised.

189 p. 428 ouzel sometimes builds nest without dome<sup>7</sup> vol. 9 Mag. Z. & B.

p. 431 Missel thrush lately increased in numbers over whole of England & Ireland.<sup>8</sup> — Curious in so wild bird. —

Annals of Natural History Vol. 1 p. 185 case of tit lark placing withered grass over nest when often looked at.<sup>9</sup> — This most puzzling whether instinct or reason??

<sup>1</sup> William Lonsdale. Personal communication. There is a tradition that the last British bear was killed in Scotland in 1007.

<sup>2</sup> Leopold von Buch. *Reise durch Norwegen und Lappland, Zweiter Theil*, 1810. The account of trees is on pages 295-302.

<sup>3</sup> Charles d'Orbigny. "Existence d'un étage de calcaire marin particulier au-dessous du terrain tertiaire du bassin de Paris, et d'une assise, également nouvelle, dépendant de l'argile plastique; découverte d'ossements fossiles dans ce dernier étage." *Compte Rendu Acad. Sci. Paris*, tome 3, 1826, p. 128.

<sup>4</sup> Charles Lyell; presumably the reference is to a reprint of "On the strata of the plastic clay formation exhibited in the cliffs between Christchurch Head, Hampshire, and Studland Bay, Dorsetshire." *Trans. Geol. Soc. Lond.*, vol. 1, 1829, p. 279.

<sup>5</sup> The Hon. Daines Barrington. "Experiments and Observations on the singing of birds," *Phil. Trans. Roy. Soc.*, vol. 61, 1773, p. 343.

<sup>6</sup> William Thompson. "Contributions to the natural history of Ireland. No. 4 On the Birds of the order Insectivora. The Water Ouzel." *Mag. Zool. Bot.*, vol. 2, 1838, p. 427. On page 429:—"The first nest of this bird I remarked was placed in a hole in the clayey bank of a pond, where, owing to the shelter afforded, there was no occasion for the display of its domed architecture, and this was consequently dispensed with."

<sup>7</sup> William Thompson. "Contributions to the natural history of Ireland. No. 4 On the Birds of the order Insectivora. The Mistle-Thrush." *Mag. Zool. Bot.*, vol. 2, 1838, p. 427. On p. 431:—"Has of late years extended its locality in Ireland, as in other parts of the British Islands, and is now found throughout the country."

<sup>8</sup> William Thompson. "Contributions to the natural history of Ireland. No. 6 On the Birds of the order Insectivora." *Ann. Nat. Hist.*, vol. 1, 1838, p. 181. On p. 182:—"... he observed a quantity of withered grass laid regularly across the nest. . . ." This remark is however made in respect of the meadow pipit.

Could says<sup>1</sup> he believes that he has seen half fox & dog & that it was most like fox. — He felt sure the half breed of Australian dogs would be most like Australian. — Curious this ready answer without any leading question. — This might be mentioned in note. — |

190 Try to trace from simplest reasoning in lower animals many times produced, a general tendency produced, such as man getting habitually into passion, becomes habitually passionate. — The key to the affections might perhaps thus be found — a person who is habitually kind to children increases general instinctive feeling. — |

191 There is great difficulty in making an alpine species from one in lower country during gradual elevation of isl<sup>2</sup>. — We must imagine a considerable range of one species on a mountain side of which the central parts become occupied by a third best adapted kind. — Lower species would then revert to pristine form (which must have been altered by crossing with alpine form). Lower species afterwards would probably often be destroyed, — or regrafted with fresh arrivals &c &c. — Climate altering as island increases. — upper parts attracting all the moisture. |

192 Henslow thinks<sup>3</sup> if leaf of plant varies, all organs vary in plant. The variation in character of leaf of plant is remarkable what is analogous to it in animals? —

Babington says<sup>4</sup> in most plants, even those on Guernsey & on West Coast of Ireland, are absolutely (& who better authority) similar with those over whole of country. — Some species are larger &c in different countries. These facts show how very permanent plants | are, & this conclusion must be arrived at, when one sees a plant like

193 Paris quadrifidum growing in one wood far from any other plants of same species.

Channel Isl. (& probably Isle of Man) no plants peculiar to themselves, this remarkable compare it with Canary Isl., Galapagos. — Iceland has same uniformity. | Primrose & Cowslip quite wild but they affect different localities, — latter

194 on banks & in damp parts, both propagated by seeds. — There are two Dandelions which just lately have been shown to be same — one grows in marsh & other dry; yet if *T. palustris* be sown in dry station it will for some generation come up so. — There are not many intermediate shades in these case, but absolute species formed.

The *Anagallis* perhaps offers another case of permanent varieties in wild state. —

195 The two | former produced by difference of station. Varieties chiefly produced by cultivating parent in rich soils & then seeds produce variety.

Wild carrot made into biennial domesticated kind with large root by sowing it at wrong time of year & manuring it. — Epigonous & perigonous are very important in classification. Here we have generative organs first character.

