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AT HARVARD COLLEGE

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A TRANSCRIPTION OF DARWIN'S FIRST NOTEBOOK
ON "TRANSMUTATION OF SPECIES"

Edited by

PAUL H. BARRETT

Michigan State University

CAMBRIDGE, MASS., U.S.A.

PRINTED FOR THE MUSEUM

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No. 6 — *A Transcription of Darwin's First Notebook on
"Transmutation of Species"*

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FOREWORD

From July 1837 until July 1839, Darwin filled a number of notebooks on the subject of evolution. Six of these notebooks are now kept among the Darwin Papers at the University Library, Cambridge, England. The library has catalogued these books as follows:

INDEX TO MSS OF CHARLES DARWIN

Volume	Contents
121	"B" Notebook dealing with evolution theory. (10 x 17 cm.)
122	"C" Notebook dealing with evolution theory. February-July 1838. (10x17cm.)
123	"D" Notebook dealing with evolution theory. "July 15th 1838, finished October 2nd." (10x17cm.)
124	"E" Notebook dealing with evolution theory. "Finished July 10th 1839." (10x17cm.)
125	"M" Notebook dealing with evolution theory. "July 15th 1838." "This book full of metaphysics on morals and speculations on expression." (10x17cm.)
126	"N" Notebook dealing with evolution theory. Begun October 2nd 1838. "Metaphysics and expression." (10x17cm.)

Through the courtesy and assistance of Sir Charles G. Darwin, the University Library of Cambridge, and the All University Research Committee of Michigan State University, microfilmed

* Department of Natural Science, Contribution 143.

copies of these notebooks were made available to the present editor. A transcription of the first notebook "B" has been made and is presented herein. In making the transcription, Darwin's text has been reproduced as faithfully as possible, although punctuation has been added where necessary. In his rough notes, Darwin often did not use any punctuation at all and used capital letters indiscriminately. Since he wrote in his most hasty and elliptical style, some words at first were illegible. After reading the collateral works of Darwin and other authors of the period, and through the very generous and invaluable assistance of Sir Charles Darwin, Dr. Mary Alice Burmester of Michigan State University, and Dr. Sydney Smith of Cambridge University, it became possible to transcribe the obscure and illegible words. In some instances I have inserted articles, etc., to complete sentences or to correct grammar; such words are enclosed in square brackets, e.g., [the]. All words or phrases that Darwin enclosed in parentheses or scrawled between lines as afterthoughts, I have put in parentheses.

Most bibliographic references cited by Darwin in the notebooks were incomplete. These have been traced, and are included in the appended notes in their completed form. I have purposely kept editorial annotations and amendments to a minimum, seeking to leave unprejudiced the integrity, arrangement and completeness of the original notes insofar as possible.

There were originally 280 numbered pages in this notebook, of which 63 were later cut out by Darwin when he began writing *The Origin of Species*. Wherever pages are missing from the notebook, a notation has been inserted in the appropriate place in the text.

Excerpts from this notebook have been published previously in: *The Life and Letters of Charles Darwin*, 2 vols., New York, 1897, edited by Francis Darwin; *Darwin and the Darwinian Revolution*, Garden City, New York, 1959, by Gertrude Himmel-farb, and *From Darwin's Unpublished Notebooks*, *Centennial Review of Arts and Science*, Vol. 3, No. 4, Fall, 1959, East Lansing, Michigan, by Paul H. Barrett.

Grateful acknowledgments are due to Sir Charles Darwin and Lady Nora Barlow who kindly granted permission to edit and publish transcriptions of these notebooks.

[Transmutation of Species]

B [Notebook]

C. Darwin

(All useful pages cut out December 7, 1856, and again looked through April 21, 1873. This book was commenced about July, 1837. Page 235 was written in January 1838. Probably ended in beginning of February.)

ZOONOMIA

Two kinds of generation [i.e., reproduction]: the coeval kind, all individuals absolutely similar, for instance fruit trees, probably polypi, gemmiparous propagation, bisection of Planaria, etc., etc.; the ordinary kind, which is a longer process, the new individual passing through several stages (typical or shortened repetition of what the original molecule has done?). This appears highest office in organization (especially in lower animals, where mind, and therefore relation to other life, has not come into play); see Zoonomia¹ arguments; [reproduction] fails in hybrids where everything else is perfect; mothers apparently only born to breed, annuals rendered perennial, etc., etc. (Yet Eunuch, nor cut stallion, nor nuns are longer lived.)

Why is life short? Why such high object generation? We *know* world subject to cycle of change, temperature and all circumstances which influence living beings. We see the young of living beings become permanently changed or subject to variety, according to circumstances, [e.g.,] seeds of plants sown in rich soil, many kinds are produced, though new individuals produced by buds are constant; hence we see generation here seems a means to vary, or adaptation. Again we believe (know) in course of generation even mind and instinct become influenced. Child of savage not civilized man. Birds rendered wild through generation acquire ideas ditto. V. [i.e., *Vide*] Zoonomia.

There may be unknown difficulty with *full grown* individual with fixed organization thus being modified; therefore generation to adapt and alter the race to *changing* world. On other hand, generation destroys the effect of accidental injuries, which if animals lived forever, would be endless (that is, with our present systems of body and universe); therefore final cause of life.

With this tendency to vary by generation, why are species are [*sic*] constant over whole country? Beautiful law of inter-marriages (separating) partaking of characters of both parents, and then *infinite* in number. In man it has been said, there is instinct for opposites to like each other. Ægyptian cats and dogs, ibis, same as formerly, but separate a pair and place them on a fresh [i.e., geologically new] island. It is very doubtful whether they would remain constant. Is it not said that marrying in *deteriorates* a race; that is, alters it from some end which is good for man? Let a pair be introduced and increase slowly, [safe] from many enemies, so as often to intermarry; who will dare say what result? According to this view animals on separate islands ought to become different if kept long enough apart with slightly differing circumstances. Now [e.g.,] Galapagos Tortoises, Mocking birds, Falkland Fox, Chiloe fox, English and Irish Hare.

As we thus believe species vary, in changing climate, we ought to find representative species; this we do in South America (closely approaching), but as they inosculate, we must suppose the change is effected at once, something like a variety produced (every grade in that case surely is not produced?). (Granting) species according to Lamarck² disappear as collections made perfect; truer even than in Lamarck's time. Gray's³ remark, best known species (as some common land shells) most difficult to separate. Every character continues to vanish: bones, instinct, etc., etc., etc.

Nonfertility of hybridity, etc., etc.

If species (1) may be derived from form (2), etc., then (remembering Lyell's⁴ arguments of transportal) island near continent might have some species same as nearest land, which were late arrivals; others old ones (of which none of same kind had in interval arrived) might have grown altered. Hence the type would be of the continent, though species all different. In cases as Galapagos and Juan Fernandez, when continent of Pacific existed, might have been monsoons, when they ceased, importation ceased, and changes commenced; or intermediate land existed, or they may represent some large country long separated.

On this idea of propagation [i.e., evolution] of species we can see why a form peculiar to continents, all bred in from one

parent; why Megatheria several species in S. America; why 2 of ostriches in S. America. This is answer to Decandoelle [*sic*]⁵ (his argument applies only to hybridity), genera being usually peculiar to same country; different genera, different countries.

Propagation explains why modern animals same type as extinct, which is law almost proved. We can see why structure is common is common [*sic*] in certain countries when we can hardly believe necessary, but if it was necessary to one forefather, the result would be as it is. Hence Antelopes at C. of Good Hope, Marsupials at Australia. (Will this apply to whole organic kingdom when our planet first cooled?) Countries longest separated greatest differences; if separated from immense ages⁶ possibly two distinct types, but each having its representatives, as in Australia. This presupposes time when no Mammalia existed; Australian Mamm. were produced from propagation from different set, as the rest of the world.

This view supposes that in course of ages, and therefore changes, every animal has tendency to change. This difficult to prove, [e.g.] cats, etc., from Egypt. No answer because time short and no great change has happened. I look at two ostriches as strong argument of possibility of such change; as we see them in space, so might they in time. As I have before said, *isolate* species, especially with some change, probably vary quicker.

Unknown causes of change. Volcanic Island? Electricity.

Each species changes. Does it progress?

Man gains ideas.

The simplest cannot help becoming more complicated; and if we look to first origin, then must be progress. If we suppose monads are constantly formed, would they not be pretty similar over whole world under similar climates, and as far as world has been uniform at former epochs? How is this Ehrenberg?⁷ Every successive animal is branching upwards, different type of organization improving, as Owen⁸ says, simplest coming in and most perfect and others occasionally dying out; for instance, secondary terebratula may have propagated recent terebratula, but Megatherium nothing. We may look at Megatherium, Armadillos and sloths as all offsprings of some still older type, some of the branches dying out.

With this tendency to change (and to multiplication when isolated) requires deaths of species to keep numbers of forms equable; (but is there any reason for supposing numbers of forms equable? — this being due to subdivisions and amount of differences, so forms would be about equally numerous). Changes not result of will of animal, but law of adaptation as much as acid and alkali.

Organized beings represent a tree *irregularly branched*, some branches far more branched; hence Genera. As many terminal buds dying as new ones generated. There is nothing stranger in death of species than individuals.

If we suppose monad definite existence, as we may suppose in this case, their creation being dependent on definite laws, then



[Fig. 1]

those which have changed most (owing to the accident of positions) must in each state of existence have shortest life. Hence shortness of life of *Mammalia*.

Would there not be a triple branching in the tree of life owing to three elements — air, land and water, and the endeavour of each typical class to extend his domain into the other domains, and subdivision three more — double arrangement? If each main stem of the tree is adapted for these three elements, there will be certainly points of affinity in each branch. A species as soon as once formed by separation or change in part of country [has] repugnance to intermarriage; [that] settles it. We need not think that fish and penguin really pass into each other (?).

The tree of life should perhaps be called the coral of life, base of branches dead, so that passages cannot be seen. This again offers contradiction to constant succession of germs in progress (no, only makes it excessively complicated). [Fig. 1.]

Is it thus fish can be traced right down to simple organization, birds not? [Fig. 2.]

We may fancy according to shortness of life of species that in perfection, the bottom of branches deader, so that in Mammalia, birds, it would only appear like circles, and insects amongst articulata; but in lower classes perhaps a more linear arrangement. How is it that then come aberant [*sic*] species in each genus (with well characterized parts belonging to each) approaching another? Petrels have divided themselves into many



[Fig. 2]

species, so have the Awks [*sic*], then is particular circumstances to which . . .⁹ Is it an index of the point whence two favourable points of organization commenced branching?

As all the species of some genera have died, have they all one determinate life dependent on germs, that germ upon another? Whole class would die out, therefore . . .¹⁰

In island neighbouring [a] continent where some species have passed over, and where other species have "air" of that place, will it be said, those have been then created there? Are not all our British Shrews diff[erent] species from the continent? Look over Bell¹¹ and L. Jenyns.¹²

Falkland rabbit may perhaps be instance of domesticated animals having effected a change which the Fr[ench] naturalists thought was species.

Study Lesson¹³ Voyage of Coquille.

Dr. Smith¹⁴ says he is certain that when White men and Hot-tentots or Negros [*sic*] cross at C. of Good Hope the children

cannot be made intermediate. The first children partake more of the mother, the later ones of the father. (Is not this owing to each copulation producing its effect, as when bitches puppies are less purely bred owing to having once born mongrels?) He has thus seen the black blood come out from the grandfather (when the mother was nearly quite white) in the two first children. How is this in West Indies? Humboldt,¹⁵ New Spain.

