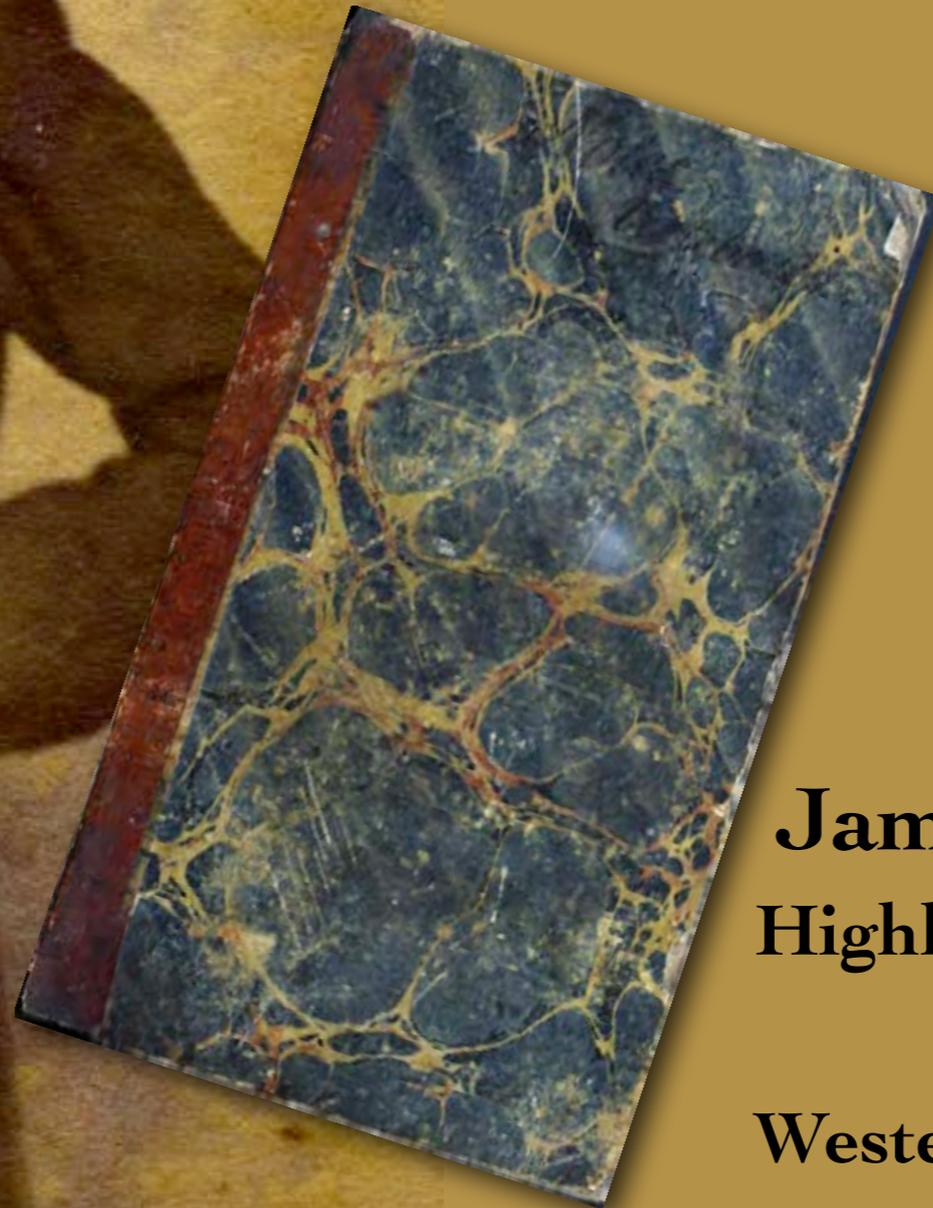


On the Organic Law of Change ~

Alfred Russel Wallace's Evolutionary
Insights and Arguments in his "Species
Notebook" of 1855-~~1859~~ **1861? 62?**



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“...I travelled about fourteen thousand miles within the Archipelago, and made sixty or seventy separate journeys...”

I find that my Eastern collections amounted to :

810	specimens of	Mammalia.
100	“	Reptiles.
8,050	“	Birds.
7,500	“	Shells.
13,100	“	Lepidoptera.
83,900	“	Coleoptera.
13,400	“	other insects.

195,660 specimens of natural history.

Malay Archipelago 1854 ~ 1862

Some of Wallace's more important papers from the field, 1855-1860

On the law which has regulated the introduction of new species

1855

On the Orang-utan or Mias of Borneo

On the habits of the Orang-utan in Borneo

Some account of an infant "Orang-utan"

Attempts at a natural arrangement of birds

Observations on the zoology of Borneo

1856

On the natural history of the Aru Islands

1857

On the habits and transformations of a species of *Ornithoptera*

Note on the theory of permanent and geographical varieties

On the tendency of varieties to depart indefinitely from the original type

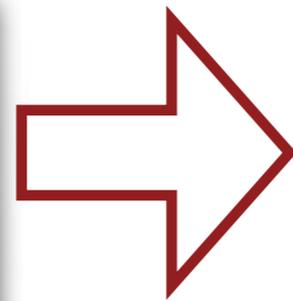
1858

On the zoological geography of the Malay Archipelago

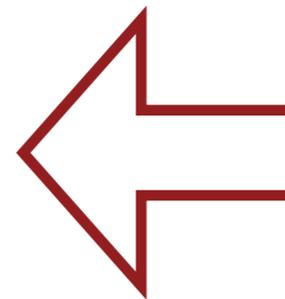
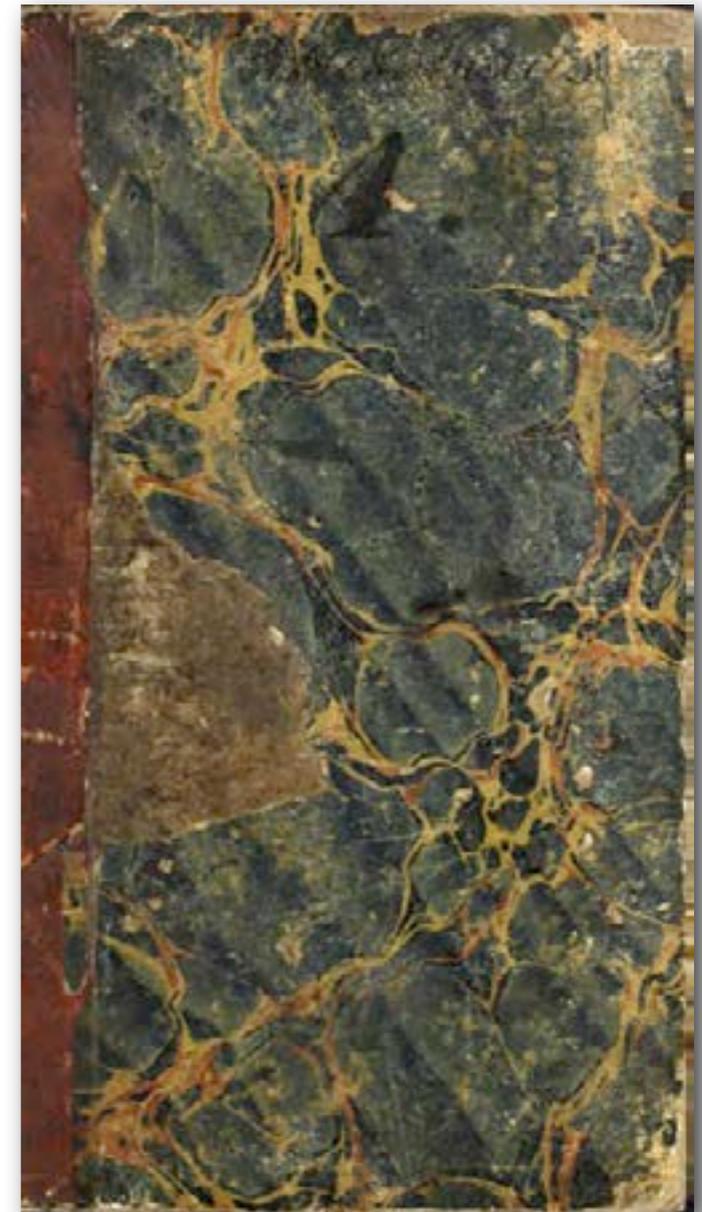
1860