In dioecious plants many of the female flowers unimpregnated Babington.<sup>4</sup> |

196 We see gradation to mans mind in Vertebrate Kingdom, in more instincts in rodents than in other animals; & again in mans mind, in different races being unequally developed. — ? is not elephant intellectually developed amongst Pachydermata like man amongst monkeys or dog in Carnivora. —

<sup>1</sup> John Gould. Probably personal communication.

<sup>2</sup> John Stevens Henslow. Probably personal communication.

<sup>3</sup> Charles Cardale Babington. "A notice, with the results, of a Botanical Expedition to Guernsey and Jersey in July and August 1839", *Mag. Zool. Bot.*, vol. 2, 1838, p. 307.

<sup>4</sup> Charles Cardale Babington. Reference untraced.

197 Man in his arrogance thinks himself a great work worthy the interposition of a deity. more humble & I believe truer to | consider him created from animals.

Insects shamming death most difficult case to imagine how art acquired. — Only reason however on this to a degree. Mem. spider only dropping where ground thick. — Shamming death it is but being motionless. How is instinctive dread it is exceedingly doubtful whether animals have any fear of death or of pain of death acquired? The S. American dung beetles will each become the father of many species, a few eggs transported to the St. of Magellan. — Change of habits in Van Diemens Land. |  
198 Study Mr. Blyths papers on Instinct.<sup>3</sup> — His distinction between reason & instinct very just; but these faculties being viewed as replacing each other it is hiatus & not saltus. —

The greater individuality of mind in man is analogous to greater individuality of bodies of some animals over those of others. — The mind of different animals less divided. — But as man has hereditary tendencies, his mind is still only, divided body.

P. 3 language seems to supply instincts, — & those powers which allow of acquirement of language hereditary, acquirable. — therefore mans mind not so different from that of brutes.

Hard to say what is instinct in animals & what reason, in precisely same way not possible to say what habitual in man & what reasonable. Some action may be either in same individual. |

199 P. 7, is not squirrel hoarding & killing grain acquirable through hoarding from short time. — My theory must encounter all these difficulties, knowing that animals have some reason, & actions habitual. it surely is not worthy interposition of deity to teach squirrel to kill ears of corn. According to my views, habits give structure, ∴ habits precede structure, ∴ habitual instincts precede structure. — duckling runs to water before it is conscious of web-feet. —

P. 7 Mr. Blyths arguments<sup>4</sup> against squirrel using reason in hiding its food is applicable to any habitual action even which man performs, — child striking a post in passion. —

Habit instinct gained during life. — do elephants easily acquire habits is this the key to their mental powers?<sup>5</sup>

p. 8 mistakes of instinct are external contingencies where the habit is not applicable. |

200 The degree of development of all animals of same class being about equal, — organs of generation about equally complicated. —

An Entomologist going into a country & collecting thousands & tens of thousands new insects, perhaps scarcely one new family & no new order. — Wonderful, partly explained on my theory, & otherwise mere fact creator chooses so to create. —

It is very remarkable, with so much death, as has gone on, no greater gaps. — External conditions to be sure have remained somewhat similar. — !!! |

201 My theory drives me to say that there can be no animal at present time having an

<sup>3</sup> Edward Blyth. "On the Psychological distinctions between Man and all other animals; and the consequent Diversity of Human Influence over the inferior ranks of Creation, from any mutual and reciprocal Influence exercised among the latter." *Mag. Nat. Hist. Lond.*, vol. 2, 1837, p. 2.

<sup>5</sup> Edward Blyth. *Ibid.*



intermediate affinity between two classes. — there may be some descendant of some intermediate link. — the only connection between two such classes will be those of analogy, which when sufficiently multiplied become affinity yet often retaining a family likeness, & this I believe the case. — Any animal really connecting the fish & mammalia must be sprung from some source anterior to giving off of these two families, but we see analogies between fish. — Birds same remarks. |

202 Characters of analogy, — last acquired, — or aberrant, therefore more easily modified. — This is not easily told, for any small family having analogous characters, might be multiplied. — We must argue reversely: *where character variable it is (one of analogy or) lately acquired.* In pigs number of vertebrae subject to variation therefore lately acquired.