Dr. Smith always urges the distinct locality or metropolis of every species; believes in repugnance in crossing of species in wild state.

No doubt (C.D.) wild men do not cross readily, distinctness of tribes in T. del Fuego; the existence of whiter tribes in centre of S. America shows this. Is there a tendency in plant's hybrids to go back? If so, man and plants together would establish Law, as above stated. No one can doubt that less trifling differences are blended by intermarriages; then the black and white is so far gone, that the species (for species they certainly are according to all common language) will keep to their type; in animals so far removed, with instinct in lieu of reason, there would probably be repugnance, and art required to make marriage. As Dr. Smith remarked, man and wild animals in this respect are differently circumstanced.

Is the shortness of life of *species* in certain orders connected with gaps in the *series of connections*? (If starting from same epoch *certainly*.) The absolute end of certain forms, from considering S. America (*independent of external causes*) does appear very probable:—

Mem. [i.e., Memento or Memorandum]: Horse, Llama, etc., etc.

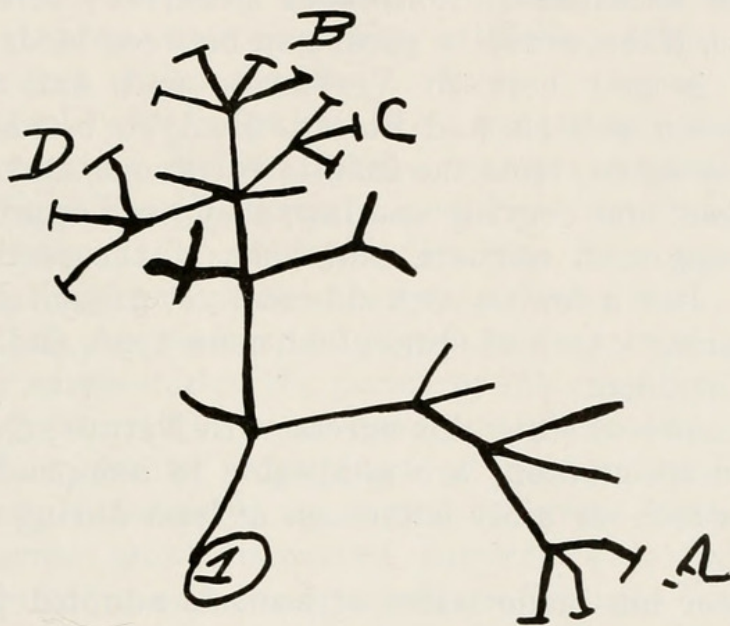
If we suppose (grant) similarity of animals in one country owing to springing from one branch, and the monucle¹⁶ has definite life, then all die at one period which is not the case, *therefore monucle not definite life*.

I think: [Fig. 3.]

Thus between A and B immense gap of relation; C and B the finest gradation, B and D rather greater distinction. Thus genera would be formed, bearing relation to ancient types, with several extinct forms. For if each species (as ancient ①) is capable of making 13 recent forms,¹⁷ twelve of the contemporaries [*sic*]

must have left no offspring at all,¹⁸ so as to keep number of species constant.

With respect to extinction, we can easily see that variety of ostrich, Petise, may not be well adapted, and thus perish out, or on other hand like Orpheus being favourable, many might be produced. This requires principle that the permanent varieties produced by confined breeding and changing circumstances are continued and produced according to the adaptation of such



[Fig. 3]

Case must be that [in] one generation there should be as many living as now. To do this and to have [as] many species in same genus (as is) *requires* extinction.

circumstances, and therefore that death of species is a consequence (contrary to what would appear from America) of non-adaptation of circumstances. *Vide* two pages back — Diagram [Fig. 3].

The largeness of present genera renders it probable that many contemporary [species] would have left scarcely any types of their existence in the present world. Or we may suppose only each [i.e., certain] species in each generation only breeds; *like* individuals in a country not rapidly increasing.

If we thus go very far back to look to the source of the Mammalian type of organization, it is extremely improbable that any of the successors of his relations shall now exist. In same manner,

if we take (a man from) any large family of 12 brothers and sisters (in a state which does not increase) it will be chances against any one (of them) having progeny living ten thousand years hence; because at present day many are relatives, so that by tracing back the fathers would be reduced to small percentages. Therefore the chances are excessively great against any two of the 12 having progeny after that distant period.¹⁹

Hence if this is true, that the *greater the groups, the greater the gaps* (or *solutions of continuous structure*) *between them*. For instance, there would be great gap between birds and mammalia, still greater between Vertebrate and Articulata, still greater between animals and Plants. But yet, besides affinities from three elements, from the infinite variations, and all coming from one stock and obeying one law, they may approach; some birds may approach animals, and some of the vertebrates invertebrates. Just a few on each side will yet present some anomaly, and bearing stamp of some great main type, and the gradation will be sudden.

Heaven knows whether this agrees with Nature: *Cuidado*.²⁰

The above speculations are applicable to non-progressive development, which certainly is the case at least during subsequent ages.

The Creator has made tribes of animals adopted [adapted?] preeminently for each element, but it seems law that such tribes, as far as compatible with such structures, are in minor degree adapted for other elements. Every part would probably be not complete, if birds were fitted solely for air and fishes for water. If my idea of origin of Quinarian System²¹ is true, it will not occur in plants which are in far larger proportion terrestrial; if in any, in the Cryptogamic Flora (but not atmospheric types. Hence probably only four. Is not this Fries' ²² rule? What subject has Mr. Newman²³ the (7) man studied?)

The condition of every animal is partly due to direct adaptation and partly to hereditary taint; hence the resemblances and differences for instance of finches of Europe and America, etc., etc., etc.

The new system of Natural History will be to describe limits of form (and where possible the number of steps known). For

instance among the Carabidae. Instance in birds. Examine good collection of insects with this in view.

Geogr. Journal, Vol. VI, P. II, p. 89, Lieut. Wellsted²⁴ obtained many sheep from Arabian coast. "These were of two kinds, one white with a black face, and similar to those brought from Abyssinia, and the others dark brown, with long clotted hair resembling that of goats."

Progressive developement [*sic*] gives final cause for enormous periods anterior to man. Difficult for man to be unprejudiced about self, but considering power, extending range, reason and futurity it does as yet appear . . .²⁵

In Mr. Gould's²⁶ Australian work some most curious cases of close but certainly distinct species between Australia and Van Diemen's Land,²⁷ and Australia and New Zealand. Mr. Gould says in subgenera they undoubtedly come from same countries. In mundane [*sic*] genera the nearest species often . . .²⁸

. . . great S. American quadrupeds part of some great system acting over whole world; the period of the great quadrupeds declining as great reptiles must have once declined.

Cuvier²⁹ objects to propagation of species (read his Theory of the Earth attentively) by saying, why not have some intermediate forms been discovered between paleotherium, Megalonyx, Mastodon, and the species now living? Now according to my view, in S. America parent of all armadilloes might be brother to Megatherium; uncle now dead.

Bulletin Geologique, April 1837, p. 216, Deshayes³⁰ on change in shells from salt and F. water; on what is species. *Very Good*. (Has not Macculloch³¹ written on same changes in fish?)

Mem.: Rabbit of Falklands described by I. and L.³² as new species. Cuvier examined it . . .³³

Same thing occurs with regards to other tribes in that same family.

(NB. I see Waterhouse thinks Quinary only three elements.)

How far does Waterhouse's³⁴ representatives agree with breeding in irregular trees and extinction of forms?? It is in simplest case saying every species in genus resembles each other (at least in one point, in truth in all excepting specific character); and in passing from species to genera, each retains some one character of all its family; but why so? I can see no reason

for these analogies; from the principle of atavism where real structures obliged to be altered, I can conceive colouring retained; therefore probably in some (heteromera) colouring of crysomela [*sic*]³⁵ may be going back to common ancestor of Crysom. and Heterom., but I cannot understand the universality of such law.

It would be curious to know in plants (or animals) whether, in *races* have tendency to keep to either parent (this is what French call *atavism*). Probably this is first step in dislike to union; offspring not well intermediate.

Lyell,³⁶ Vol. III, p. 379.

Mammalian type of organization same from one period to another, preeminently Pachydermata, less so in Miocene and so on.

As I have traced the great Quadrupeds to Siberia, we must look to type of organization; extinct species of that country parents of American. Now Genera of these two countries ought to be similar.

Law?: existence *definite* without change, superinduced, or new species; therefore animals would perish if there were nothing in country to superinduce a change (?).

Seeing animal die out in S. America, with no change, agrees with belief that Siberian animals lived in cold countries and therefore not killed by cold countries. Seeing how horse and elephant reached S. America, explains how Zebras reached South Africa.

It is a wonderful fact, Horse, Elephant and Mastodon dying out about same time in such different quarters. Will Mr. Lyell say that some [same?] circumstance killed it over a tract from Spain to South America? *Never!* They die, without [i.e., unless] they change; like Golden Pippens [*sic*]³⁷ it is a *generation* of *species* like generation of *individuals*. Why does individual die? To perpetuate certain peculiarities (therefore adaptation), to obliterate accidental varieties, and to accomodate [*sic*] itself to change (for of course change even in varieties is accomodation [*sic*]). Now this argument applies to species. If individual cannot procreate, he has no issue; *so with species*.

I should expect that Bears and Foxes, etc., same in N. America and Asia, but many species closely allied but different, because

country separated since time of extinct Quadrupeds. Same argument applies to England. Mem.: Shrew, Mice.

Animals common to South and North America. *Are there any?*

Rhinoceros peculiar to Java, and another to Sumatra. Mem.: Parrots peculiar, according to Swainson,³⁸ to certain islets in East Indian Archipelago. Dr. Smith considers probable true northern species replace the southern kinds.

(1) [*sic*] Gnu reaches Orange River and says so far will only go and no further.

Prof. Henslow says that when race once established so difficult to root out. For instance ever so many seeds of white flax, all would come up white, though planted in the same soil with blue. Now this is same bearing with Dr. Smith's fact of races of men.³⁹

Strong odour of negroes, a point of real repugnance. Waterhouse says there is no TRUE *connection* between great groups.

Speculate on land being grouped towards centre near Equator in former periods, and then splitting off.

If *species* generate other *species* their race is not utterly cut off; like golden pippen [*sic*], if produced by seed go on, otherwise all die. The fossil horse generated in S. Africa Zebra, and continued, perished in America.

All animals of same species are bound together just like buds of plants, which die at one time, though produced either sooner or later.

Prove animals like plants, trace gradation between associated and nonassociated animals, and the story will be complete.

It is absurd to talk of one animal being higher than another. We consider those, when the intellectual faculties (cerebral structure) most developed, as highest. A bee doubtless would when the instincts were . . .⁴⁰

. . . there appears in Australia great abundance of species of few genera or families (long separated).

Proteaceae and other forms (?), being common to Southern hemisphere, does not look as if S. Africa peopled from N. Africa.

An originality is given (and power of adaptation is given by *true* generation) through means of every step of progressive increase of organization being imitated in the womb (which has been passed through to form that species). (Man is derived from Monad each fresh —)⁴¹

Mr. Don⁴² remarked to me, that he thought species became obscurer as knowledge increased, but genera stronger. Mr. Waterhouse says no real passage between good genera. How remarkable spines, like on a porcupine, on *Echidna*.