“Species Notebook” • Linnean Society ms. 180

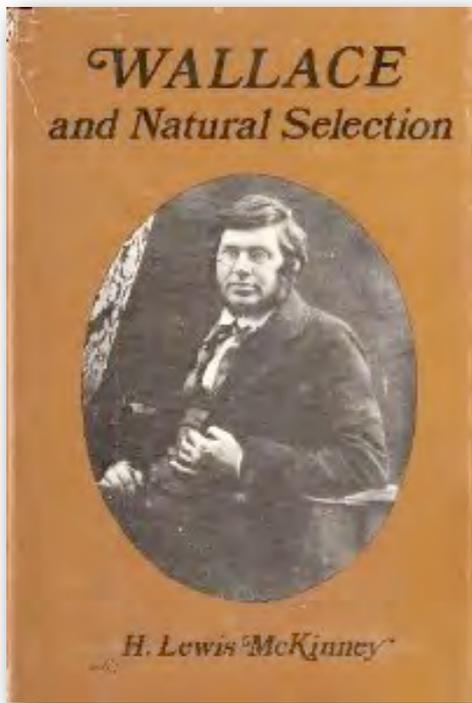
Like most of Wallace’s notebooks, this was used
tête-bêche ~ “head-to-tail”



“recto”
181 pages



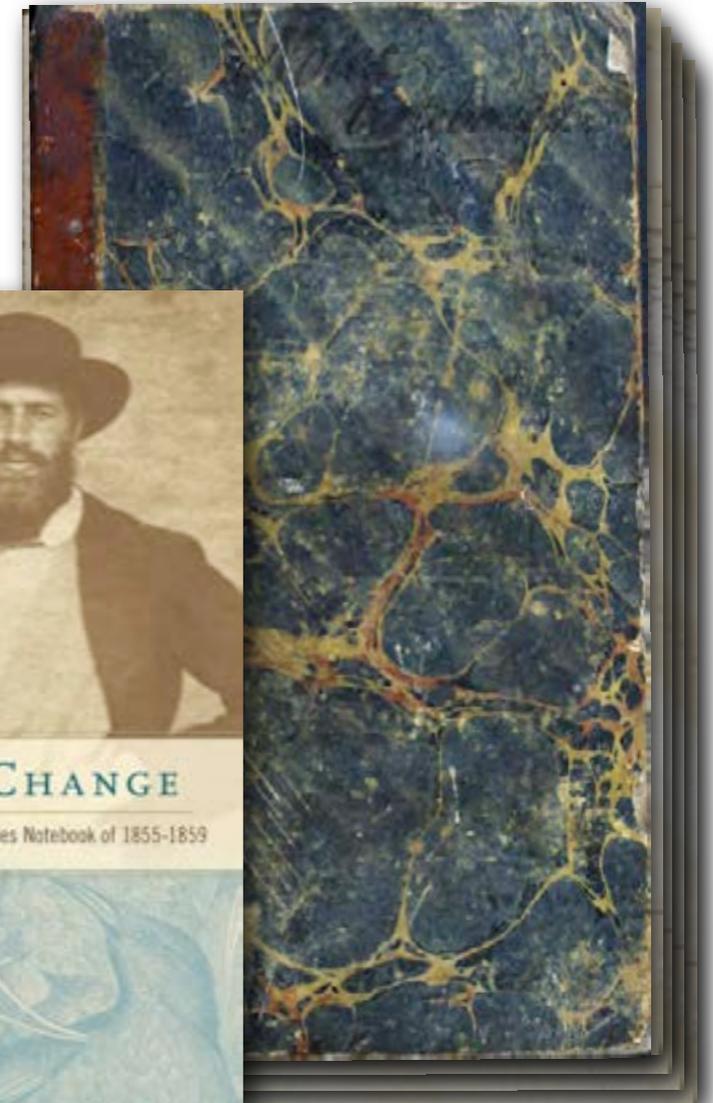
“verso”
77 pages



McKinney 1972

H. Lewis McKinney dubbed this the “Species Notebook,” and argued that Wallace intended its extensive notes for a pro-transmutation book.

“Note for Organic law of Change”



35
Note for Organic law of
We must at the outset end
the present condition of
underlying any changes. If what nature is to what

Transmutation and related topics in the Species Notebook

Design (32 pages) ~

Critiques of claims of "designedness," and related claims of the supposed balance or harmony of nature; also, entries with moral or spiritual overtones.

Geographical Distribution (20 pages) ~

Entries on comparative species richness of different areas, relationships of island species, and the concept of isolation on islands.

Morphological Affinity (29 pages) ~

Entries relating to homology, morphology, and classification, with an "evolutionary" interpretation.

Transmutation (56 pages) ~

Widely ranging entries that can be best seen as evidence and arguments for the reality of transmutation. The extracts of Lyell's *Principles* and attendant rebuttals constitute the bulk of this category, with 24 pages dedicated to critiquing Lyell.

Instinct (40 pages) ~

Explored in several contexts, including birds' nests, construction of bees' cells, and a critique of claims of instinct in humans.

Humans (14 pages) ~

Ethnological and racial observations, including descriptions of physical features and behaviors of various peoples that Wallace encountered in his travels.

Lyell as Wallace's Inspiration and Foil



Wallace to Bates, 11 April 1846:
**“I am much pleased to find you
so well appreciated ‘Lyell’”** WCP340

Charles Lyell
(1797 ~ 1875)

“Lyell’s geological uniformitarianism...permeated
[Wallace’s] essays written between 1855 and 1858”