I fear great evil from vast opposition in opinion on all subjects of classification, I must work out hypothesis & compare it with results; if I acted otherwise my premises would be disputed. — According to Principle of last page osculant groups between two circles of equal value must be so from characters of analogy. — See my notes on p. 37 of Macleay.<sup>1</sup> Wonderfully accordant with fact there stated only in most discordant groups. |

203 The formation of genera may sometimes be due to accident as submersion of land containing all of intermediate Father-species, & not, therefore, solely owing to such interm. father-species being little adapted to some physical change. — If Patagonia became fertile all intermediate species living there would be destroyed, & N. & S. existing species become fathers of genera — Whatever the cause is, any osculant species which survived would be few in number. —

204 Parallel of Japan, near Himalaya, & European forms on that Isl.<sup>d</sup>. | The races of men differ chiefly in colour, form of head & features (hence intellect? & what kinds of intellect) quantity & kind of hair forms of legs — hence the father of mankind probably possessed a structure in these points for a less time than other points. — female genital organs, — make abstract on this subject from Lawrence,<sup>2</sup> Blumenbach<sup>3</sup> & Prichard.<sup>4</sup> In some monkeys clitoris wonderfully produced. — Now we might expect that animal half way between man & monkey would have differed in hair colour & form of head & features; but likewise in length of extremities, how are men in this respect upper & lower, which I do not know whether it differs in present races, & form of feet. — Negro or father of negro probably was first black at base of nails & on white of eyes. —

Will he say creation is at end seeing that Tertiary geology has obeyed rules of modern causes & considering over the vicissitudes of present animals. He would be bold. I will venture to say unphilosophical. |

207 A question of immense difficulty is whether Apterix descend from same parent with other birds, or branched off anteriorly. think what principles are there to guide in this opinion? *Excellent principle of abortion.*

<sup>1</sup> William Sharp Macleay. *Novae Zoologicae*, London 1859, p. 37: — "These genera I propose to call *anomalista*, from their occurring as it were at the point where the circles touch one another."

<sup>2</sup> William Lawrence. *Lectures on physiology, zoology, and the natural history of man*, London 1819. This edition was suppressed.

<sup>3</sup> Johann Friedrich Blumenbach. *A Manual of the Elements of Natural History*, London 1803.

<sup>4</sup> James Cowles Prichard. *Researches into the physical history of Man*, London 1813.

*Isolation of range tends to alteration view.* — ostriches ditto but then there may have existed series between Apterix & other birds. — Will having many trifling characters in common with other birds reveal the secret. — Now all the different forms of Synalaxis trifling characters as red band on wing show to be from one parent — same form of beak &c without these trifles, it would not then be told whether not descended  
 208 from long way back. — aberrant forms produced when many species | but when much death, may be inferred much time elapsed &, therefore descended from branch high up. — Such probabilities only guides. — Yet trifles are produced by circumstances. Spines on Echidna, when it can be traced through series then probably hereditary & not produced by circumstances.

In Ostrich which is not isolated we must suppose the changes from typical structure have either been more rapid than in all other birds, or that it sprung from a branch high up. This argument not applicable to Apterix, but source of error for only |

209-210 excised.

211 organic matter — have & which thinking principle seems to be given a assumed according to a more extended relations of the individuals, whereby choice with memory or reason? is necessary — which is modified into endless forms bearing a close relation in degree & kind to the endless forms of the living beings. We see this unity in thinking and acting principle in the various shades of separation between those individuals thus endowed & the community of mind even in the tendency to delicate emotions between races. — recurrent habits in animals. —

Animal magnetism principle of irritation, sleep walking, fits, laughter, &c &c. Man & man may have some relation together as well as man & child, polypus &  
 212 polypus, bud & bud, polypus & germ, plant & seed. — | Instincts in young animals well developed, just like habits easily gained in childhood. — Young salmon first a species which lived in estuaries. its tastes taught it to go to salt water (& its necessities teach it taste, but that a much more general argument) & therefore down the stream follow ebb tide, therefore got into habit of going down stream which would last were the stream 1000 miles long.

A monkey (Baboon) at Z. garden upon being beaten behaved very differently from a dog, more like man. continued long in a passion & looked out for him to come again, very different from dog, perhaps being in passion chief difference. |

213-216 excised.

217 before, then there always have been gaps, & there now must be, ∴ extinction of species bears relation to existence of genera &c &c. Discussion useless, until it were fixed what a species means. Two savages, two species, — civilized man may exclaim with Christians we are all Brothers in spirit, all children of one father, — yet differences carried a long way.

Case of habit : I kept my tea in right hand side for some months, & then when that was finished kept it in left, but I always for a week took off [ ] cover of right side though my hand would sometimes vibrate seeing no tea brought back memory — old habit of putting tea in pot, made me go to tea chest almost unconsciously. — Why do absent [minded] Dr Black tea & sugar people reverse habits. |

218 Insects & birds are the only two tribes fitted for water, air & land (Macleay has this remark).

Mem. number 5 here most evident!!? Examine into this case. L<sup>d</sup> Jeffrey<sup>1</sup> (*Life of Mackintosh*, vol. II, p. 495) — ['] in fact in all reasonings of which human nature is the object, there is really no natural starting place, because there is nothing more elementary than that complex nature itself with which our speculations must end as well as begin " &c &c. The centre is everywhere & the circumference nowhere as long as this is so — !! Metaphysics!!! |

- 219 Mrs. Somerville<sup>2</sup> connection of Physical sciences p. 276 may be worth glancing at as she has no original idea, it will show state of knowledge. Negroes existed since time of earliest Egyptian drawings & Old Testament.