Good to study Regne Animal for *Geography*.⁴³

The motion of the earth must be excessive up and down: Elephants in Ceylon, East India Archipelago; West Indies. Opossum and Agouti same as on continent (3 *Paradiseini* are common to Van Diemen's Land and Australia). From the consideration of these archipelago's ups and downs [they are] in full conformity with European formations (England and Europe, Ireland, common animals); for instance tertiary deposits between East India islets.

Ireland longer separated; hare of two countries different. Ireland and Isle of Man possessed elk, not England. Did Ireland possess *Mastodons*?? (Negative facts tell for little.)

Geographic distribution of *Mammalia* more valuable than any other, because less easily transported. Mem.: plants on Coral islets. Next to animals, land birds, and life shorter or change greater.

In the East Indian Archipelago it would be interesting to trace limits of large animals.

Owls transport mice alive?

Species formed by subsidence: Java and Sumatra *Rhinoceros*; elevate and join, keep distinct, two species made. Elevation and subsidence continually forming species. (Man and wife being constant together for life is in accordance with . . .)

(The male animal affecting *all* the progeny of female insures of the mixing of individuals.)

South Africa, proof of subsidence and recent elevation: pray ask Dr. Smith to state that most clearly.

Fox tells me that beyond all doubt seeds of Ribston Pippin produce Ribston Pippin, and Golden Pippin, goldens, hence *sub-varieties*, and hence possibility of reproducing any variety, although many of the seeds will go back. Get instances of a *variety* of fruit tree or plant run wild in foreign country. (Here we have avitism [*sic*, i.e., atavism] the ordinary event and succession the extraordinary.)

When one sees nipple on man's breast, one does not say some use, but sex not having been determined, so with useless wings under elytra of beetles, born from beetles with wings, and modified. If simple creation surely would have been born without them.

In some of the lower orders a perfect gradation can be found from forms marking good genera by steps so insensible that each is not more change than we know *varieties* can produce. Therefore all genera *may* have had intermediate steps. Quote in *detail* some good instance.

But it is other question, whether there have existed *all* those intermediate steps especially in those classes where species not numerous. (N.B., in those classes with few species greatest jumps strongest marked genera? Reptiles?) For instance there never may have been grade between pig and tapir, yet from some common progenitor. Now if the intermediate ranks had produced infinite species, probably the series would have been more perfect, because in each there is possibility of such organization (spines in Echidna and Hedgehog). As we have one marsupial animal in Stonefield [*sic*]⁴⁴ slate, the father of all Mammalia in ages long past, and still more so known with fishes and reptiles. In mere eocene [*sic*] rocks we can only expect some steps. I may ask whether the series is not more perfect by the discovery of fossil Mammalia than before, and that is all that can be expected. This answers Cuvier.

Perhaps the father of Mammalia as Heterodox as ornithorhynchus [*sic*]. If this last animal bred, might not new classes be brought into play?

The father being climatized, climatizes the child. Whether every animal produces in course of ages ten thousand varieties (influenced itself perhaps by circumstances) and those alone preserved which are well adapted? This would account for each tribe acting as in vacuum to each other.

p. 306. Chamisso on Kamtschatka quadrupeds; Kotzebue first voyage.⁴⁵ Entomological Magazine, paper on Geographical range. Richardson,⁴⁶ Fauna Borealis.

It is important the possibility of some island not having large quadrupeds. Humboldt⁴⁷ has written on the geography of plants. Essai sur la Geographie des Plants, I Vol. in 4° —

I have abstracted Mr. Swainson's⁴⁸ trash at beginning of volume on Geographical distribution of animals.

Geograph. Journal,⁴⁹ Vol. I, p. 17-21, says from Swan river along South coast all the remarkable Australian genera collected together.

Man has no *hereditary prejudices* or instinct to conquer, or breed together. Man has no limits to desires; in proportion instinct more, reason less, so will aversion be.

L'Institut,⁵⁰ (1837, no. 246) a section of fossil "singe,"⁵¹ it cannot be made to approach the Colobes [*sic*]⁵² which in South Africa appears to represent the semnopitheque⁵³ of India. Tooth of Sapajou.⁵⁴ Sapajou is S. American form. Therefore it is like case of great edentate (has been doubted) and opossum found in Europe now confined to southern hemisphere. (If these facts were established it would go to show a *centrum* for Mammalia.) I really think a very strong case might be made out of world before Zoological divisions. Mem.: Species doubtful when known only by bones. Mem.: Silurian fossils. How are South American shells?

Do not plants which have male and female organs together, yet receive influence from other plants? Does not Lyell⁵⁵ give some argument about varieties being difficult to keep on account of pollen from other plants?; because this may be applied to [all], show all plants do receive intermixtures. But how with hermaphrodite shells!!!?

We have not the slightest right to say there never was common progenitor to mammalia and fish, when there now exists such strange forms as ornithorhyncus [*sic*].

The type of organization constant in the shells.

The question if creative power acted at Galapagos it so acted that birds with plumage and tone of voice purely American, North and South; so permanent a breath cannot reside in space before island existed. Such an influence must exist in such spots. We know birds do arrive, and seeds. (And geographical divisions are arbitrary and not permanent. This might be made very strong, if we believe the Creator created by any laws, which I think is shown by the very facts of the Zoological character of these islands.)

The same remarks applicable to fossil animals same type; armadillo-like cray [i.e., crayfish?] created; passage for vertebrae in neck same cause. Such beautiful adaptations, yet other animals live so well. This view of propagation gives a hiding place for many unintelligible structures; it might have been of use in progenitor, or it may be of use, — like mammae on man's breast.

How does it come wandering birds such [as] sandpipers not new at Galapagos? Did the creative force know that these species could arrive? Did it only create those kinds not so likely to wander? Did it create two species closely allied to *Mus. coronata*,⁵⁶ but not *coronata*? We know that domestic animals vary in countries without any assignable reason.

Astronomers might formerly have said that God ordered each planet to move in its particular destiny. In same manner God orders each animal created with certain form in certain country, but how much more simple and sublime power: let attraction act according to certain law; such are inevitable consequences. Let animals be created, then by the fixed laws of generation, such will be their successors.

Let the powers of transportal be such, and so will be the forms of one country to another. Let geological changes go at such a rate, so will be the number and distribution of the species!! It may be argued representative species chiefly found where [there are] barriers (and what are barriers by?), interruption of communication, or when country changes. Will it [be] said that volcanic soil of Galapagos under equator, that external conditions, would produce species so close as Patagonian Cha — ⁵⁷ and Galapagos Orpheus? Put this strong, so many thousand miles distant.

Absolute knowledge that species die and others replace them. Two hypotheses: [1] fresh creations is mere assumption, it explains nothing further; [2] points gained if any facts are connected.⁵⁸ No doubt in birds, mundane [*sic*] genera (Bats, Foxes, Mus) are birds that are apt to wander and of easy transportal. Waders and waterfowl. Scrutinize genera, and draw up tables. Instinct may confine certain birds which have wide powers of flight; but are there any genera mundane which cannot transport easily (it would have been wonderful if the two Rheas had existed in different continents)? In plants I believe not.

It is a very great puzzle why Marsupials and Edentata should only have left off springs [*sic*] in or near South Hemisphere. Were they produced in several places and died off in some? Why did not fossil horse breed in S. America? It will not do to say period unfavourable to *large* quadrupeds; horse not large.⁵⁹

. . . but not vice versa. (Could plants live without carbonic acid gas?) Yet unquestionably animals most dependent on vegetables, of the two great Kingdoms.

Principes de Zool. Philosop.:⁶⁰ I deduce from extreme difficulty of hypothesis of connecting mollusca and vertebrata, that there must be very great gaps, yet some analogy. The existence of plants, and their passage to animals appears greatest argument against theory of analogies.

States there is but one animal: one set of organs; the other animals *created* with endless differences; does not say propagated, but must have concluded so. Evidently considers (or hints) generation as a short process, by which one animal passes from worm to man (highest) as typical of changes which can be traced in *same* organ in *different* animals in scale. In monsters also *organs* of lower animals appear, yet nothing about propagation. I see nothing like grandfather of Mammalia and birds, etc. P. 32,⁶¹ reference to M. Edwards' law of crustacea, with respect to mouth, those beautiful passages from one to other organ; Cuvier on opposite side: V. [i.e., *Vide*] Vol. of Fish, p. 59,⁶² Cuvier has said each animal made for itself does not agree with old and modern types being constant. Cuvier's theory of *Conditions* of existence is thought to account [for] resemblances, etc., therefore Quinary system, or three elements (p. 68).

With unknown limits, every tribe appears fitted for as many situations as possible (conditions will not explain states) for instance take birds, animals, reptiles, fish. (Perhaps consideration of range of capabilities past and present might tell something.)

P. III., G. St. Hilaire.⁶³

Insects and Molluscs allowed to be wide hiatus; states in one the sanguineous system, in other nervous developed; (Owen's idea); states these class[es] approach on the confines? Balanidae? I cannot understand whether G. H. [Geoffroy St. Hilaire] thinks development in quite straight lines, or branching.

G. H.: What does the expression mean, used by Cuvier, that all animals (though some maybe) have not been created on the same plan? (Second resumé well worth studying.) H. says grand idea God giving laws, and then leaving all to follow consequences. I cannot make out his ideas about propagation. *His work: Philosophie Anatomique*⁶⁴ (2nd Vol. about monsters worth reading).

N.B. Well to insist upon (different animals)⁶⁵ large Mammalia not being found on all islands (if act of fresh creation why not produced on New Zealand?); if generated an answer can be given.

It is a point of great interest to prove animals not adapted to each country. Provision for transportal (otherwise) not so numerous; quote from Lyell. Assuming truth of quadrupeds being created on small spots of land, of the same type with the great continents, we get a means of knowing of movements.

How can we understand excepting by propagation that out of the thousands of new insects all belong to same types already established? Why out of the thousand forms should they all be classified [i.e., classifiable]? Propagation explains this.

Ancient Flora thought to [be] more uniform than existing. Ed. N. Philos. Jr.,⁶⁶ p. 191, no. 5, Apr. 1827.

F. Cuvier⁶⁷ says, "But we could only produce domestic individuals and not races, without the occurrence [i.e., concurrence]⁶⁸ of one of the most general laws of life, the transmission of [the organic or intellectual modifications by generation. Here one of the most astonishing phenomena of nature manifests itself to us, the transformation of]⁶⁹ a fortuitous modification into a durable form, of a fugitive want into a fundamental propensity, of an accidental habit into an instinct." Ed. N. Phi. J. p. 297, No. 8, Jan.-Apr. 1828. I take higher grounds and say life is short for this object and others, viz., not too much change.

In Number 6 of Ed. N. Philo. Journ., Paper by Crawford⁷⁰ on Mission to Ava, account of *hairy* man (because ancestors hairy), with one hairy child, and of *albino* (*disease*) being banished and given to Portuguese priest. In first settling a country, people very apt to be split up into many isolated races! Are there any instances of peculiar people banished by rest? (Therefore most monstrous forms have tendency to propagate, as well as diseases.)