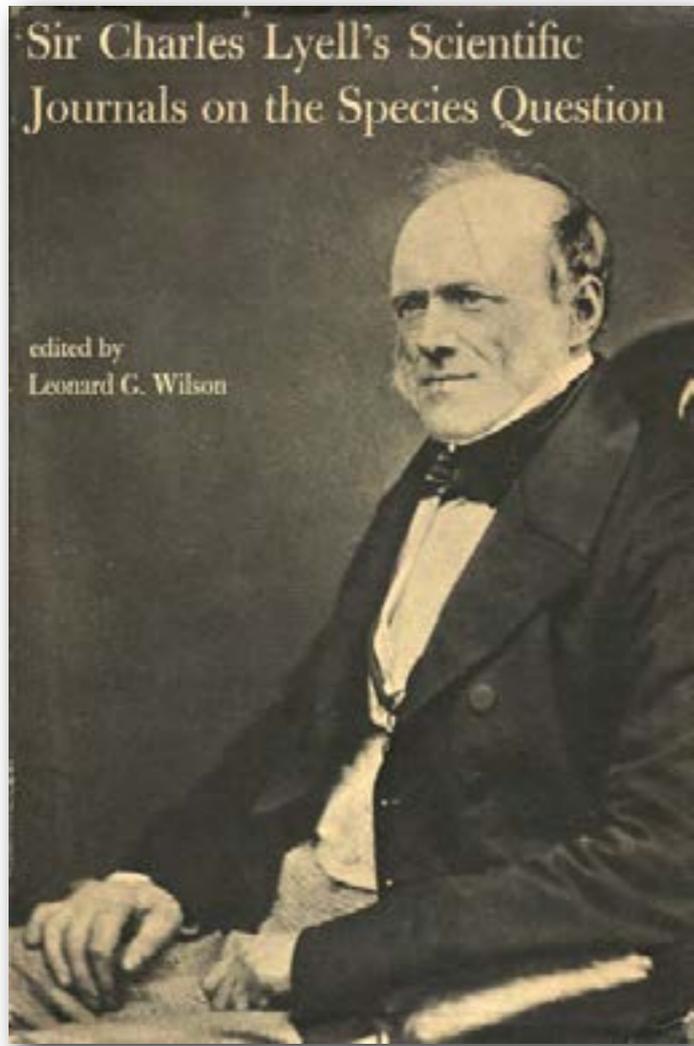
184 Mr. A. R. Wallace *on the Law which has regulated*

XVIII.—*On the Law which has regulated the Introduction of New Species.* By ALFRED R. WALLACE, F.R.G.S.

EVERY naturalist who has directed his attention to the subject of the geographical distribution of animals and plants, must have been interested in the singular facts which it presents.

Lyell and the Sarawak Law paper (1855)

- The opening is framed in Lyellian terms: the "singular facts of geographical distribution" are illuminated by "geological investigations" of recent years.
- The second paragraph articulates a vision of gradual (Lyellian) change in both the Earth and the life upon it.
- Wallace argues that "the phenomena of geological distribution are exactly analogous to those of geography," and proceeds to show that slow, gradual geological change results in gradual extinction, citing "C. Lyell in his admirable *Principles*."
- A Lyellian vision permeates the central argument of the paper in which Wallace lists nine "propositions in Organic Geography and Geology" culminating in a 10th proposition, namely, his Law: "*Every species has come into existence coincident both in space and time with a pre-existing closely allied species*"



L. G. Wilson 1970

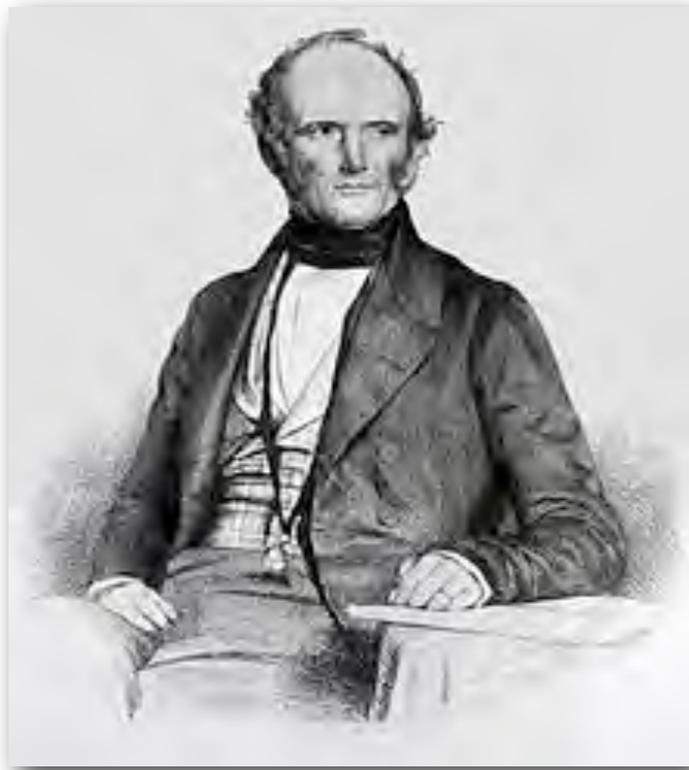
Effect of the Sarawak Law paper on Lyell

26 Nov 1855

- **Lyell first read Wallace's "Sarawak Law" paper**

28 Nov 1855

- **Lyell opened the first of a series of notebooks on "the species question; notes on Wallace's paper constitute the first entry.**
- **In a related notebook Lyell extracted the paper extensively.**



1/2 May 1856

• **Lyell urged Darwin: "I wish you would publish...& so out with the theory & let it take date & be cited & understood."** [Darwin Correspondence Project (DCP), letter 1862]

22 Dec 1857

• **Darwin to Wallace: "You must not suppose that your [1855] paper has not been attended to: two very good men, Sir C. Lyell and Mr. E. Blyth at Calcutta specially called my attention to it."** [DCP, letter 2192]

18 June 1858

• **Darwin to Lyell: "Some year or so ago, you recommended me to read a paper by Wallace in the Annals, which had interested you & as I was writing to him, I knew this would please him much, so I told him. He has to day sent me the enclosed & asked me to forward it to you..."** [DCP, letter 2285]