Domesticated animals having same idiosyncrasy, cause of fertility. — varieties not produced as by nature, if so the habits which would have formed them would have arisen under different climates &c. Do I mean that idiosyncrasy of wild animals is generally different, because this difference arises a good deal from climate & habits, & therefore less fertile according to Mr Herbert's views.<sup>3</sup>

Argue case of abortive organs to mules in their genitals & even to a limb not used.

The only cause of similarity in individuals we know of is relationship, children of one parent, races of animals — argue opening case thus. |

- 220 Educate all classes, avoid the contamination of castes, improve the women (double influence) & mankind must improve. —

The areas of subsidence marked out by animals of same genera is not equal to areas of elevation: marked out by existence of elevated extinct? genera of shells. — duration in the classes however different. — |

- 221-2 excised.

- 223 & hereditary & such definite thoughts, I will never allow that because there is a chasm between man (— & chasms necessary consequence of to account for the scheme of nature) and animals that man has different origin.

Dr Royle<sup>4</sup> Royal Institution seems to think Botanical Provinces will turn out not nearly so confined as now thought. — N. American, European, & Chinese genera & some species in Himalaya, some English beetle, birds & a fox most close. |

- 224 The most curious case is saxifrage, almost closely allied species Himalaya, 13000 & Melville Is<sup>5</sup>. —

West Africa & India some plants same.

<sup>1</sup> Lord Francis Jeffrey. Robert James Mackintosh: *Memoirs of the Life of the Right Honourable Sir James Mackintosh*, London 1836. In chapter VIII there is a letter to the editor by The Hon. Lord Jeffrey, p. 491. Darwin's quotation is on p. 496 of the second edition.

<sup>2</sup> Mary Somerville. *On the connection of the physical sciences*. London 1834. [From the 3rd edition, London 1852, p. 286] — " . . . nothing is more remarkable than the distinctions which characterize the different tribes of mankind, from the ebony skin of the torrid zone to the fair and ruddy complexion of Scandinavia, — a difference which existed in the earliest recorded times, since the African is represented in sacred writing to have been as black as he is at the present day, and the most ancient Egyptian paintings confirm that truth; yet it appears from a comparison of the principal circumstances relating to the animal economy or physical character of the various tribes of mankind, that the different races are identical in species. Many attempts have been made to trace the various tribes back to a common origin, by collating the numerous languages which are, or have been spoken. . . . "

<sup>3</sup> William Herbert. *Amoryllidaceae; founded by an attempt to arrange the Monocotyledonous orders, and following the Treatise on Cross-bred Vegetables, and Supplements*, London 1837, p. 343.

<sup>4</sup> John Forbes Royle. "Illustrations of the Botany and other branches of the Natural History of the Himalayan Mountains, and of the Flora of Cashmere". *Journ. Roy. Geogr. Soc. Lond.*, vol. 3, 1833, p. 361. The significance of the words "Royal Institution" is not clear.

America. See Brown Congo Expedition? 400 Australian plants found in other parts of world.

Athenaeum June 3<sup>d</sup> 1838 quotes Mr. Turpin's assertion that globules of milk produce a plant capable of growing!! & propagating itself.

In Tropical countries (as St. Jago Cape de Verdes) the shells in equal periods with Europe would probably have changed much less. — Here is an |

125-230 excised.

131 Henry Thompson<sup>3</sup> tells me best way to improve cattle is to cross between a good bull & the provincial breed, & the first offspring thus produced are better than those bred in & in, — which looks as if qualities were not permanent in the new cross. — In the Bantam clubs they used to fix on the kind wanted, colouring of each feather, weight & size & they would produce number agreeing almost to the point in question. — Merely picking opposite qualities, with no other means whatever. — |

132 Individual man & animals could only exist by habit — therefore same principle transferable not wonderful.

According to my view because actions are constant they are instincts and not ∴ instincts constant.

? whether mutilations non-hereditary & variation produced in short time in some extent counterpart, mutilation being variation produced in shortest possible time.

Mr. Willis<sup>4</sup> long-eared little dogs, I am told, go to heat, take dog but do not become impregnated | & puppies delicate. — they cross sister & brother of same litter, those of different litters or of father & child are thought to be unhealthy — puppies become very small, idiots, & bandy legged by this long breeding in. Hope<sup>5</sup> says must not trust him that genus of parasite to genus of animals different (p. 234), different species to different. — inguinal louse African — European different. — those 2 breeds differ Africa Australia.

Parasites die when brought over on tropical animals, which account for the species changing ∴ because mammalia can subsist where parasite [. . ?].

Read Entomological Transactions. |

134 Why if louse created should not new genus have been made, & only species. Good argument for origin of man one. —

Is the extinction & change of species two very different considerations. with respect to law of mammals shorter duration than molluscs. argue case both in Europe & S. America. very difficult case. Does this law of duration apply to utter extinction

<sup>1</sup> Robert Brown. "Observations, Systematical and Geographical, on Professor Christian Smith's collection of Plants from the Vicinity of the River Congo", *Narrative of an Expedition to explore the River Zaire, usually called the Congo in South Africa in 1816 under the direction of Captain J. R. Tuckey*, R.N., London 1818, Appendix v, p. 428.