In intermarriages, smallest differences blended; rather stronger tendency to imitate one of the parents; repugnance generally to marriage before domestication; afterwards none or little, with fertile offspring; marriage never probably excepting from strict domestication, offspring not fertile, or at least most rarely and perhaps never female. No offspring: physical impossibility of marriage.

Whether those genera which unite very different structure, as *petrel* and *alk* [*sic*], do [they] not show the possibility of common branching off?

Accra.⁷¹ Coast of Africa. Clay slate. Strike SSW and NNE, dip 30°-80° (?). Ed. Phil. N. J. p. 410, 1828.

It is daily happening that Naturalist[s] describe animals as species, for instance Australian dog, or Falkland rabbit. There is [i.e., are] only two ways of proving to them it is not; one, when they can [be] proved descendant, which of course most rare, or when placed together they will breed. But what a character is this?⁷²

The relation of Analogy of Macleay,⁷³ etc., appears to me the same, as the irregularities in the degradation of structure of Lamarck, which he says depends on external influences. For instance he says wings of bat are from external influence. Hence name of analogy, the structures in the two animals bearing relation to a third body,⁷⁴ or common end of structure.

A Race of domestic animals made from influences in one country is permanent in another. (Good argument for species not being so closely adapted.)

Near the Caspian (Province of Ghilan) wooded district cattle with humps as in India. Geograph. J.,⁷⁵ Vol. III, P. I, p. 17. (Lat. 37° about.)

Vol. IV, P. I, Geograp. Journal, Voyage up the Massaroony, by W. Hillhouse [*sic*].⁷⁶ Demerara. In note, Demerara, 10 (12) feet beneath surface, forest trees fallen (kind well known, carbonized), clay fifty feet, then forest 120 feet, micaceous rocks; subsidence appears indicated, p. 36.

Geograp. Journ. Vol. IV, P. II, p. 160,⁷⁷ Melville Island. "The buffaloes, introduced from Timor, herded separate from the English cattle, nor could we get them to associate together."

There is long rigmarole article by G. Hilaire⁷⁸ on wonder of finding monkey in France, of genus peculiar to East Indian islands. Compares it to fossil Didelphus (S. American genus) in plaster of Paris. Now this is exception to *law of type*, like horse in S. America, or like living Edentata in Africa, etc., etc. Now if suppose world more perfectly continental, we might have wanderers (as Peccari in N. America); then if it is doomed that only one species of family has offspring, the *chance* is that these wanderers would not, but where original forms most numerous, then would be wanderers. Some however might have offspring, and then we should have anomalies, as Cape Anteater (V. [i.e., *Vide*] L'Institut,⁷⁹ p. 245, 1837). This supposes world divided into Zoological provinces — united — and now divided again. Weakest part of theory death of species without apparent physical cause. Mem.: Mastodon all over S. America. Hilaire does not seem (?) to consider the monkey as a wanderer, but as produced by climate?

M. Baer⁸⁰ (thinks) the Auroch was found in Germany and thinks even now in central and Eastern Asia beyond the Ganges and perhaps even in India, p. 261, L'Institut, 1837.

Mem.: Sir F. Darwin,⁸¹ cross-breed boars were wilder than parents, which is same as Indian Cattle, therefore tameness not hereditary? Having been gained in short time.

Milvulus forficatus⁸² has a wide range, is a Tyrant flycatcher doing the service of a swallow.

I think we may conclude from Australia and S. America that only some mundane cause has destroyed animals over the whole world. For instance gradual reduction of temperature from geographical or central heat. But then shells — .

Mr. Yarrell⁸³ says that old *races* when mingled with newer, hybrid variety partakes chiefly of the former.

Eyton's⁸⁴ paper on Hybrids, Loudon's Magazine.

Gould⁸⁵ on Motacilla, Loudon Mag., September or October, 1837. Species peculiar to Continent and England.

Westwood⁸⁶ has written paper on affinity and analogy in Linnaean Transactions.

Mr. Wynne⁸⁷ distinctly says that the mixture between Chinese and English Breed decidedly exceedingly prolific, and hybrid

about half-way. Eyton says hybrid about half aways [*sic*] and result the same.

Indian cattle and common produced very fine hybrid offspring, much larger than the dam, from those imported by Dr. (Ld.) Powis.⁸⁸

Hybrid dog's offspring seldom intermediate between parents. How easily does wolf and dog cross? Mr. Yarrel [*sic*] thinks oldest variety impresses the offspring most forcibly, Esquimaux dog and Pointer. (Game fowls have courage independently of individual force.)

Mr. Wynne has crossed Ducks and Widgeon and offspring, either amongst themselves, or with parent birds. (W. Fox⁸⁹ knew of case of male widgeon, winged, and turned on pool, first season bred readily with common ducks.)

Kirby⁹⁰ all through Bridgewater errs greatly in thinking every animal born to consume this or that thing. There is some much higher generalization in view.

In marsupial division do we not see a splitting in orders, carnivora, rodents, etc., JUST COMMENCING!!?

Kirby says (not definite information) west of Rocky Mountains Asiatic types discoverable.

Bridgewater Treatise, p. 85 [Vol. I]. Parasite of Negroes different from European. Horse and ox have different parasite in different climates.

Humb. (Humboldt?)⁹¹ Vol. V, P. II, p. 565. Consult. Says types most subject to vary where intermixtures precluded.

There are some good accounts of passages of legs into mouth-pieces of Crustacea. (Kirby, Bridgewater Treatise.) Vol. II, p. 75. A Fish which emigrates over land is a silurus, p. 123. A climbing fish, p. 122.

A Terrestrial annelidous animal, p. 347. Vol. I⁹² compare with my planaria; leaches out of water.

Does the odd Petrel of T. del F. [Tierra del Fuego] take form of auk because there is no auk in Southern Hemisphere? Does this rule apply?

A Treatise on Form of animals by Mr. Cline.⁹³ "The character of both parents are observed in their offspring, but that of the male more frequently predominates." p. 20, ditto. "If hornless ram be put to horned ewe almost all the lambs will be hornless."

(Does this apply to where same animal breeds often with same female?) p. 28, "It is wrong to enlarge a native breed of animals, for in proportion to their increase of size they become worse in form, less hardy, and more liable to disease."

If population of place be constant (say 2000) and at present day every ten living souls on average are related to the 200th year degree, then 200 years ago there were 200 people living who now have successors. Then the chance of 200 people being related within 200 years backward might be calculated and this number eliminated. Say 150 people four hundred years since were progenitors of present people, and so on backwards to one progenitor, who might have continued breeding from eternity backwards.

If population was increasing between each lustrum, the number related at the first start must be greater, and this number would vary at each lustrum, and the calculation of chance of the relationship of the progenitors would have different formula for each lustrum. [A lustrum is a five year census.]

We may conclude that there will be a period, though long distant, when of the present men (of all races) not more than a few will have successors. At present day in looking at two fine families one will [have] successors for centuries, the other will become extinct. Who can analyze causes: dislike to marriage (some delay), disease, effects of contagions and accidents. Yet some causes are evident, as for instance one man killing another. So is it with *varying* races of man; then races may be overlooked; many variations consequent on climate, etc.; the whole races act towards each other, and are acted on, just like the two fine families (no doubt a different set of causes must act in the two cases).

May this not be extended to all animals? First consider species of cats, other tribes, etc., etc. (Exclude mothers and then try this as simile.)

In a decreasing population at any one moment fewer closely related; therefore (few species of genera) ultimately few genera (for otherwise the relationship would converge sooner), and lastly, perhaps some one single one. Will not this account for the odd genera with few species which stand between great groups, which we are bound to consider the increasing ones?

N.B. as illustrations, are there many anomalous lizards living, or of the tribe fish extinct, or of Pachydermata, or of coniferous trees, or in certain shell cephalopoda? Read Buckland.⁹⁴

L'Institut, 1837, p. 319, Brongniart,⁹⁵ no dicotyledonous plants and few monocot. in coal formation (?). P. 320, states Cryptogam. Flora formerly common to New Holland?! P. 320, says Coniferous structures intermediate between vascular or Cryptogam. (original Flora) and Dicotylldones, which nearly first appear (p. 321) at Tertiary epochs. P. 330, Fossil Infusoria found of unknown forms, a circumstance undiscovered by Ehrenbergh [*sic*].⁹⁶

Indian cow with hump and common; between Esquimaux and European dog? Yet man has had no interest in perpetuating these particular varieties.

If species made by isolation, then their distribution (after physical changes) would be in rays from certain spots. (Agrees with old Linnaean doctrine and Lyell's to certain extent.)

Von Buch, Canary Islands, French Edit.:⁹⁷ Flora of Islands very poor (p. 145) 25 plants; 36 St. Helena, without ferns, analogous to nearest continent; poorness in exact proportion to distance (?) and similarity of type (?) (Mem.: Juan Fernandez). From study of Flora of islands, "ou bien encore on pourrait au plus en conclure quels sont les genres qui, sous ce climat, se divisent le plus aisément en espèces distinctes et permanentes." p. 145. In Humboldt⁹⁸ great work de distribut., Plantarum, relation of genera to species in France is 1:5, 7; in Laponia 1:2, 3.

(Mem.: Lyell ⁹⁹ on shells.)	genera
In: North Africa	1:4,2
Iles Canaries	1:1,46
St. Helena	1:1,15

Calculate my Keeling case; Juan Fernandez, Galapagos, Radack Isle? Therefore islands and arctic are in same relation. We find species few in proportion to difficulty of transport. For instance the temperate parts of Teneriffe, the proportion of genera 1:1. I can understand in one small island species would not be manufactured. Does it not present analogy to what takes place from time? Von Buch distinctly states that permanent varieties become species, p. 147, p. 150, not being crossed with others.

Compares it to languages. But how do plants cross? — admirable discussion.¹⁰⁰

Mr. Owen¹⁰¹ suggested to me, that the production of monsters (which Hunter¹⁰² says owe their origin to very early stage) and which follow certain laws according to species, present an analogy to production of species.

Animals have no notions of beauty, therefore instinctive feelings against other species (for sexual ends), whereas man has such instincts very little.

In Zoology Proceedings, Jan. 1837 by Eyton,¹⁰³ account of three kinds of pigs; difference in skeletons; *very good*.

Apteryx, a good instance probably of rudimentary bones. As Waterhouse¹⁰⁴ remarked, mere length of bill does not indicate affinity because similar habits produce similar structures. Mem.: Ornitho Rhyncus [*sic*]. Would not *relationship* express a real affinity, and affinity, [e.g.?] whales and fish?

Progeny of Manks cats without tails; some long and some short; therefore like dogs. Ogleby [*sic*]¹⁰⁵ says Wolves at Hudson Bay breed with dogs, the bitches never being killed by them, whilst they eat up the dogs.

L'Institut. Curious paper by M. Serres¹⁰⁶ on Molluscous animals representing foetuses of vertebrata, etc., 1837, p. 370. Owen says nonsense.

The distribut[ion] of big animals in East Indian Archipelago, very good in connection with Von Buch Volcanic chart and my idea of double line of intersection. At India House collection of Birds from Java, at Leyden series from several islands. Bear peculiar to Sumatra and not found on Java. Monkey peculiar to latter, not to former. (Dr. Horsfield.)¹⁰⁷

Consult Dr. Smith History of S. African Cattle;¹⁰⁸ Phillips¹⁰⁹ Geology, p. 81 in Lardner's Encyclop., proportion between fossils and recent shells, between herbivorous and zoophagous mollusca according to periods. N.B., was Europe desert (like S. Africa) after Coal Period?