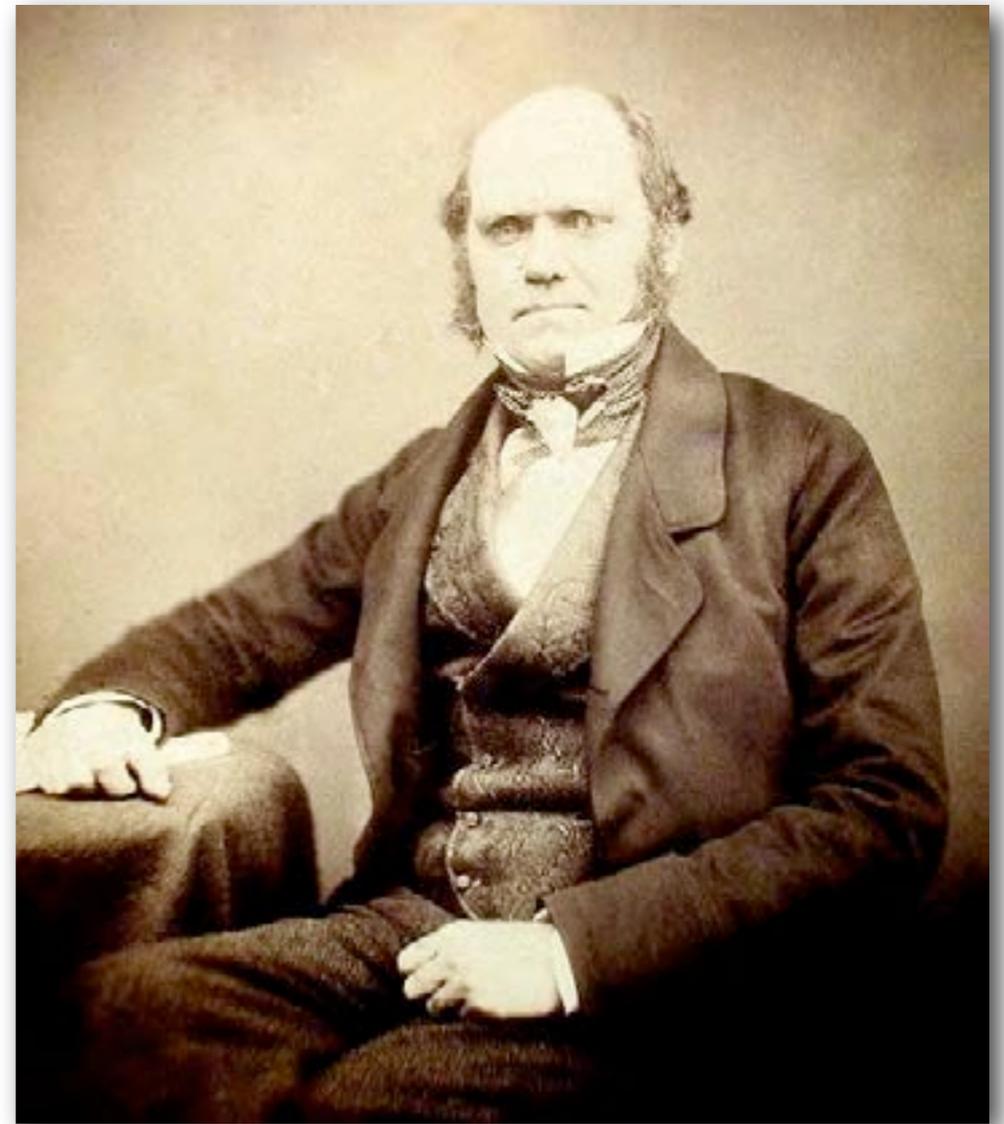
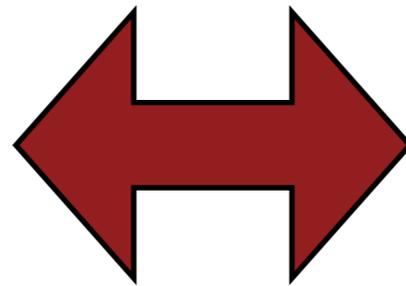
III. *On the Tendency of Varieties to depart indefinitely from the Original Type.* By ALFRED RUSSEL WALLACE.

The Ternate Essay (1858) was intended for Lyell

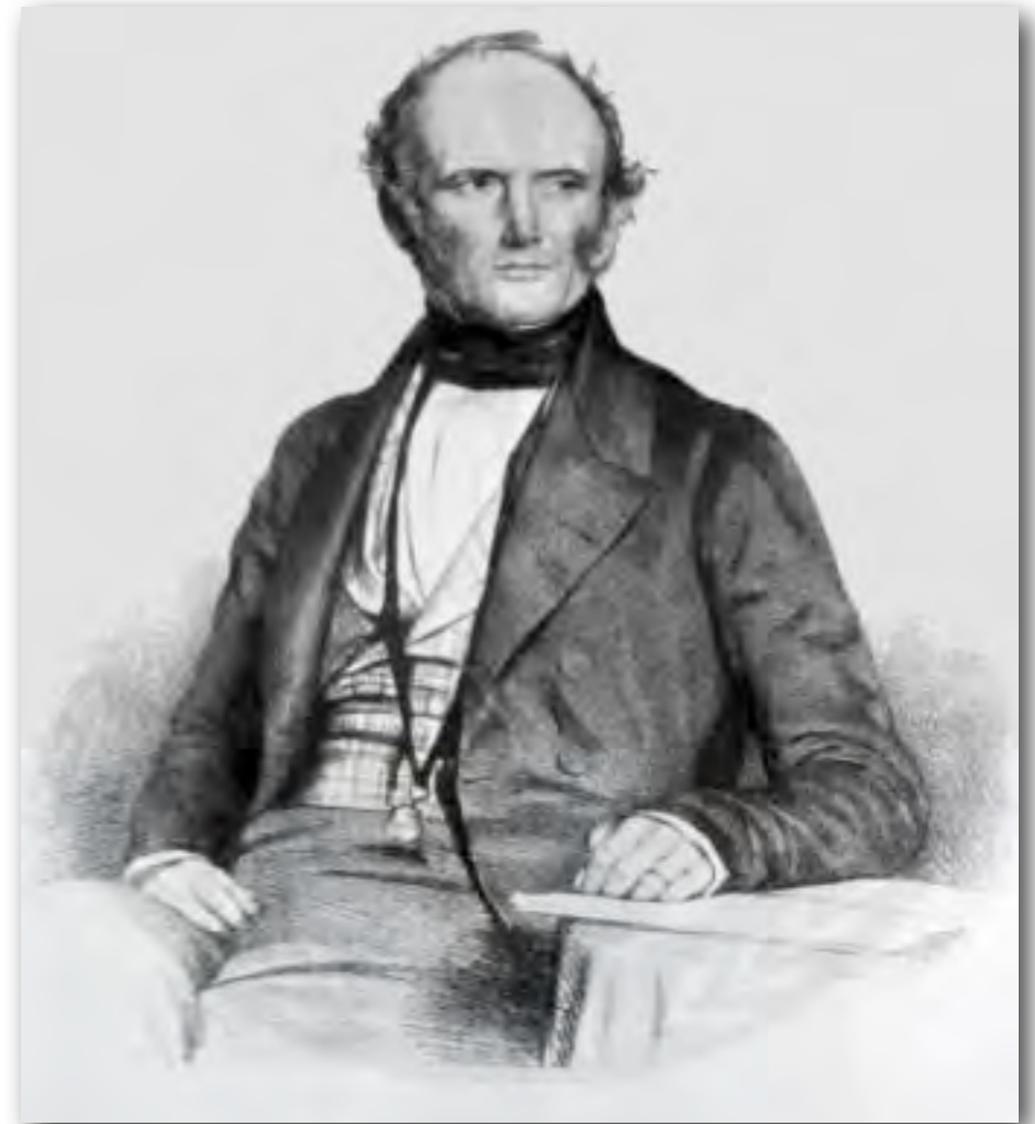
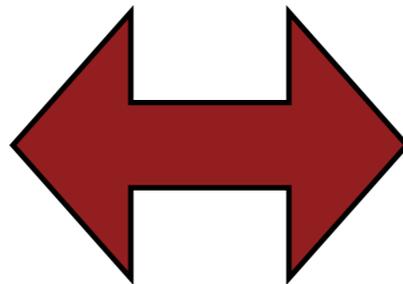
Ternate essay (page) ¹	Concept/terms/observations/ideas	<i>Principles</i> ² (volume/pages)
53	domestication (anti-transmutation argument based on)	III/437-448
54	struggle for existence	III/9, 59, 108-109, 140, 162
	wild asses of the Tartarian deserts	III/59
	pops. increase rapidly; yet there is appearance of equilibrium	III/108-120
55	power of population increase	III/113-115
56	migration necessary to birds' existence	III/66-70
58	antelopes: variation and fleetness	II/415
	result of "alteration of physical conditions" of a district	III/152
	destruction of vegetation by locust irruptions	III/115-116, 123
	question of varieties return to original form, or not	III/162
59	ARW argues, contra Lyell, for continued change in varieties	III/162
	geological time: "periods of time...so near to infinity..."	I/111, 114, 127; III/449
60	result of turning animals like horses, oxen loose on the Pampas	III/134-137
61	hypothesis of Lamarck	II/407-425, 426-448, 449-465
	origin of the giraffe's long neck	II/415
62	ARW, contra Lyell: continual divergence from parental type	II/438-439
	succession of species through past ages	I/222-239; III/155, 164-166

