

# Evolution and the Origins of Species

STS.003, Fall 2010

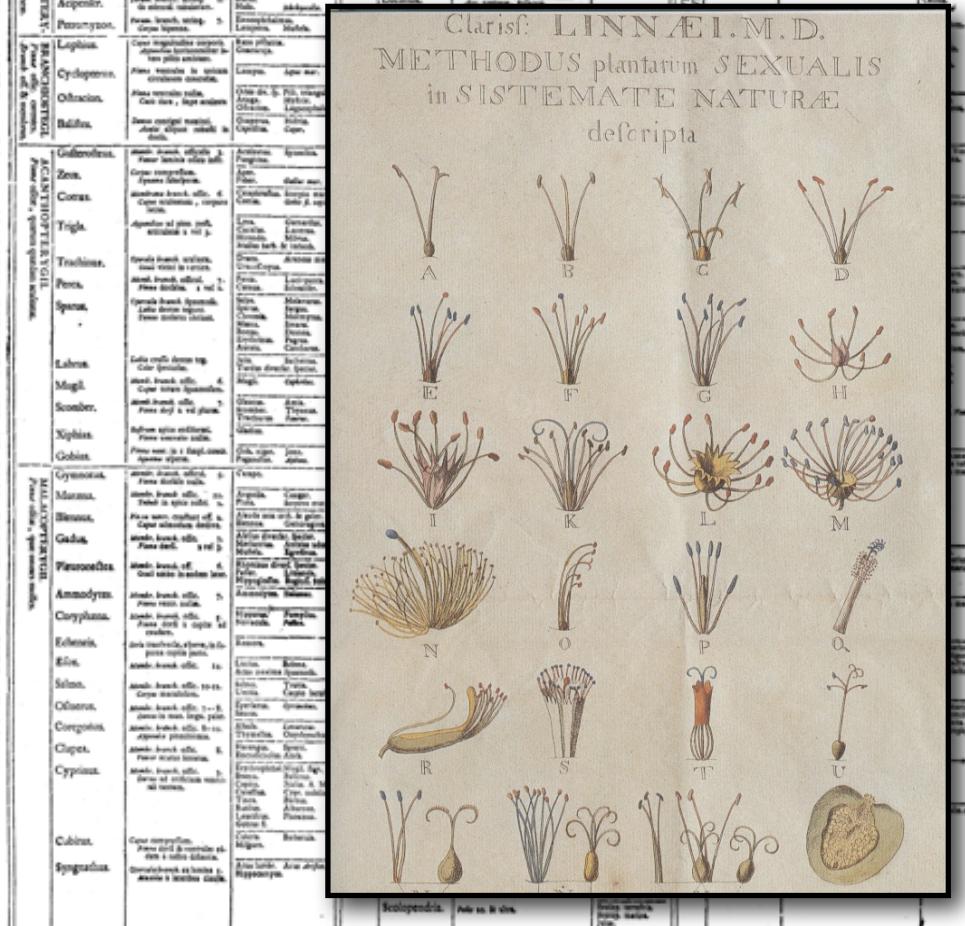
# Unit 2: Nature



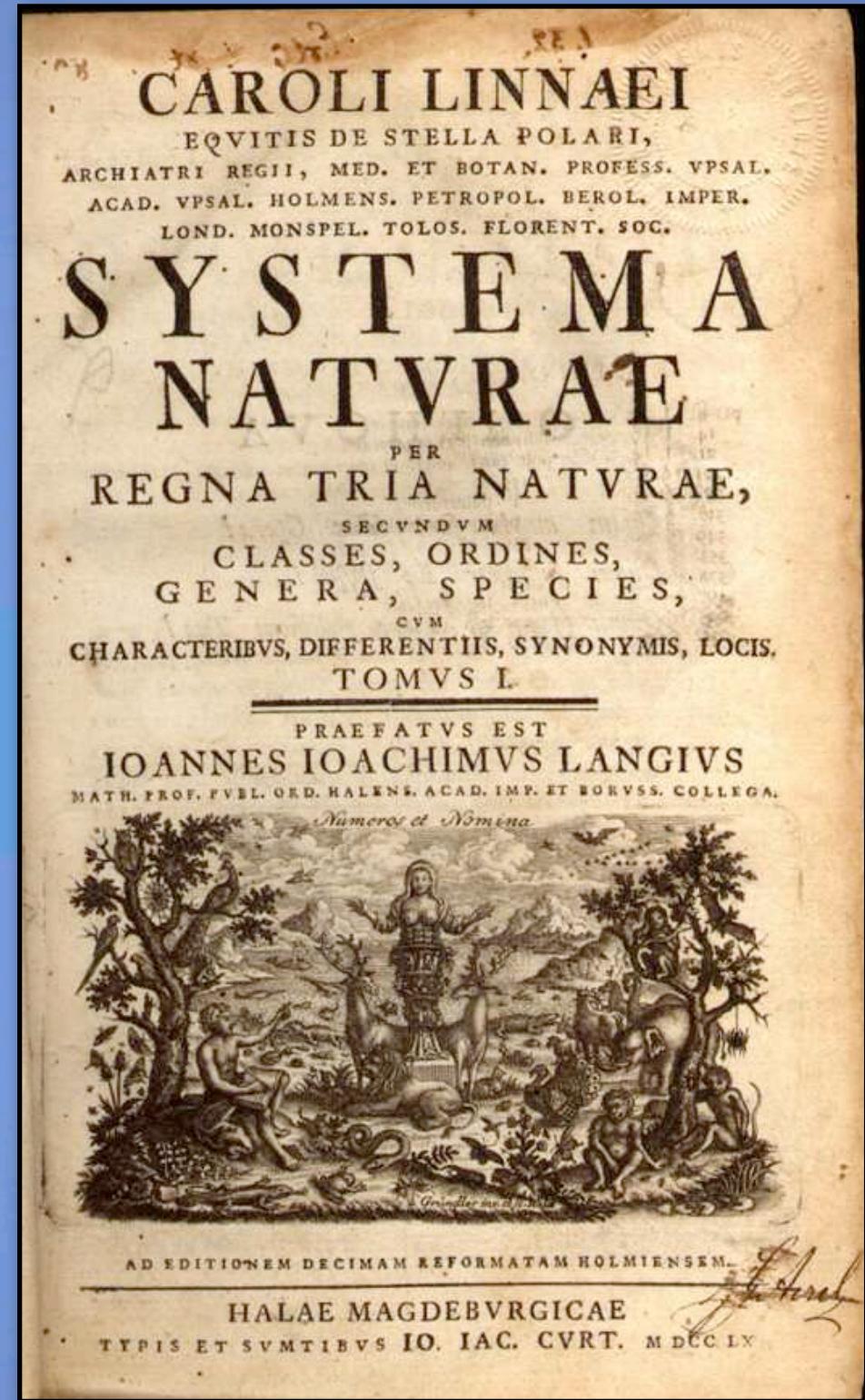
- (1a) Are humans part of nature? Are they distinct from nature?  
Do they make nature?
- (1b) Are living things, in particular species, changing or  
unchanging?
- (2) Science and commerce

# You are here

REGNUM ANIMALE.					
IV PISCES.		V INSECTA.		VI VERMES.	
Cetops spadon.	Pisces vere infrafundit, medus., vel squamulos.	Cetops crista colla cava loco sellum.	Cetops antennae infrafundit.	Corpora Mytili ab uno parte bali coquidae foliis affici.	
Therichthys.	Dorsu in uterum medula. Dorsum imponit.	Muscis 1. Forma sec.			
Carodon.	Dorsum in uterum medula. Dorsum imponit.	Form. Viscosa in rectis arcis. Cerv. cap.			
Monodus.	Dorsum in uterum medula. Dorsum imponit.	Muscosus. Uterus.			
Balana.	Dorsu in recto, non. recta. Dorsum imponit.	Ex. Crustacei. & Piscis. S. Meall. In rectis arcis. Cerv. cap.			
Delphinus.	Dorsu in uterum medula. Dorsum imponit.	Polyp. Diaphanes.			
PLACENTARI.					
Raja.	Femina brachii, uter. 1. Corp. imponit.	Silura.	I. Forma uterina recta anterius. Epiphysis, recta.	Gordius.	Cepha. Eumenides, tenu. Eupolis.