In those divisions of molluscs where species now least in number (as Cephalopods) in last tertiary epochs, [were] most genera dead? Examine into this (in Phillips). According to this, formerly there would have been many genera of monobranchous animals, p. 82. (There are many tables in Phillip's of numerous

genera in fossil and recent state well worth consideration.) Tabulate Mammalia on this principle.

Man (Varieties-Races) in *savage* state may be called species (races); in *domesticated* [state] species (races). If all men were dead, then monkeys make men. Men make angels.

Those species which have long remained are those (?Lyell?) which have wide range and therefore cross and keep similar. But this is difficulty: this immutability of some species. [Fig. 4.]



[Fig. 4]

In Phillips p. 90, it seems the most organized fishes lived far back. Fish approaching to reptiles at Silurian age.

How long back have insects been known? As Gould remarked to me, the "beauty of species is their exactness," but do not known varieties do the same? May you not breed ten thousand greyhounds and will they not be greyhounds?

Yarrell's remark about old varieties affecting the cross most well worthy of observation.

I think it is certain, strata could not now accumulate without [including] sealbones and cetaceans, both found in every sea, from Equatorial to extreme poles. Oh, Wealden, — Wealden.¹¹⁰

Do the N. American Tertiary deposits present analogies to shells of living seas? ¹¹¹

A breed of Blood Hounds from Aston Hall close to Birmingham, and supposed to be descended from a breed known to be there since the time of Charles, and now in the possession of Mr. Howard Galton,¹¹² have one of the vertebra, about $\frac{2}{3}$ from base of tail, enlarged two [*sic*] very considerably, so that any person would say the tail was broken. This came so often that it was difficult to obtain a litter without this defect. Very curious case — W. D. Fox.

When dogs are bred into each other the females loose [*sic*] desire, and it is required to give the cantharinides.¹¹³

Bull. Soc. Geolog., 1834, p. 217 Java. Fossils 10 out of twenty have *analogues* (uses this word for similar) in the Indian sea. Deshayes.¹¹⁴

Mr. McClay¹¹⁵ is inclined to think that offspring of Negro and white will return to native stock (the cross often whiter than white parent). The mulattos [*sic*] themselves explain it by intermarriages with people either a little nearer black or white as it may happen. Dr. Smith¹¹⁶ says he is sure of the case at Cape. McClay argues from it Black and White species. For says he seeds of hybrid lillies, etc., etc., etc., (V. Herbert¹¹⁷ on hybrids) thus act. Now the point will be to find whether known varieties in plants do so, as in cacti, etc., etc.; as in dogs; investigate case of pidgeons [*sic*], fowls, rabbits, cats, etc., etc. When black and white men cross some offspring black, others white, which is more closely allied to case of cross of dogs. See paper in Philosoph. Transactions on a quagga and mare crossing, by Ld. Moreton [*sic*]¹¹⁸ where mare was influenced in this cross to after births, like aphides. Case of boy with foetus developed in breast looks as if many ova impregnated at once. Dr. Smith considers the Caffers [i.e., Kaffirs] (like Englishmen), men of many countenances, as hybrid race. Is not this contradiction to his view of races not mingling?

In Foxes [*sic*] case of Blood Hounds, a little mingling would probably have been good, namely such as blood hounds from other parts of England. Mr. Bell of Oxford St. had a very fine bloodhound bitch which would never take the dog. But at last a rough-haired shepherd dog lined [i.e., bred] her and produced a very large litter; never afterwards went in heat. This is good instance of same fact in Mr. Galton's case. It explains the loss (and expense) (must probably have occurred to everyone) of rare breeds of dogs from owners great care of them. Fox says when two dogs of opposite breeds are crossed, sometimes offspring quite intermediate, sometimes take strongly after either parent, about as often one way as other. He has known case of good pointer and rough water spaniel produce litter like both parents and Mr. Bell has half bloodhound and grey hound.

Where two dogs have lined bitch directly one after the other, puppies differ and like both parents. Fox told me of case of mare covered by blood horse and carthorse, two folds [*sic*].¹¹⁹

Mr. Herbert's¹²⁰ papers are in the Horticultural Transactions and a distinct work on hybridity under title of Amaryllidae and Narcissus. (Mr. Donn¹²¹ considers Mr. H. rather wild.)

Mr. Donn remarked to me that give him a species from Ireland, England, Scotland, and other localities and each one will have a peculiar constant aspect. That is, varieties though of trifling order are formed by nature.

Carmichael,¹²² Tristan D'Acunha, a list of its Flora is given. Mr. Don [*sic*] remarked to me that some good African and some good S. American forms (and daresays some of these forms would have some [same?] peculiarity). Now when we hear that the whole island is volcanic surmounted by crater and studded with others, we see a beginning to island. Graham Island. We know many seeds might be transported, some blown, — floating trees. Thrushes (*Turdus Guyanensis?*), and bunting (*Emberiza Brasiliensis?*), and coots (*Fulica chloropus*) might bring in stomach, etc., etc. (Mem.: discover what kinds of seeds, then plants.) Mem.: Fact stated by Mr. Don in island Teneriffe, St. Helena, J. Fernandez, Galapagos. Many trees compositae (Ferns ditto), because seeds first arrived and hence formed trees, and would creator (on volcanic island) *make* plants (grow closely) when this volcanic point appeared in the great ocean, have made plants of American and African form merely because intermediate position? We cannot consider it as adaptation because volcanic island, whilst Africa [is] sandstone and granite (that is genera near Cape); see if there are any species same as T. del Fuego and C. of Good Hope; show *possibility* of transport. If some cannot be explained, more philosophical to state we do not know how transported. Glaciers might have acted at Tristan D'Acunha. Carmichael, Linn. Transact., Vol. XII.

The Alpine plants of the Alps must be new formations because snow formerly descended lower, therefore species of lower genera altered, or northern plants. No. Mem.: The Antarctic flora must formerly have been separated by short space from mountains low down, therefore plants common. Take an example from T. del. Fuego.

Ellis (?)¹²³ says Tahitian kings would hardly produce from Incestuous intercourse, a parallel fact to Blood Hounds.

Before attract. of gravity discovered, it might have been said it was as great a difficulty to account for movement of all [planets],¹²⁴ by one law, as to account for each separate one, so to say that all Mammalia were born from one stock, and since distributed

by such means as we can recognize, may be thought to explain nothing, it being as easy to produce (for the creator) two quadrupeds (Jaguar and Tiger) at S. America.¹²⁵

When species cross and hybrids breed, their offspring show tendency to return to one parent, this is only character, and yet we find this same tendency (only less strongly marked) between what are called varieties. N.B., one mother bringing forth young having very different characters is attempt at returning to parent stock. I think we may look at it so, — ?? It holds good even with trifling differences of expression, one child like father, another like mother.

Has Lowe¹²⁶ written any other paper besides one in Latin, one on Madeira? Any general observations? Difference of species between land shells of Porto Santo and Madeira. I believe very curious.

My idea of propagation almost infers what we call improvement. All Mammalia from one stock, and now that one stock cannot be supposed to be most perfect (according to our ideas of perfection), but intermediate in character. The same reasoning will allow of decrease in character (which perhaps is case with fish, as some of the most perfect kinds, the shark, lived in remotest epochs). Lizards of secondary period in same predicament? It is another question, whether whole scale of Zoology may not be perfecting by change of Mammalia for Reptiles, which can only be adaptation to changing world. I cannot for a moment doubt but what cetaceae and Phocae now replace Saurians of Secondary epoch; it is impossible to suppose such an accumulation at present day and not include Mammalian remains. The Father of all insects gives same argument as father of Mammals, but have improvement in system of articulation. Whether type of each order may not be supposed that form which has wandered least *from* ancestral form? If so are present typical species most near in form to ancient? In shells alone can this comparison be instituted.

People often talk of the wonderful event of intellectual man appearing. The appearance of insects with other senses is more wonderful; its mind more different probably, and introduction of man nothing compared to the first thinking being, although hard to draw line; not so great as between perfect insect, etc.

Forms hard to tell, whether articulata, or intestinal, or even mite. A bee (compared with cheese mite) with its wonderful instincts (might well say how —). The difference is that there is a wide gap between man and next animals in mind, more than in structures.

If the skeleton of a negro had been found, what would Anatomists have said? Where is Pentland's ¹²⁷ account of . . . ? ¹²⁸

A, B, C, D. (A) crossing with (B), and (B) being crossed with (C) prevents offspring of A becoming a good species well adapted to locality, but it is instead a stunted and diseased form of plant, adapted to A, B, C, D. Destroy plants B, C, D, and A will soon form good species!

The increased fertility of slightly different species and intermediate character of offsprings accounts for *uniformity* of species. We must confess that we cannot tell what is the amount of difference which improves and checks it. It does not bear any precise relation to structure. (Mem.: Eyton's ¹²⁹ Hogs and Dogs.)

The passage in last page explains that between species from moderately distant countries there is no test but generation (but experience according to each group) whether good species, and hence the importance naturalists attach to Geographical range of species.

Definition of species: one that remains at large with constant characters, together with other beings of very near structure. Hence species may be good ones and differ scarcely in any external character; for instance two wrens forced to haunt two islands, one with one kind of herbage, and one with other, might change organization of stomach and hence remain distinct. Where country changes rapidly we should expect most species.

The difference [in] intellect of man and animals not so great as between living things without thought (plants), and living things with thoughts (animals). (Therefore my theory very distinct from Lamarck's.) Without *two* species will generate common kind, which is not probable; ¹³⁰ then monkeys will never produce man, but both monkeys and man may produce other species. Man already has produced marked varieties and may someday produce something else, but not probable owing to mixture of races. When all mixed and physical changes (intellectual[ity]

being acquired alters case?), other species or angels produced.

Has the Creator since the Cambrian formation gone on creating animals with same general structure? Miserable, limited view. With respect to how species are, Lamarck's "willing" doctrine absurd. As equally are arguments against it, namely how did otter live before being modern otter? Why to be sure there were a thousand intermediate forms. Opponent will say, show them me. I will answer yes, if you will show me every step between bull Dog and Greyhound. I should say the changes were effects of external causes, of which we are as ignorant as why millet seed turns a Bullfinch black (or iodine on glands of throat), or colour of plumage altered during passage of birds (where is this statement, I remember L. Jenyns talking of it?), or how to make Indian cow with hump and pig's foot with cloven hoof.

Ask Entomologists whether they know of any case of *introduced* plant, which an insect has become attached to, that insect not being called omniphitophagous [*sic*]. But it will be said there are latent insects, as crows against man with gun, and Bustards, etc., etc.!!!

An American and African form of plant being found in Tristan D'Acunha may be said to deceive man as likely as fossils in old rocks for same purpose!!

Can the wishing of the Parent produce any character on offspring? Does the mind produce any change in offspring? If so [*is*] adaptation of species *by generation* explained? N.B. Look over Bell ¹³¹ on Quadrupeds for some facts about dogs, etc., etc. N.B. Animals very remote, ass and horse produce offspring exactly intermediate. Reference to pig and dogs.

My theory will make me deny the creation of any new quadruped since days of Didelphus in Stonefield [*sic*] ¹³² therefore all lands united (Falkland Fox, ice). Mauritius, what a difficulty, where elevation, subsidence near is only hope. New Zealand (compare to Van Dieman's land), glorious fact of *absence of quadrupeds*. East India Archipelago very good on opposite tendency.