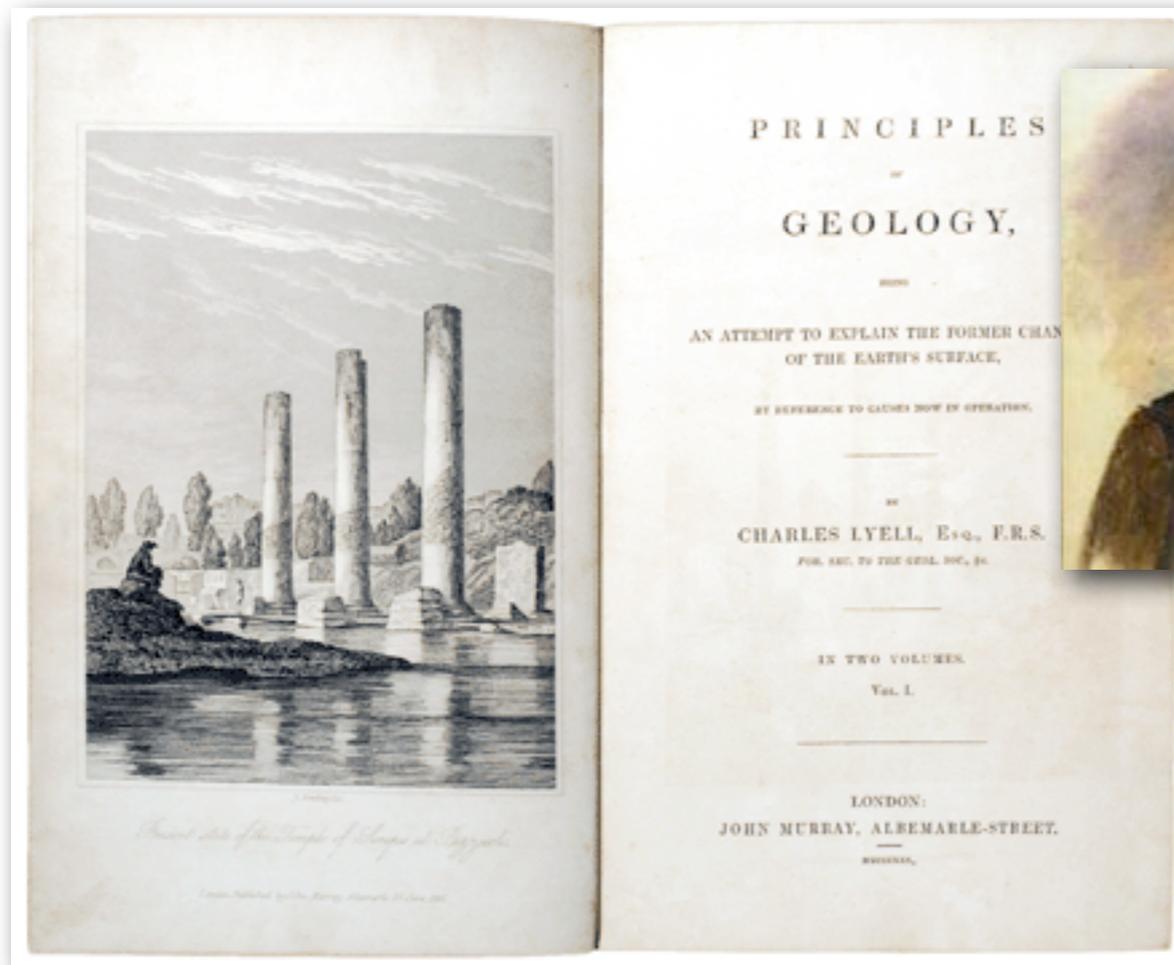
¹ Wallace 1858 ² Lyell 1835

We think of Wallace and Darwin as the main characters of the events of 1858, with Lyell in a secondary “supporting” role.



In fact, it was with Lyell that Wallace wanted to communicate, with Darwin intended to play a supporting role in helping him achieve this goal...





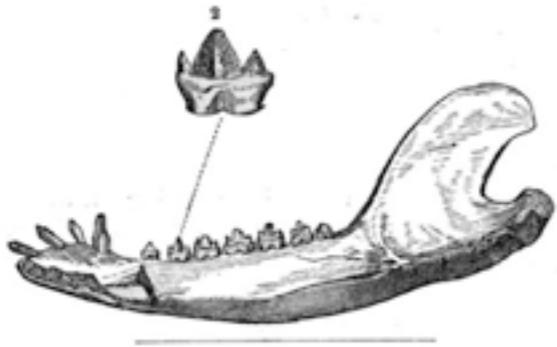
Lyell and Wallace's Species Notebook

Wallace had the 4th (1835) edition of Lyell's *Principles of Geology* with him in SE Asia.

In the Species Notebook he engages in a long “dialog” with Lyell, aiming to refute his anti-transmutationist arguments.

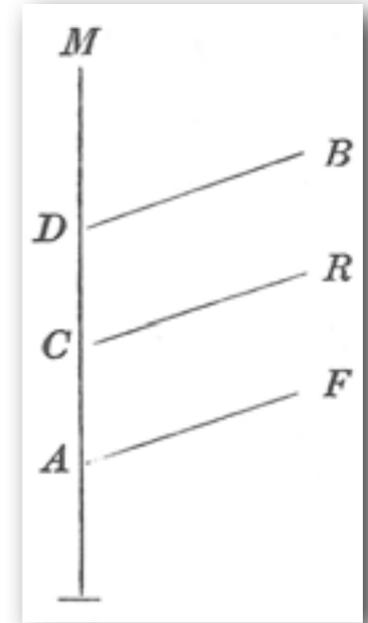
Species Notebook page nos. (all <i>recto</i>)	<i>Principles</i> 4 th edition (1835) [Volume, Pages]
34	I, 35-42; 69
35	----
36	I, 226
37-38	I, 231-234
39-40	II, 435
41-42	II, 437, 446-448, 452
43	II, 414, 464
44	II, 443
45-48	III, 22-28
49-50	III, 115-116, 154
51-52	III, 161-162
53	III, 172-173
142	I, 266; II, 334; IV, 60-61
149-150	I, 239; III, 21

A sampling of topics from Lyell's *Principles of Geology* critiqued by Wallace in the *Species Notebook*