<sup>2</sup> Jean-Pierre-François Turpin. "Recherches microscopiques sur l'organisation et la vitalité des globules de lait; sur leur germination, leur développement et leur transformation en un végétal rampant et articulé." *Comptes Rendus Acad. Sci., Paris* tome 3, 1837, pp. 822-835. Darwin's reference to the *Athenaeum* of 3 June 1838 is incorrect, and should read June 2 where on page 298 M. Turpin's assertion is quoted.

<sup>3</sup> Henry Thompson. Unidentified.

<sup>4</sup> Mr. Willis was the name of the hairdresser in Great Marlborough Street where Darwin was then living at No. 30. His *Third Notebook on the Transmutation of Species* (p. 116) has another reference to the breeding of dogs.

<sup>5</sup> Frederick William Hope. The reference is presumably: "On Insects and their larvae occasionally found in the Human Body". *Trans. Entom. Soc. Lond.*, vol. 2, 1837-40, p. 278.

or rapidity of specific change? he first would be called generic & other specific extinction. — |

235 In the Entomostraca<sup>1</sup> (Magazine of Zoology & Botany) where several generations are produced in succession (13<sup>2</sup>) without impregnation, therefore sexual passion must arise after long interval, very good case. — habit is awakened by association (case of Elephant which had run wild in India in Heber's)<sup>3</sup> is analogous to dormant instinct. — (How wonderful a case bees developing sex of neuters). Species may have had their infancies as well as men, when habits much more firmly impressed we see in the Entomostraca. The sexual curiosity of the orang outang (in June 1838[]) when young male was added good instance of instinct showing itself, not from instruction. |

236 Even the action of the viscera under sympathetic nerve may be instinct or habits. ? Are sympathetic nerves & nervous system of insects analogous? — Even plants have habitual actions. — this very important in considering how children come to suck or other actions in foetus of mammalia, or chick eat.

Generation becomes necessary when organs of parent are concentrated in different parts & scission cannot effect the process. — scission in all cases probably gemmation (Ehrenberg) but why two sexes — not necessary to generation (latent with no relation to time) as in buds. — I can scarcely doubt final cause is the adaptation of species to circumstances by principles, which I have given |

237-242 excised.

243 Study Bell on Expression<sup>4</sup> & the Zoonomia<sup>5</sup>, for if the former shows that if a man grinning is to expose his canine teeth (this may be made a capital argument if man does move muscles for uncovering canines), no doubt a habit gained by formerly being a baboon with great canine teeth. — Blend this argument with his having canine teeth at all. — This way of viewing the subject important. — Laughing modified barking, smiling modified laughing. Barking to tell other animals in associated kinds of good news, discovery of prey. arising no doubt from want of assistance. — crying is a puzzler. — Under this point of view expression of all animals becomes very curious — a dog snarling in play. — |

244 Hensleigh<sup>6</sup> says the love of the deity and thought of him or eternity only difference between the mind of man & animals. — yet how faint in a Fugian or Australian! Why not gradation. — No greater difficulty for Deity to choose when perfect enough for future state, that when good enough for Heaven or bad enough for Hell. — Glimpses bursting on mind & giving rise to the wildest imagination & superstition. — York Minster story of storm of snow after his brothers murder. — good anecdote.<sup>7</sup>

<sup>1</sup> William Baird. "The Natural History of the British Entomostraca", *Mag. Zool. Bot.*, vol. 1, 1837, pp. 15, 309, 314. On p. 322:—"They must either therefore, be hermaphrodite, or, as in some other genera, as the *Daphnia* for instance, one copulation suffices not only to impregnate the female for life, but succeeding generations also."

<sup>2</sup> Reginald Heber. *Journey through the Upper Provinces of India, from Calcutta to Bombay, 1824-5*, (with notes on *Ceylon*); *to Madras & South Provinces, 1826*, & *Letters written in India*. London 1833.

<sup>3</sup> Sir Charles Bell. *Anatomy and Philosophy of Expression*, London 1806. Darwin referred to this subject in his *Expression of the Emotions in Man and Animals* (London 1872) on pp. 190-1.

<sup>4</sup> Erasmus Darwin. *Zoonomia; or, the Laws of Organic Life &c.* London 1794-6.

<sup>5</sup> Hensleigh Wedgwood. *Brother of Darwin's wife.*

<sup>7</sup> Charles Darwin. *The Descent of Man and selection in relation to Sex*. London 1871, p. 67:—"York Minster" related how, when his brother killed a "wild man", storms long raged, much rain and snow fell."