Study Ellis and Williams, ¹³³ Zoology of South Sea islands. Any animals? I believe none. Canary islands? Madeira? Tristan D'Acunha? Iceland? The connection between Mauritius and Madagascar very good; Fernando Po and Coast of Africa equally

good. Small island off New Guinea same fact. See Coquille's Voyage.¹³⁴ Galapagos mouse (brought by canoes) (?). Ceylon and India; Van Diemen's land; Australia; England and Europe. It will be well worth while to study profoundly the origin and history of every terrestrial Mammalia, especially moderately large ones.

Is the Flora of Tierra del Fuego like that of North Europe, many genera and few species?

The number of genera on islands and on Arctic shores evidently due to the chance of some ones of the different orders being able to survive or chance having transported them to new station. When the new island splits and grows larger, species are former [i.e., formed] of those genera (and hence by same chance few representative species). (This must happen, and then enquiry will explain representative Systems.) Of this we see example in English and Irish Hare, Galapagos' shrews, and when big continent, many species belonging to its own genera. Therefore if in small tract we have many species, we may insure mass continental or many large islands. Hence this must have been condition of Paris basin land. (How is this with Fernando Po, with plants of St. Helena and Tristan D'Acunha?) If on one island several species of same genus, subsided land, Mauritius? (Resolves itself into question of proportion of species to genus.) Although the Horse has perished from S. America, the jaguar has been left, and fox, and bear. If I had not discovered channel of communication by which great Edentata might have roamed to Europe and Pachydermata from Europe to America, how strang [*sic*] would presence of Jaguar [have] been in S. America?

W. Coast of Africa and E. of America ought to present great contrast in forms. India intermediate, see how that is.

Are shell-boring [shell-bearing] molluscs like Carnivorous Mammalia in their wide range and in their duration of species? (Are carnivorous Mamm. in Paris basin allied to present, [i.e.,] more like present Carnivora than Pachydermata?)

If my theory true, we get: (1st.) a *horizontal* history of earth within recent times and many curious points of speculation; for having ascertained means of transport, we should then know whether former lands intervened; (2nd.) by character of any two ancient fauna, we may form some idea of connection of those

two countries (hence India, Mexico, and Europe, one great sea; coral reefs; therefore shallow water at mtns. [form] the islands); (3rd.) we know that structure of every organ in A.B.C., three species of one genus, can pass into each other (by steps we see); but this cannot be predicated if structures in two genera. (We then cease to know the steps.)¹³⁵ Although D.E.F. follow close to A.B.C., we cannot be sure that structure (C) could pass into (D). We may foretell species, limits of good species being known. It explains the blending of two genera. It explains typical structure. Every species is due to adaptation and hereditary structure (*latter far* chief element, therefore little service habits in classification, or rather the fact that they are *not* [by] far the most serviceable). We may speculate of durability of succession from what we have seen in old world and on amount [of] changes which may happen. *It leads you to believe the world older than GEOLOGISTS think. It agrees with excessive inequality of numbers of species in divisions. Look at articulata!!!* It leads to nature of physical change between one group of animals and a successive one. It leads to knowledge what kinds of structure may pass into each other; now on this view no one need look for intermediate structure, say in brain between lowest Mammal and Reptile (or between extremities of any great divisions). Thus a knowledge of possible changes is discovered for speculating on future. Therefore fish never become a man. Does not require fresh creation. If continent had sprung up round Galapagos on Pacific side, the Oolite¹³⁶ order of things might have easily been formed. With belief of transmutation and geographical grouping we are led to endeavour to discover *causes* of change, the manner of adaptation (wish of parents??); instinct and structure become full of speculation and line of observation. View of generation being condensation, test of highest organization intelligible; may look to first germ, led to comprehend two affinities. My theory would give zest to recent and fossil Comparative Anatomy, it would lead to study of instincts, heredity and mind heredity, whole metaphysics. It would lead to closest examination of hybridity and generation, causes of change in order to know what we have come from and to what we tend, to what circumstances favour crossing and what prevents it; this, and direct examination of direct passages of structures in species, might lead

to laws of change, which would then be main object of study, to guide our speculations with respect to past and future. (The grand question which every naturalist ought to have before him when dissecting a whale or classifying a mite, a fungus, or an infusorian is, "What are the Laws of Life?")

Where we have near genera far back, as well as at present time, we might expect confusion of species. Important. For instance take *Valvata* and *Conus* (??) ¹³⁷ which now run together; were not both genera formerly abundant?

Seed of Ribston Pippin tree producing crab.¹³⁸ (Is [it like] the offspring of a male and female animal of one variety going back?) Whether this going back may not be owing to cross from other trees???? Do the seeds of Ribston Pippin and Golden Pippin produce real crabs, and in each case similar or mere mongrels?

It really would be worth trying to isolate some plants under glass bells and see what offspring would come from them. Ask Henslow for some plants whose seeds go back again, not a monstrous plant, but any marked variety. Strawberry produced by seeds?? Universality of generation strongly shown by hybridity of ferns, hybridity showing connexion of two plants.

Animals whom we have made our slaves we do not like to consider our equals. Do not slave holders wish to make the black man other kind? Animals with affections, imitation, fear of death, pain, sorrow for the dead, respect.

We have no more reason to expect [to find] the father of mankind, than *Macrauchenia*, ¹³⁹ yet it may be found. We must not compare chances of embedment in man in present state with what he is as former species. His arts would not then have taken him over whole world. The soul by consent of all is superadded; animals not got it, not look forward. If we choose to let conjecture run wild, then animals our fellow brethern in pain, disease, death and suffering, and famine, our slaves in the most laborious works, our companions in our amusements; they may partake from our origin in one common ancestor; we may be all netted ¹⁴⁰ together.

Hermaphrodite animals couple; argument for true molluscs coupling.¹⁴¹

Geograph. Journal, Vol. V, P. I, p. 67: Dr. Coulter ¹⁴² on decrease of population in California, cessation of female offspring; applicable to any animal.

Athenaeum,¹⁴³ p. 154, 1838. Hybrid Ferns.

It may be argued against theory of changes, that if so, in approaching desert country or ascending mountains you ought to have a gradation of species; now this notoriously is not the case. You have stunted species, but not such as would make species (except perhaps in some plants and then a chain of steps is found in same mountain). How is this explained by law of small differences producing more fertile offspring? 1st. All variation of animal is either effect or adaptation, therefore animal best fitted to that country when change has taken place. Nature . . .¹⁴⁴

Any change suddenly acquired is with difficulty permanently transmitted. A plant will admit of a certain quantity of change at once, but afterwards will not alter. This need not apply to very slow changes, without crossing. Now a gradual change can only be traced geologically (and then monuments imperfect) or horizontally, and then cross-breeding prevents perfect change. It is scarcely possible to get evidence of two races of plants run wild (for we know that such can take place without impregnating each other), for if they are different then they will be called species, and mere producing fertile hybrids will not destroy that evidence, as so many plants produce hybrids, or else whole fabric will be overturned. Hence extreme difficulty, argument in circle. Falkland Island case good one of animals not soon being subjected to change in Americas; perhaps merely gone back previous to fresh change. Get a good many examples of animals and plants very close (take European birds, instance Gould's case of Willow wren) and others varying in wild state to show that we do not know what amount of difference prevents breeding; or as others would express it, amount of varying in wild state.

When breaking up the primeval continent, Indian Rhinoceros, Java, and Sumatra ones, all different. Join Sumatra and Java together by elevation now in progress and you will have two Tapirs existing in East Indian seas. Marsupial animals all show greater connexion in Quadrupeds, but *plants do not follow* by any means. Ostriches, Hippotomus [*sic*] only African; American and African forms maybe in India and East Indian Islands? Monkeys different, not travellers??

Royle's¹⁴⁵ case of Himalayan plants; migratory birds? He told me some story of Crane from Holland!!!, in stomach, or in feathers — seeds.

Two inhabitants of the Tropics (whether one fossil or not) are related by real relationships, as well as effect of similar temperature; now those of temperate regions and tropics are only related by one connection, viz., descent. Hence far greater discordance in latter. Hence change in form. This probably explains crag¹⁴⁶ and miocene. The descendants left in cooling climate might change twice over, whereas those which migrated a little to the southward would merely be specifically different, if so. Now this is difficult to explain by creation, so we must suppose a multitude of small creations.

Will Dromedaries and Camels breed?

As man has not had time to form good species, so cannot the domesticated animals with him! Modern origins shown by only one species, far more than by non-embedment of remains. Agrees with non-blending of languages? Till man acquired reason he would be limited animal in range, hence probability of starting from one point. In the crag we see the process of change of those forms which have succeeded in becoming habituated to colder climate whilst others died out, or moved toward equator (or some species might then have been wanderers.) There ought to be fewer species in proportion to genera than in present seas. All the species which survive any change may undergo indefinite change (marking in their history an Eocene, Miocene, and Pliocene epoch), whilst others may die out or move southward. Therefore species must be compared to neighbouring sea. For change of species does not measure time, but physical changes (we assume like weather on long average tolerably uniform). Comparing fossils with whole world would be like in a Meteorologic table (in comparison of temperature of two countries), finding a very hot day in one; oh, we will take a day from the equator to add to the mean of the other. If the world had cooled by secular refrigeration in chief part instead of change from insular to extreme climate, Iceland would have possessed a most peculiar Flora (and north of Europe). As European forms have travelled towards Equator, so would the plants from extreme north, which according to all analogy would have been very unlike southern European ones, — “a variation played on secular refrigeration.”

Experimentise on land shells in salt water, and lizards ditto. Ask Eyton to procure me some.

Get Hope¹⁴⁷ to give me an account of parasitic animals of beasts varying in different climates.

Those will not object to my theory, those the philosophy who soar above the pride of the savage, they perceive the superiority of man over animals, without such resorts.¹⁴⁸

M. Jarred and Dumeril¹⁴⁹ great work on Reptiles. M. J. says some reptiles same from Maurice [Mauritius] and Madagascar, and of Good Hope. His book probably worth studying.

Wingless birds [of] S. Continents, Ostriches, Dodo, Apteryx, Penquin, Loggerheaded Duck; larger proportion of water and small[er] of land, and a few quadrupeds.

Study productions of great Fresh Water Lakes of North America.

If parasites different whilst man and his domesticated quadrupeds are not so, [then] greater faculties of change in the articulata than Vertebrata. But how does this agree with the longevity of species in Molluscs!!!

When we talk of higher orders, we should always say intellectually higher. But who with the face of the earth covered with the most beautiful savannahs and forests dare to say that intellectuality is only aim in this world . . . ?¹⁵⁰

. . . of all genera (in all classes) are not a few only cosmopolitan, and in genera peculiar to any one country do not species generally affect different stations? This would be strong argument for propagation of species.

Again, is there not similarity even in quite distinct countries in same hemisphere more than in others? Are there any cases when domesticated animals separated and long interbred having great tendency to vary? Is not man thus circumstanced? Varieties of dogs in different countries a case in point. All cases like Irish and English Hare bear upon this.

Why do Van Diemen's land people require so many imported animals?

At what part of tree of life can orders like birds and animals separate, etc., etc.?

Work out Quinary system according to three elements.