"Non-progression" of the fossil record

Branching pattern of species relationships



Geographical distribution:
Islands; climate v. geography

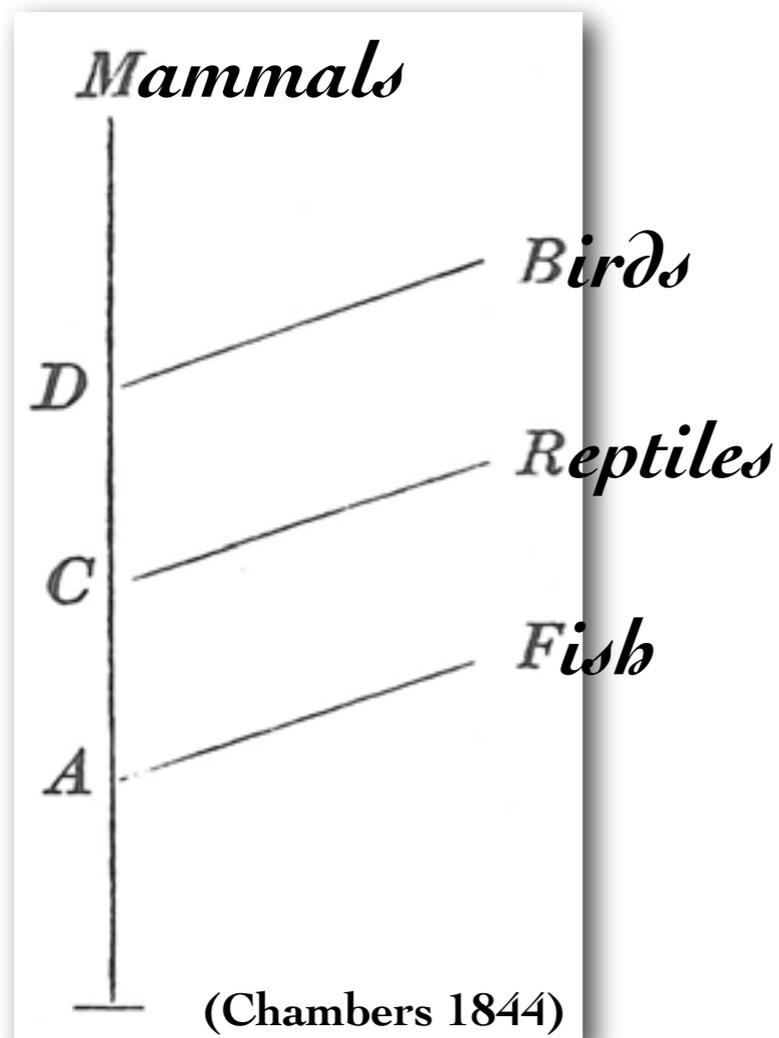
Lessons from domestication



Non-progression of the fossil record

Lyell denied that the fossil record exhibits directional change over time – his “non-progression” argument.

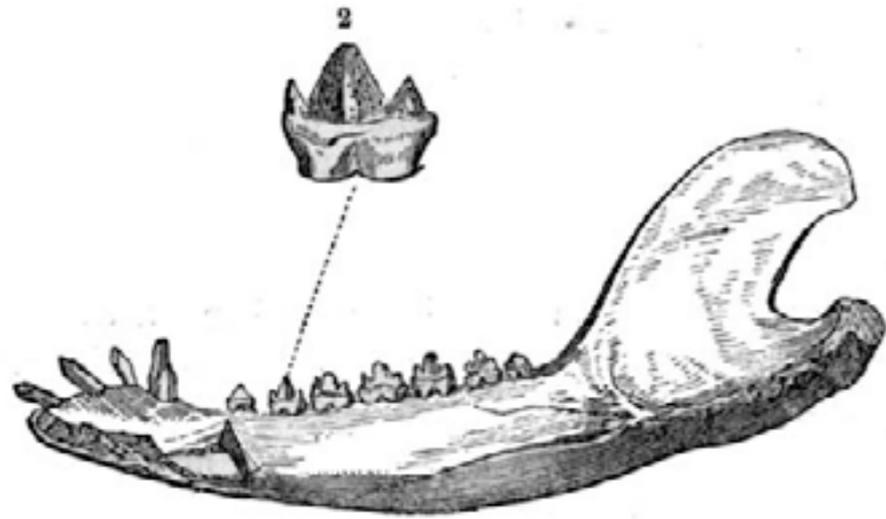
In the *Principles* he wrote that: “Some of the more ancient Saurians approximated more nearly in their organisation to the types of living Mammalia than do any of our existing reptiles.”



“Which?” Wallace asks;
“just what I want” (p. 37)

Wallace realizes this is consistent with
common ancestry of reptiles and
mammals.

Branching patterns of species relationship



Phascolotherium (Didelphis) bucklandi

Lyell: “the Didelphys of the [Jurassic] is fatal to the theory of progressive development.”

“Not so,” declares Wallace...

“...if low organized mammalia branched out of low reptiles, fishes. All that is required for the progression is that some reptiles should appear before Mammalia & birds or even that they should appear together. In the same manner reptiles should not appear before fishes but it matters not how soon after them.”

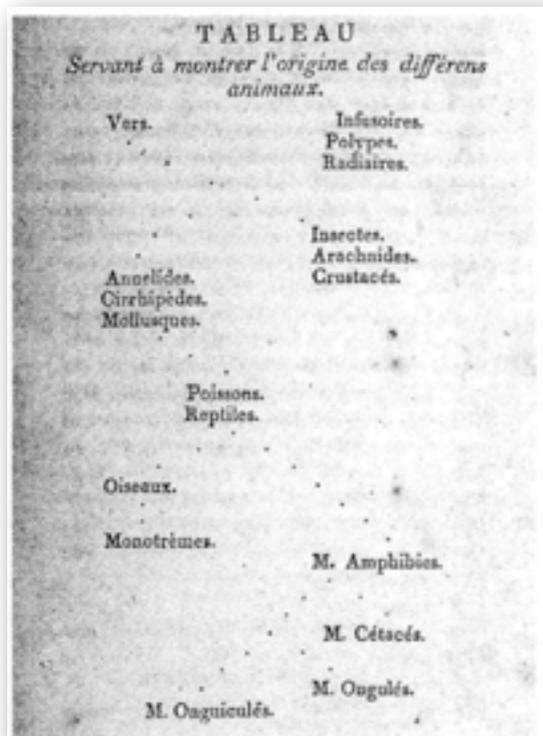
“All that the development theory requires is that some specimens of the lower organized group should appear earlier than any of the group of higher organization.” (p. 37)

(pp. 38-39)

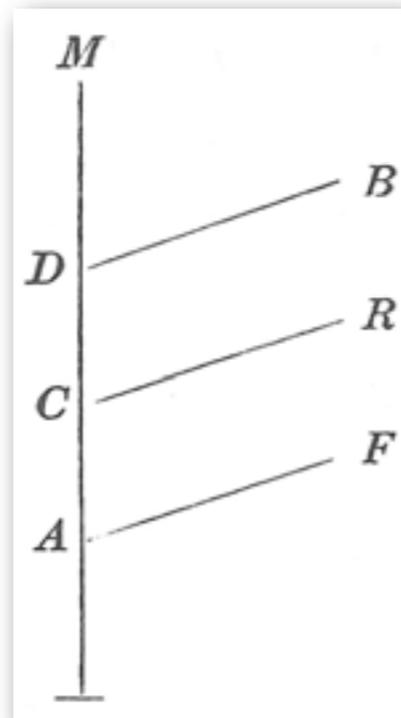
It is not “necessary that the highest forms of one group should appear before the lowest of the next succeeding.”

Consider, rather, “that each group goes on progressing after other groups have branched from it. They then go on in parallel or diverging series...”