Sowerby.<sup>1</sup> Geographical range, shells, like cryptogamic plants, of marine kinds, there are some restricted genera, but then they appears always very small ones as Trigonina in Australia or Concholepas in America. — yet many countries have far  
 245 more species than other countries (\*\* p. 246) | as Cyclostoma in Phillippines & Amphidroma in S. America. — yet there are a few Cyclostomes & a few Amphidromas. —

This is remarkable. —

Fish & drift sea weed may transport ova of shells. — Conchifera hermaphrodite, eggs in groups. Have dioecious plants more restricted ranges than other plants. —

Many same genera confined to hot countries & many to cold. — Hence latitude is more important element than longitude. But in land & f[resh] w[ater] shells there is more confinement, thus the Nalads (study de Ferussac)<sup>2</sup> are confined to S. America.  
 246 — Mr. Sowerby says | there are some shells common to West coast of Africa & E.S. America. — get instances. — very good anomaly in range.

\* <sup>3</sup>What circumstances have led to formation of some species some few have been scattered over whole world.

Many shells at present day same (or according to Sowerby fine species) on coasts of N. America & England — but the fossils are not like, except in very few cases, |  
 247 those of Tertiary European fossils — (so much the more remarkable, ∴ Carboniferous ones similar?). Now this is very remarkable (connect these facts with identity of land animals, these however come from Siberia). — It cannot be said American fossils more resemble those of America than of Europe, because the recent ones are so close.

Was there continent between N. America & Europe? — Norton<sup>4</sup> has written on fossils of N. America. — |

248 At the end of "White's Selborne"<sup>5</sup> many references very good. Also "Rays Window of God"<sup>6</sup>. Often refer to these. — Also some few facts at end of "The British Aviary"<sup>7</sup> or Bird Keepers Companion. Study Appendix (& only appendix) of Congo Expedition.<sup>8</sup> |

249-254 excised.

255 gradually separated the birds might yet remember which way to fly. There is a kind of wren (Belyk??) which seems common in Rocky mountains & on one lofty isolated spot on the Alleghanies to which it migrates every year; probably a chance wanderer like the first pair of Pipe flycatcher. —

<sup>1</sup> James Sowerby. *The Genera of Recent and Fossil Shells, for the use of students in Conchology and Geology*, London 1800-5.

<sup>2</sup> This asterisk refers to the passage marked by an asterisk on page 246 of the manuscript above.

<sup>3</sup> André-Etienne-Justin-Pascal-Joseph-François D'Andébar de Ferussac. *Histoire Naturelle et particulière des Mollusques terrestres et fluviatiles*, Paris 1819-51.

<sup>4</sup> This asterisk marks the beginning of the sentence referred to on page 244 of the manuscript above.

<sup>5</sup> Reference untraced.

<sup>6</sup> Gilbert White. *The Natural History and Antiquity of Selborne, in the county of Southampton: with engravings and an appendix*, London 1789.

<sup>7</sup> John Ray. *The Wisdom of God manifested in the works of Creation*, London 1691.

<sup>8</sup> *The Botanic Aviary*, London n.d.

<sup>9</sup> Robert Brown. "Observations, Systematical and Geographical, on Professor Christian Smith's Collection of Plants from the Vicinity of the River Congo", *Narrative of an Expedition to explore the River Zaire, usually called the Congo in South Africa in 1816 under the direction of Captain J. K. Turley*, R.N. London 1818 Appendix v, p. 420.

Bachman<sup>1</sup> says he thinks the Mocking thrush beats all English birds in song. — one of their thrushes exceeds our blackbird, but our blackbird exceeds their other thrushes, — yet they have one with very sweet notes. — | Their soft-billed birds are inferior to ours, & our lark ranks very high. — Upon the whole thinks more birds sing in England than in America, but the few of N. America are quite as beautiful. The thrushes of N. America singing so well & the mocking thrush being so very beautiful great contrast with South America. — |

257-258 excised.

259-264 blank.

265<sup>2</sup> Books quoted by Herbert p. 338

Schiede in 1825 & Lasch. Linn. in 1829 has given list of Spontaneous Hybrids, where ?

Sweet. Hortus Britannicus has remarks on acclimatizing of Plants.

Herbert p. 348 gives reference to Kohlreuter's Papers

Wiegman has published German pamphlet on crossing Oats, &c

Mr. Cox " Views of the Cultivation of Fruit trees in N. America." in Lib. of Hort. Soc.<sup>3</sup>

Mc Neil has written good article on Horticulture in Edinburgh Encyclop. — Horticulture Journal

The British & Foreign Medical Review No. XIV April 1839. — Review on " Walker on intermarriage ", price 1s.

March 20<sup>th</sup> 1839. Philosophy of Blushing lately advertised /6s

Mrs. Necker on Education preeminently worthy of studying in metaphysical point of view

Henslow has list of plants of Mauritius with locality in which each one is found.