How is Fauna of Van Diemen's Land and Australia . . . ?¹⁵¹

Falconer's¹⁵² remarks on influence of climates, situations, etc., on — (242)

Smellie ¹⁵³ Philos. of Zoology (842).

White ¹⁵⁴ regular gradat. in man (1024). (Poor, trash; Lyell.)

Fleming's ¹⁵⁵ Philosophy of Zoology. Royle ¹⁵⁶ on Himalayan Plants.

Would it not be possible to work through all genera and see how many confined to certain countries?; so on with families.

Ask Royle about Indian cattle with humps.

To be solved: if horses sent to India and long bred in and no new ones introduced, would not change be superinduced? Why is everyone so anxious to cross animals from different quarters to prevent them taking peculiar characters? Indian Bull?

Do species of any genus as American or Indian genus inhabit different kind of localities? If so change.

The grand question: Are there races of plants run wild or nearly so, which do not intermix, any cultivated plants produced by seed? Lychnis, Flax. ¹⁵⁷

In production of varieties, is it not per saltum?

Islands bordering continents same type; collect cases. African Islands? How is Juan Fernandez — Humming Birds? Types of former dogs; character of Miocene Mammalia of Europe.

Mem.: Mr. Bell's ¹⁵⁸ case of *Sub Himalayan* land emys, decidedly an Indian form of Tortoise. On other hand fresh water tortoises from Germany (where Mr. Murchison's ¹⁵⁹ fox was found) decidedly next species to some South American kinds.

Are the closest allied species always from distant countries, as Decandelle [*sic*] ¹⁶⁰ says? (No, he only says sometimes.) We might expect disseminated species to vary a little, but such should not be general circumstance. In insects in England surely it is not; intermediate genera we might expect.

Lindley ¹⁶¹ Introduct.

Dict. Scien. Naturelle. ¹⁶²

Geographie Botanique, De Candoelle [*sic*]. ¹⁶³

Geol. Soc.

Horae Entomologicae. ¹⁶⁴

Linn. Soc.

Geoff. St. Hilaire, ¹⁶⁵ Philosophy of Zoology.

Waterhouse. ¹⁶⁶

NOTES AND REFERENCES

1. Darwin undoubtedly has reference to the book of his grandfather: Darwin, Erasmus. 1794-1796. *Zoonomia; or, the laws of organic life*, 2 vols. London, J. Johnson.
2. Probably: Lamarck (J. B. P. A. de Monet de). 1830. *Philosophie zoologique*. Paris.
3. Gray, John Edward. 1835. Remarks on the difficulty of distinguishing certain genera of testaceous Mollusca by their shells alone, and on the anomalies in regard to habitation observed in certain species. *Philosophical Transactions of the Royal Society of London*: 301-310.
4. Lyell referred to dispersal of plants by icebergs, or "ice-islands." Lyell, Charles. 1837. *Principles of geology*, 5th ed., vol. 3, p. 16. London, Murray.
5. Probably Candolle, Augustin Pyramus de, and K. Sprengel. 1821. *Elements of the philosophy of plants*. (Translated from the German.) Edinburgh, Blackwood.
6. Francis Darwin transcribed "immense ages" as "immersage," see: Darwin, Francis. 1898. *Life and letters of Charles Darwin*, vol. 1, p. 367. New York, Appleton.
7. Darwin undoubtedly has reference to Ehrenberg, C. G. 1837. On the origin of organic matter from simple perceptible matter and on organic molecules and atoms; together with some remarks on the power of vision of the human eye. *Scientific Memoirs, Selected from the Transactions of Foreign Academies of Science and Learned Societies, and from Foreign Journals*; edited by R. Taylor, 1:555-583.
8. This no doubt is Owen, Richard, author of: *Zoology of the voyage of H.M.S. Beagle, Part 1, Fossil Mammalia*. London, 1840.
9. This entire sentence is unfinished and crossed out.
10. Remainder of page 29 and first half of page 30 are missing in the notebook.
11. Bell, Thomas. 1837. *A history of British quadrupeds, including the Cetacea*. London.
12. Jenyns, Leonard. 1835. *A systematic catalogue of British vertebrate animals*. Cambridge.
13. Duperrey, Louis Isidore. 1826-30. *Voyage autour du monde, exécuté sur la Corvette du Roi La Coquille . . . pendant les années 1822-25 . . . publie . . . par L. I. D. Zoologie par Lesson et Garnot*. Paris.

14. Smith, Andrew, author of: *Illustrations of the zoology of South Africa, consisting chiefly of figures and descriptions of the objects of natural history collected during an expedition into the interior of South Africa, in the years 1834-1836; etc.* London, 1838. Darwin visited with Smith while in Capetown, South Africa in 1836.
15. Humboldt, Alexander von. 1811. *Political essay on the Kingdom of New Spain*. Transl. from the original French, by John Black, 2 vols. New York.
16. I am not sure to what Darwin has reference here. He spells the word "monucle" in this line and "monucule" in the next. I have not found either word in such context in any other writings by Darwin or his contemporaries. Perhaps he means "monocule" and is suggesting that the progenitor of all animals was a cyclops-like creature or perhaps he means to say "molecule," as he did previously on page 249. Possibly he meant to use "minuscule," or even "monticule." See also Ehrenberg, *op. cit.*, note 7.
17. In the diagram there are 13 lines that have a perpendicular line at the end.
18. In the diagram there are 12 lines that are without a perpendicular line at the end.
19. In this and in the preceding paragraphs Darwin to all intents and purposes formulates the postulates of his theory of natural selection, viz., the survival of the fittest and the constancy of populations generation after generation.
20. Cuidado — Be careful!
21. Darwin no doubt has reference to the Quinary System of classification described by Macleay, William Sharp, in *Horae entomologicae; or, essays on the Annulose animals, etc.*, vol. 1, pts. 1, 2, London, 1819, 1821. William Swainson also described the system in *A treatise on the geography and classification of animals*, London, Longman, etc., in Lardner, D., *The Cabinet Cyclopaedia*. 1835. The system was based on the postulate that the animal kingdom may be classified into five major divisions and that these divisions have such a relation to each other that they form a circle when grouped together according to morphological similarities. Thus each division includes some taxonomic forms which bear a close resemblance through affinities or analogies to two of the other major divisions. Since each of the five major divisions is related by some of its members to two of the remaining divisions, the entire group of five must have a circular arrangement

amongst themselves. Also each of the five major divisions itself was thought to be composed of five smaller taxonomic units, each of which similarly was circularly related to two of the five units within its division.

22. Fries, Elias Magnus, author of: *Systema Mycologicum, etc.*, 3 vols., 1821-32. Fries, according to Swainson (*op. cit.*, note 21, p. 216), also suggested that taxonomic groups are arranged in circles, but in Fries' system there were four major groups instead of five.
23. Swainson, *op. cit.* note 21, p. 220, mentions Newman (Edward), author of *Sphinx Vespiformis: An Essay*. London, 1832. Newman, according to Swainson also supported the circular theory of classification, but believed the "magic" number of circles to be seven.
24. Wellsted, Lieutenant R. 1836. Observations on the coast of Arabia between Rás Mohammed and Jiddah. *Journal of the Royal Geographical Society of London*, 6:51-96.
25. Remainder of page missing.
26. Gould, John. 1837-38. *A synopsis of the birds of Australia and the adjacent islands*. Pts. 1-4. London.
27. Van Diemen's Land is Tasmania.
28. Remainder of page missing.
29. Cuvier, G. 1827. *Essay on the theory of the earth*, 5th ed. (Translated from the French by R. Kerr.) Edinburgh, Blackwood.
30. Deshayes, Gérard Paul. 1836-37. Séance du 17 avril 1837. *Bulletin de la Société Géologique de France*, 8:212-224.
31. This reference probably is Macculloch, John. 1831. *A system of geology, with a theory of the earth, and an explanation of its connexion with the Sacred Records*, 2 vols. London.
32. Probably Isidore Geoffroy Saint-Hilaire or René P. Lesson, or both.
33. Pages 55 and 56 missing.
34. Waterhouse, George R., author of: *Zoology of the voyage of H.M.S. Beagle, Part 2, Mammalia*. London, 1839. I could not locate a reference to a specific paper by Waterhouse to which Darwin probably refers here.
35. Heteromera is a division of beetles including darkling and blister beetles; the Chrysomelidae are leaf beetles.

36. Lyell, Charles. 1833. *Principles of geology*, vol. 3. London, Murray.
37. Pippin, a variety of apple.
38. Swainson, *op. cit.*, note 21.
39. Pages 69 and 70 missing.
40. Pages 75 and 76 missing.
41. Crossed out.
42. Probably Don, George, author of *A general system of gardening and botany*. London, 1832-1838, or possibly Don, David, both botanists, and brothers.
43. Cuvier, G. 1829-30. *Le règne animal distribué d'après son organisation, etc.*, Tomes 1-5. Paris.
44. Stonesfield slate, a geological formation of the Jurassic. See Lyell, Charles. 1850. *Principles of geology*, 8th ed. p. 143. London, Murray. See also Lylell, *op. cit.*, note 4 (in vol. 1, p. 237).
45. Kotzebue, Otto von. 1821. *A voyage of discovery, into the South Sea and Beering's Straits, for the purpose of exploring a North-East passage . . . in . . . 1815-1818*. (Remarks and opinions of the Naturalist of the Expedition, A. von Chamisso, vol. 2) 3 vols. London.
46. Richardson, John. 1829-37. *Fauna Boreali-Americana; or the zoology of the northern parts of British America*. 3 vols. London.
47. Humboldt, F. H. Alexander von, and Aimé Bonpland. 1807. *Voyage de Humboldt et Bonpland. Part 5. Essai sur la géographie des plantes, accompagné d'un tableau physique des régions équinoxiales . . . Rédigé par A. de Humboldt*. Paris.
48. Swainson, *op. cit.*, note 21.
49. Brown, Robert. 1831. General view of the botany of the vicinity of Swan River. *Journal of the Royal Geographical Society of London*, 1:17-21.
50. Geoffroy Saint-Hilaire. 1837. Singe fossile de Sansan. *L'Institut, Journal des Académies et Sociétés Scientifiques de la France et de l'Étranger*, Paris, 5:242-244.
51. "singe," ape or monkey.
52. *Colobus*, a genus of African monkey.

53. Sennopitheque, a name now technically invalid for the Old World langur monkeys.
54. Sapajou, a monkey of the genus *Cebus* of S. America.
55. See Lyell, *op. cit.*, note 4 (in vol. 2, p. 402).
56. *Muscicapa coronata*? Lath., a tyrant-flycatcher of the Galapagos Islands. See Darwin, Charles, 1839. *Journal of researches into the geology and natural history of the various countries visited by H.M.S. Beagle*, p. 461. London, Colburn.
57. This word is crossed out, but looks as if it might have been "Chat" or "Chais." Perhaps Darwin meant "Calandria" a mocking-bird of Patagonia. See Darwin, *op. cit.*, note 56, pp. 62-63, where *Orpheus modulator* and *O. Patagonica* D'Orbigny are mentioned; see also p. 475, where various species of the Galapagos' *Orpheus* are mentioned. Possibly Darwin intended to write "Chatham" for Chatham Island.
58. Perhaps this should read, "when points are finally gained, if any, then the facts become connected."
59. Pages 107 and 108 missing.
60. Geoffroy Saint-Hilaire, Étienne, 1830. *Principes de philosophie zoologique, discutés en Mars 1830 au sein de l'Académie Royale des Sciences*. Paris.
61. *Op. cit.*, note 60.
62. *Op. cit.*, note 60.
63. *Op. cit.*, note 60.
64. Geoffroy Saint-Hilaire, Étienne, 1818. *Philosophie anatomique*. Paris.
65. The words "different animals" are crossed out.
66. Sternberg, Count, 1827. On the distribution of living and fossil plants. *Edinburgh New Philosophical Journal*, April to October: 190-192.
67. Cuvier, Frédéric. 1827-28. Essay on the domestication of mammiferous animals, with some introductory considerations on the various states in which we may study their actions. *Edinburgh New Philosophical Journal*, October to April: 45-60; 292-297.
68. The correct quotation is "concurrence."
69. Darwin, apparently inadvertently, omitted this portion of the quotation.