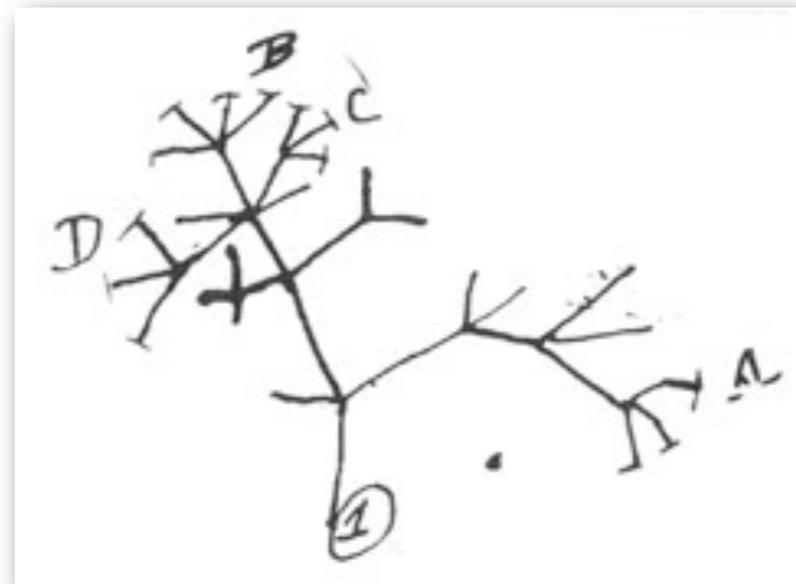
Lamarck
1814



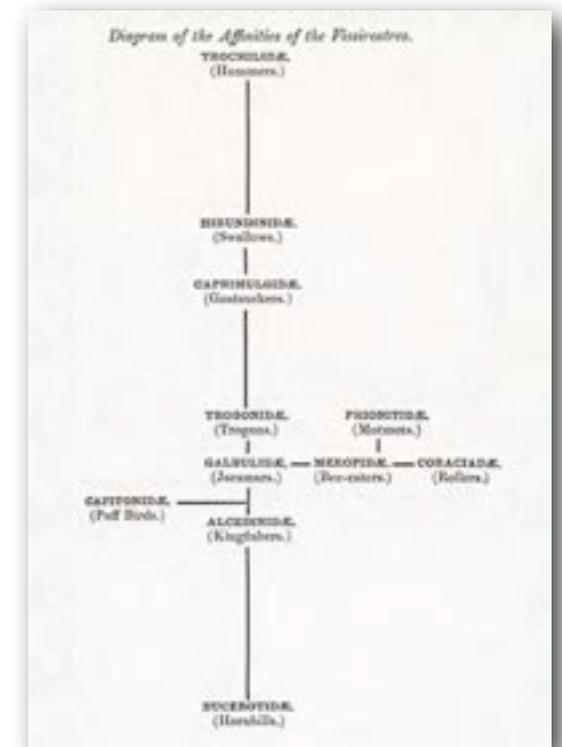
Chambers
1844



Darwin
1838



Wallace
1856



Geographical Distribution

Lyell occupies much space in shewing how the species which are common to different & distant countries, might have been carried from one to the other by a variety of accidents. But this has never been felt to be a difficulty. The matter of wonder has always been that in distant countries of similar climate so many should be different. This he gets over by special creations of the species each in one spot as they were wanted.

(p. 45)

Lyell occupies much space in shewing how the species which are common to different & distant countries, might have been carried from one to the other by a variety of accidents. But this has never been felt to be a difficulty. The matter of wonder has always been that in distant countries of similar climate so many should be different. This he gets over by special creations of the species each in one spot as they were wanted.

Borneo v. New Guinea v. Australia

Relative isolation trumps important environmental similarity



Borneo v. New Guinea v. Australia

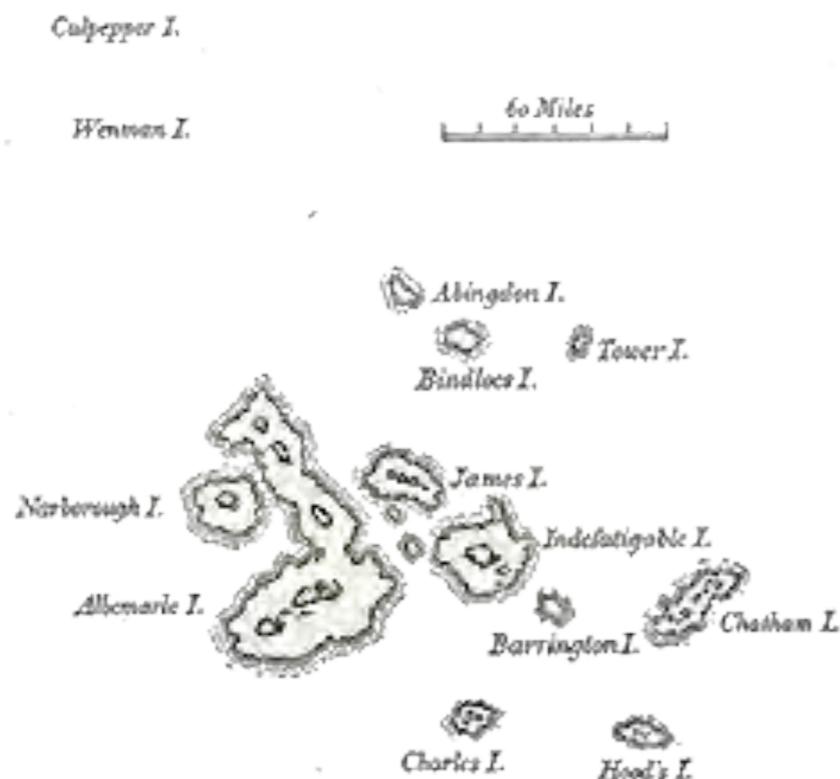
Relative isolation trumps important environmental similarity



Lessons from Islands

Why do unique island species show an affinity with species of the nearest mainland?

“In a small group of islands not very distant from the main land, like the Galapagos, we find animals & plants different from those of any other country but resembling those of the nearest land...



...If they are special creations why should they resemble those of the nearest land? Does not that fact point to an origin from that land?” (p. 46)

Wallace dismisses Lyell's view:

“Here we must suppose special creations in each island of peculiar species though the islands are all exactly similar in structure soil & climate & some of them within sight of each other...”

“Again in these islands we find species peculiar to each island, & not one of them containing all the species found in the others as would be the case had one been peopled with new creations & the others left to become peopled by winds currents &c. from it.”

“It may be said it is a mystery which we cannot explain, but do we not thus make unnecessary mysteries & difficulties by supposing special creations contrary to the present course of nature?” (pp. 46-47)

Raivavae, Andrew Bruckner

Domestication

In the *Principles*, Lyell cited a number of ways that domesticated varieties undermine transmutationism, among them:

(1) the notion that species only vary within limits, as no domestic variety had been seen to be transmutated into a new species;

(2) the tendency of domesticated varieties to "revert" to parental type illustrates the limited nature of their capacity for change; and

(3) the observation that preserved remains of animals (including domestic species) from ancient tombs suggest no change over thousands of years.

Richard Barnes, National Geographic, November 2009



Wallace's approach to domestication in the Species Notebook differs from that in the Ternate Essay.

In the notebook he calls Lyell on the question of what we learn from domestic varieties.

Wallace argues that domestic varieties are *themselves* evidence of transmutation:

“Is not the change of one original animal to two such different animals as the Greyhound & the bulldog a transmutation? – Is there more essential difference between the ass the giraffe & the zebra than between these two varieties of dogs?”



Species only vary within limits?

Wallace:

“In fact what positive evidence have we that species only vary within certain limits?”

“Let us suppose that every variety of the Dog but one was to become extinct & that one...gradual[ly] spread over the whole world, subjected to every variety of climate & food, & domesticated by every variety of the human race.