Very good to see whether peculiar plants in high points |

266 Institution of Paris with respect to licentiousness destroying children, — it is not effect, as Lyell suggested, of organs being worn out as otherwise old couple would not have children

Turner's embassy to Thibet, perhaps worth reading, quoted by Malthus. —

Heberdens Observat. on increase & decrease of different diseases 4<sup>th</sup> 1801. — quoted by ditto. —

There appears to be good art. on Entozoa by Owen in Encyclop. of Anat & Physiology. —

Dampier probably worth reading

Lessings Laocoon (translated in 1837) on limits of painting & poetry. — Erasmus thinks I should like it.

The Sportsman's Repository 4<sup>th</sup> contains much on dogs. —

Reports of Brit. Assoc. — some important Papers.

Dr Mayo. Pathology of Human Mind. —

<sup>1</sup> John Bachman. Reference omitted.

<sup>2</sup> From this point the succession of pages is inverted, because Darwin wrote these pages by working forwards from the end of the notebook.

<sup>3</sup> William Cox of Burlington, New Jersey. *A view of the cultivation of fruit trees, and the management of orchards and vines*, Philadelphia 1817.

Audubons Ornithological Biography 4 volumes well worth reading

Bevans work on Bees, new edit 1838

Harlaam [Harlan] Physical & Medical Researches on Horse in N. America. —

Owen has it —

Ld. Brougham. Dissertations on subject of Science connecting with Natural Theology. — on instinct & animal intelligence, — very good.

Endlicher has published in first volume of annalen of Vienna, sketch of South sea Botany

R. Brown has curious coloured maps by Copenhagen Botanist of range of plants |  
Silliman's [American] Journal [of Science]

Rengger on Mammalia of Paraguay, account wild cattle &c

Montagu on birds (facts about close species).

Wilson's American Ornithology

Read Aristotle to see whether any my views is ancient?

Study with profound care abortive organs produced in domesticated plants, where function has ceased to be used as tendrils into stump

Library of Useful Knowledge, Horse, Cow, Sheep

Vesey Philosophie d'Histoire Naturelle

Marcel de Serres Cavernes d'Ossements 3rd edit. Octavo (good to trace European forms compared with African)

Annals [of natural history]

Histoire Generale et Particuliere des Anomalies de l'organisation des Hommes et les animaux. by Isid. Geoffroy St. Hilaire 1832 contains also his fathers views. Quoted by Owen. —

Hunter has written quarto works on physiology besides the papers collected by Owen (at Shrewsbury)

Yarrells Paper on change of plumage in the Pheasants Philosoph Transactions 1827 [vol. 118]

Paxton on the culture of Dahlias

Mrs. Gore on roses might be worth consult.

Paper on Consciousness in Brutes in Blackwood, June 1838

H. C. Watson on Geograph. Distrib : of British Plants.

Humes Essay on H[uman] Understanding (some time)

Du[fgald] Stewart works & lives of Reid, Smith & giving abstracts of their views Mackintosh Ethnical [Ethical] Philos : |

268. To be read

Humbold[t]. New Spain — much about castes &c

Richardson's Fauna Borealis

Entomological Magazine (paper on geograph range)

Study Buffon on Varieties Domesticated animals see if laws cannot be made out

Find out from Statistical Society where M. Quetelet has published his laws about sexes relative to age of marriages

Brown at end of Flinders & at end of the Congo Voyage

Decandolle Philosophie on Geographical distrib in Dict. Sciences Nat. in Geolog Soc.

F. Cuvier on instinct



L. Jenyns paper in *Annals of Nat. History*  
 Prichard. — Lawrence  
 Roy St. Vincent vol. iii p. 164 on unfixed form.  
 Dr Royle on Himalaya types.  
 Smellie. *Philosophy of Zoology*  
 Flemming, ditto  
 Falconers remark on the influence of climate  
 Whites regular gradation in Man.  
 Lindleys introduction to the *Natural System*  
 Bevan on honey bee  
 Dutrochet *memoires sur les vegetaux et animaux* — on sleep & movements of  
 Plants £1. 4s

Voyage aux terres Australes chapt. xxxix, tom iv. p. 273 [Peron . . .]

Latreille *Geographie des insectes* 8° p. 181

Sept. 17 [1839] For references to authors about E. Indian Islands consult Dr  
 Horsfield |

Sir G. Staunton's Embassy to China Oct. 12<sup>th</sup> [1838]

Kotzeb's two voyages, skimmed well ditto

Lutkes Voyage, carefully read. —

Reynolds Discourses

Lessings Laocoon

Whewell's inductive History. References at end of each vol

Herschel's introduction to *Natural Philosophy*

R. W. Darwin's Botany. — references at end

Mayo *Pathology of the Human Mind*

Evelyn's *Sylva*, skimmed stupid

Brown's travels in Africa; well skimmed.

1839

Jan. 10<sup>th</sup> All Life of W. Scott, except the V volume

— 19<sup>th</sup> Mungo Parks Travels

Feb. 12 Sir H. Davy *Consolations in travels*

— *Observations on morals of Eugenius*

— 14<sup>th</sup> Boswells Life of Johnson 4 vols.