70. Crawford. 1827. Account of Mr. Crawford's mission to Ava. *Edinburgh New Philosophical Journal*, April to October: 359-370.
71. Park, Thomas. 1827-28. Mr. Thomas Park's journey into the interior of Africa. *Edinburgh New Philosophical Journal*, October to April: 410.
72. Pages 123 through 128 missing.
73. Probably has reference to Macleay, *op. cit.*, note 21, who discussed analogy and affinity.
74. Thus the wings of birds and bats are related to the air.
75. Monteith, Colonel (William), E. I. C. 1833. Journal of a tour through Azerdbijan and the shores of the Caspian. *Journal of the Royal Geographical Society of London*, 3:1-58.
76. Hilhouse, William. 1834. Journal of a voyage up the Massaroony in 1831. *Journal of the Royal Geographical Society of London*, 4:25-40.
77. Campbell, Major (James). 1834. Geographical memoir of Melville Island and Port Essington, on the Cobourg Peninsula, Northern Australia; with some observations on the settlements which have been established on the north coast of New Holland. *Journal of the Royal Geographical Society of London*, 4:129-181.
78. *Op. cit.*, note 50.
79. Undoubtedly Geoffroy Saint-Hilaire, *op. cit.*, note 50.
80. Baer. 1837. Aurochs du Caucase. *L'Institut, Journal des Académies et Sociétés Scientifiques de la France et de l'Étranger*, Paris, 5:260-261.
81. Sir Francis Sacheverel Darwin (1786-1859). For biographical notes, see Pearson, Karl. 1914. *The life, letters and labours of Francis Galton*, vol. 1:22-25. Cambridge Univ. Press.
82. See Darwin, *op. cit.*, note 56 (p. 163 in Darwin).
83. Yarrell, William, author of numerous papers including: On the laws which regulate the change of plumage in birds. *Transactions of the Zoological Society of London*, 1:13-20, 1835.
84. Eyton, Thomas C. 1837. Some remarks upon the theory of hybridity. *Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology, and Meteorology*, London, 1:357-359. Conducted by J. C. Loudon.

85. Gould, John. 1837. Observations on some species of the genus *Motacilla* of Linnaeus. *Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology, and Meteorology*, London, 1:459-461. Conducted by J. C. Loudon.
86. Westwood, J. O. 1837. On *Diopsis*, a genus of dipterous insects, with descriptions of twenty-one species. *Transactions of the Linnean Society of London*, 17:283-314.
87. I could find no reference to Wynne in the published literature.
88. Undoubtedly Lord Powis. See Darwin, Charles. 1868. *Variation of animals and plants under domestication*, vol. 1, p. 83; vol. 2, p. 45. London, Murray.
89. Darwin's cousin, William Darwin Fox.
90. Kirby, William. 1835. *On the power, wisdom and goodness of God as manifested in the creation of animals and in their history, habits and instincts*, 2 vols. London, William Pickering. (Bridgewater Treatises.)
91. Humboldt, Alexander de, and Aimé Bonpland. 1821. *Personal narrative of travels to the equinoctial regions of the New Continent during the years 1799-1804*. Vol. 5, pt. 2. (Transl. by Williams) London, Longman, etc.
92. Kirby, *op. cit.*, note 90.
93. Cline, Henry. 1805. *On the form of animals*. London.
94. Buckland, William. 1836. *Geology and mineralogy considered with reference to natural theology*. London, William Pickering. (Bridgewater Treatises.)
95. Brongniart, Ad. 1837. Végétaux fossiles. *L'Institut, Journal des Académies et Sociétés Scientifiques de la France et de l'Étranger*, Paris, 5:318-321.
96. Pages 151 through 154 missing in the notebook. The reference is: Ehrenberg. 1837. Infusoires fossiles du tripoli d'Oran. *L'Institut, Journal des Académies et Sociétés Scientifiques de la France et de l'Étranger*, Paris, 5:330-331.
97. Buch, Leopold von. 1836. *Description physique des Îles Canaries, suivie d'une indication des principaux volcans du globe*. Traduite de l'Allemand par C. Boulanger. Revue et augmentée par l'auteur. Paris, Levrault.

98. Humboldt, F. H. Alexander von. 1817. *De distributione geographica plantarum secundum coeli temperiem et altitudinem montium, prolegomena*. Lutetiae Parisiorum.
99. Lyell, *op. cit.*, note 4 (p. 367 in Lyell).
100. Pages 159 and 160 missing.
101. Probably Richard Owen.
102. Undoubtedly John Hunter. For various references, see Abernethy, J. 1817. *Physiological lectures exhibiting a general view of Mr. Hunter's physiology and of his researches in comparative anatomy, etc.*; Hunter, John. 1835-37. *The works of John Hunter. With notes*. Edited by J. F. Palmer. 4 vols. London.
103. Eyton, Thomas C. 1837. Notice of some osteological peculiarities in different skeletons of the genus *Sus*. *Proceedings of the Zoological Society of London*, Part 5:23-24.
104. See note 34.
105. This reference possibly is one of the following: Ogilby, W. 1833. Characters of a new genus of carnivorous Mammalia (*Cynictis*), from the collection of Mr. Steedman. *Proceedings of the Zoological Society of London*, Part 1:48-49; Ogilby, W. 1836. Remarks upon the probable identity of *Cynictis melanurus* Mart., with a species noted by Boshman under the name of Kokebog. *Proceedings of the Zoological Society of London*, Part 4:56.
106. Serres. 1837. Anatomie des mollusques. *L'Institut, Journal des Académies et Sociétés Scientifiques de la France et de l'Étranger*, Paris, 5:370-371.
107. Pages 165 and 166 missing from the notebook. The reference undoubtedly is Horsfield, Thomas, author of several articles including: Notice of a species of *Ursus* (*U. isabellinus*) from Nepal. *Transactions of the Linnean Society of London*, 15:332-334, 1827.
108. I could find no such specific reference, see however Smith, *op. cit.*, note 14.
109. Phillips, John. 1837. *A treatise on geology*. London, Longman, etc., in Lardner, D. *The Cabinet Cyclopaedia, etc.*, vol. 1.

110. Wealden, a freshwater geological formation underlying the Lower Cretaceous in England. See Lyell, *op. cit.*, note 4 (vol. 4:302 in Lyell).
111. Pages 173 and 174 missing.
112. For further citations on Aston in the literature see: Pearson, Hesketh. 1930. *Doctor Darwin* (p. 180). London, Dent and Sons; Oswald, Arthur. 1953. Aston Hall, Warwickshire—I. The property of the Corporation of Birmingham. *County Life*, London, 114:552-555, 620-623, 694-697; *Historic Houses and Castles in Great Britain and Northern Ireland* (1959 Edition), Index Publishers Limited, London, 1959.
113. Pages 177-178 missing.
114. Deshayes, Gérard Paul. 1833-1834. Mémoires et communications séance du 3 février 1834. *Bulletin de la Société Géologique de France*, 4:200-293.
115. I have not been able to find any bibliographic reference to Mr. McClay. Undoubtedly should be Macleay (see note 21).
116. Dr. Andrew Smith, *op. cit.*, note 14.
117. Herbert, William. 1822. On the production of hybrid vegetables; with the result of many experiments made in the investigation of the subject. *Transactions of the Horticultural Society of London*, 4:15-50. In this article Herbert proposes that new species are formed by divergence and hybridization.
118. Morton, George. 1821. A singular fact in natural history. (Peculiarities of the progeny of an Arab horse from a mare that had previously bred with a Quagge.) *Philosophical Transactions of the Royal Society of London*: 20-23.
119. Pages 185 through 190 missing. "Folds" no doubt should be "foals."
120. Herbert, William. 1820. Instructions for the treatment of the *Amaryllis longifolia*, as a hardy aquatic, with some observations on the production of hybrid plants, and the treatment of the bulbs of the genera *Crinum* and *Amaryllis*. *Transactions of the Horticultural Society of London*, 3:187-196. An interesting quotation from p. 196 of this article is the following: "Considering the wide field that is open for the creation of new species of plants, by hybrid intermixture, some mode of naming them must be adopted, or the art of cultivators will break down all the landmarks of the botanist." See also Herbert, William. 1837. *Amaryllidaceae; preceded by an attempt to arrange the monocotyledonous orders, and followed by a treatise on cross-bred vegetables, etc.* London.

121. Darwin probably was referring to either George Don or David Don, and not Donn. See note 42.
122. Carmichael, Dugald. 1818. Some account of the island of Tristan da Cunha and its natural productions. *Transactions of the Linnean Society of London*, 12:483-513.
123. Probably Ellis, William. 1829. *Polynesian researches, during a residence of nearly six years in the South Sea Islands, etc.* 2 vols., London.
124. The word "planet" was inserted in brackets by Darwin, Francis, *op. cit.*, note 6 (p. 370 in Darwin).
125. Pages 197 through 202 missing.
126. Lowe, R. T. 1833. Primitiae Faunae et Florae Maderae et Portus-Sancti; sive species quaedam novae vel hactenus minus rite cognitae animalium et plantarum in his insulis degentium breviter descriptae. *Transactions of the Cambridge Philosophical Society*, 4:1-70.
127. The most nearly appropriate bibliographic references that I could find are: Laurillard, Charles Léopold, Valenciennes and Pentland. 1835? *Catalogue des préparations anatomiques laissées dans le Cabinet d'Anatomie comparée du Muséum d'Histoire Naturelle*, par G. Cuvier. (Paris?); and Darwin, *op. cit.*, note 56 (p. 153 in Darwin).
128. Pages 209 and 210 missing.
129. *Op. cit.*, notes 84 and 103.
130. I believe Darwin means that under his theory two distinct species would not independently evolve into a single species.
131. Bell, *op. cit.*, note 11.
132. See note 44. The correct spelling should be "Stonesfield."
133. *Op. cit.*, note 123. See also Williams, John. 1837. *Narrative of Missionary enterprises in the South Sea Islands; with remarks upon the natural history . . . etc.* London.
134. See Duperrey, *op. cit.*, note 13.
135. This sentence crossed out.
136. Oolite, or Jura Limestone Group. See Lyell, *op. cit.*, note 4 (vol. 4, p. 303 in Lyell).
137. *Valvata*, a genus of freshwater snails; *Conus*, a genus of marine snails.
138. Probably the Ribston Pippin apple occasionally produced a crab apple.



Barrett, Paul H. 1960. "A transcription of Darwin's first notebook on "transmutation of species." Edited." *Bulletin of the Museum of Comparative Zoology at Harvard College* 122, 245–296.

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