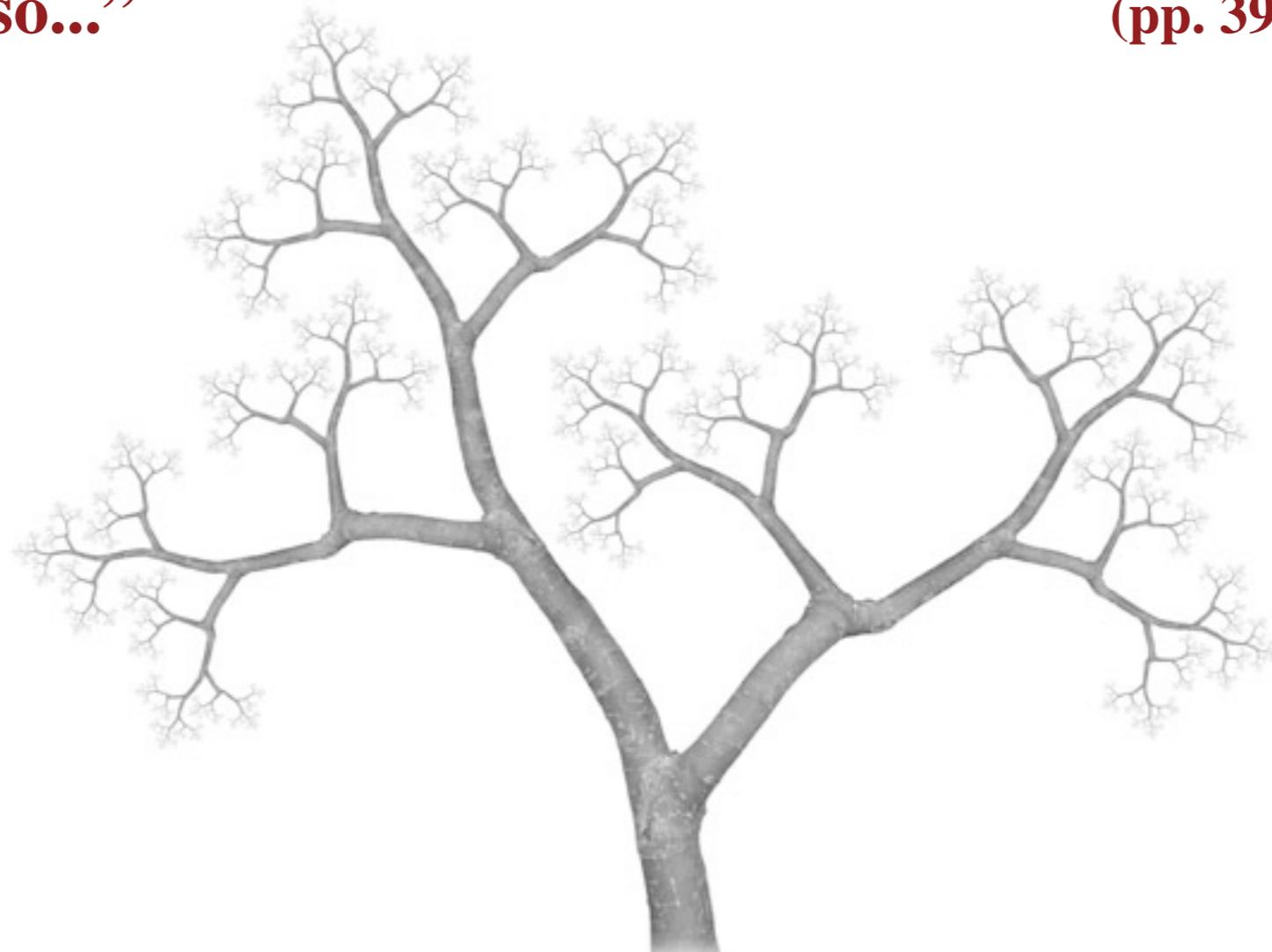
Have we any reason for supposing that in the course of ages a new series of varieties quite distinct from any now existing would not be developed[?] ...

...& then should the same process be repeated & one of these varieties farthest removed from the original, again be spread over the earth & be subjected to the same variety of conditions...

“Does it not seem probable that again new varieties would be produced, & have we any evidence to show that at length a check would be placed on any further change & ever after the species remain perfectly invariable under any circumstances whatever[?]”

“Those who advocate variation within definite limits must suppose so...”

(pp. 39-40)



Reversion to parental type?

“Changes which we bring about artificially in short periods may have a tendency to revert to the parent stock. This is considered a grand test of a variety. But when the Change has been produced by nature during a long series of generations, as gradual as the changes of Geology, it by no means follows that it may not be permanent & thus true species be produced.” (p. 45)

Here Wallace essentially states a central thesis of his Ternate essay of 1858.

Out-Lyelling Lyell...

“It would be an extraordinary thing if while the modification of the surface ... by natural causes now in operation & the extinction of species was the natural result of the same causes, yet the reproduction & introduction of new species required special acts of creation, or some process which does not present itself in the ordinary course of nature...”

“...Introduce this and disprove all Lyell's arguments first at the commencement of my last chapter.”

“Evolutionary” topics of the Species Notebook

Geology & Paleontology

Geological change; uplift, subsidence
Intermediate nature of common ancestors
Gaps in fossil record
Geol. Succession; Continuous and gradual change
Progressive development, parallelism
Iceberg theory / Erratics
Didelphys of the Oolite

Arguments & Observations for Transmutation

Beautiful facts of morphology...
Caution RE adaptive function
Resistance to acceptance of transmutation; like prejudiced reception of earlier ideas
Domestication, Limits of var.
New varieties arising - examples
Varieties: origin and fate
Criticism of claims of 'design'
Struggle f/existence; lack of harmony, balance
Primroses and Cowslips

Human-Primate Relationship & Human Variation

"Man" - reason vs. instinct
Human-primate relationship
Orangutans / behavioral obs.
Human races

Instinct & Habit

Habits and structure not in accord
Transitional habits, form
Bees' cells
Instinct; 'proceed by degrees' - grad. ser
Bird migration
Ants & aphids
Birds' nests; Variation in nest building behavior

Morphology & Affinity

Morphological affinities, analogies, transitions
Eyes of cave/burrowing mammals
Embryology informs classification
Branching, tree, divergence
Geographical Distribution
Distribution, relationships
Islands / island biota etc.
St. Helena, Galapagos, Canaries, Cape Verde
Tenerife - spp. interaction, isolation
Climate change affecting distribution



Insights from the Species Notebook

- 1. Depth and breadth of Wallace's "evolutionary" thinking in the 1850s.**
- 2. Wallace's "evolutionary foil" was Lyell; there is good evidence that both the Sarawak Law and Ternate papers were aimed at Lyell, and "On the Organic Law of Change" likely would have been too.**
- 3. Wallace was pursuing a "consilience" argument, like Darwin, tying together numerous disparate strands of evidence in support of transmutation. Their paths were more similar than has been realized.**

Acknowledgements



I am deeply grateful to Andrew Berry & George and Jan Beccaloni...



...Lynda Brooks, Elaine Charwat, Andrea Deneau, and the Executive Council of the Linnean Society...



...Michael Fisher at Harvard University Press...



Highlands Biological Station, Western Carolina University, and the Wissenschaftskolleg zu Berlin...

...And last but not least, my wife and collaborator, Leslie Costa