— 25<sup>th</sup> Philips *Geology*, 2<sup>nd</sup> vol. —

March 16 Gardner's *Mosaic of Nature*

— Herbert on Hybrid mixture: marginal notes.

— 20<sup>th</sup> Carlyle's *French Revolution* 3? vols oct:

— 26<sup>th</sup> Blumenbach's *Essay on Generation*. English Transla.

— The Rev. A. Wells *Lecture on instinct*

— Clive on the Breeding of animals

— Spallanzani's *Essay on Animal Reproduction*

— *Treatise on Domestic pigeons*

— 30<sup>th</sup> Lives of Hayd[an] & Mozart

April 25<sup>th</sup> Lockarts Life of Napoleon.

.. 5<sup>th</sup> Dr Edwards influence of physical causes, well skimmed

— Bartrams travels in N. America

May 18<sup>th</sup> Stanley familiar History of Birds

— Mackintosh's Ethical Philosophy

— Bell's Bridgewater Treatise

— Wilkinson's Egyptian remains skimmed

— Pliny Nat. Hist of world ditto

.. .. Lamarek II vol Philos. Zoology references at end of each chapter  
Crabbes Life

June 1<sup>st</sup> King & Fitzroy |

Rays Wisdom of [God]

Lisiansky's Voyage round World. 1803-6. nothing

Lyells Elements of Geology

Gibbons Life on himself

Hume's ditto with correspond. with Rousseau

Miss Martineau How to observe

Mayo Philosophy of Art of Living

Several of Walter Savage Landors Imaginary Conversations very poor

Sir J. Browne's Religio Medici

Lyell Book III there are many marginal notes

Rengger & Mitchell's Australia.

Walter Scotts Life 1<sup>st</sup> 2<sup>nd</sup> & 3<sup>rd</sup> volumes

Abercrombie on the Intellectual Powers.

Hunters Universal Oeconomy edited by Owen. read several papers all that bear  
on any of my subjects

Elie de Beaumont 10 vols of Memoires on Geology of France on Etna almost re-  
read the previous volume & C. Prevost on l'île Jube

Waterton's Essays on Natural History Octob 2<sup>d</sup> [1838]

Transactions of Royal Irish Academy ditto

Lavater's Physiognomy Octob 3<sup>rd</sup>

Malthus on Population

W. Earl's Eastern Seas. Octob 12<sup>th</sup> |

271-274 excised :

273 Sir J. Sebright's Pamphlets } not abstracted  
Wilkinsons on cattle }

Scientific Memoirs published by Taylor

Magazine of Zoology & Botany & continuation

Annals of Natural History

Skimmed von Buch travels

Whites Natural History of Selbourne References at end

Dr Langs Australian tract, skimmed

Macleays Horae Entomologicae

Rays Wisdom of God references at end

The British Aviary — ditto

Lisle's Husbandry

Tuckey Voyage reread Appendix

Ovington Voyage to Surinam

Voyage Congo Expedition Zaire except Browns Appendix & excellent table of Canary Island plants

Home's History of Man

Transactions of the Entomological Society vol. I & 1<sup>st</sup> no. of vol. II (read remainder) when out |

Most of those which have references at end, is so said to have

Books examined with ref: to species

Mackenzie's Iceland

Molina's Chile

Falkner Patagonia

Azara Voyage & Quadrupeds of Paraguay

Dobrizhoffer Abipomnes

Edinburgh New Phil. Journal about 13 numbers have been read

Voyage a l'isle de France

{ Voyage de l'Australasie

{ Partie Zoologique

Pernety voyage a l'isle Malouines

Zoological Journal 5 vols

Voyage de la Coquille

Zoological Transactions up to parts published March 1838. done

Whole of Geographical Journal

Asiatic Journal to end of 1837, read. contains very little

Macleay's letter to Dr Fleming & Review of letter in Quarterly |

*Inside Back Cover:*

Read Volney's Travels in Syria vol 1, p 71. account of European plants transported —

Crawford. Eastern Archipelago probably some account

Raffles Sir 5. ditto ditto —

Buffon suites

Line on the improvement of domesticated animals

Fries de plantarum praesertim crypt. transitu et analogior commentalia

Library of Useful Knowledge on horse & cow & sheep

Clarke's travels

Temminck's Hist. Nat. des Pigeons et des Gallinacés

Sillimans Journal during 1837. paper by Bachman on migration of birds [vol. 30 July 1836, p. 81.]

Temminck has written Coup d'Oeil sur la faune des îles de la sonde et de l'empire du Japon

Wowett on cattle — (Waterhouse has it)

Shells from Bernier Island many relations with a living Natica & many shells of genera Corbula, Chama, Cardium, Porcellana, Turbo, Cerithium

Jardin du Roi

Java fossils at same time

Study Botanical works on Buds & Gemmae