Squalus.	Femina brachii, uter. Corp. imponit.	Dipterus.	Corp. rectum recta formae de. sub. Cerv. cap.	Tenius.	Corp. Eumenides, plures, vivent.
		Melol.	Corp. rectum recta formae de. sub. Cerv. cap.	Lombricus.	Corp. uterina, recta prominent diffus.
		Forficula.	Corp. rectum recta formae de. sub. Cerv. cap.	Hirudo.	Corp. uterina plures, sparsae inter. Corp. uterina plures, sparsae inter. Corp. uterina plures, sparsae inter.
		Notopoda.	Polypus in rectis aplo. non replicata.	Lymnaea.	
		Mordella.	Corp. recta uterina recta uterina.		
		Corydalis.	Corp. recta uterina recta uterina.		
		Bacillus.	Corp. recta uterina recta uterina.		
		Larvula.	Corp. recta uterina recta uterina.		
CHONDRICHTY.					



- Why classify?
- Science: “the great alphabet of nature”
- Theology: “Surely for no other reason than that the observer of the wonderful work might admire and praise its Maker.”
- Commerce: “All that is useful to man originates from these natural objects”



# Overview:

- Do the things of nature change? Darwin's argument for evolution
- What relations between humans and nature? The challenging consequences of Darwin's theory
- What relations between science and commerce? Darwinian evolution and Victorian capitalism

# The Fossil Question

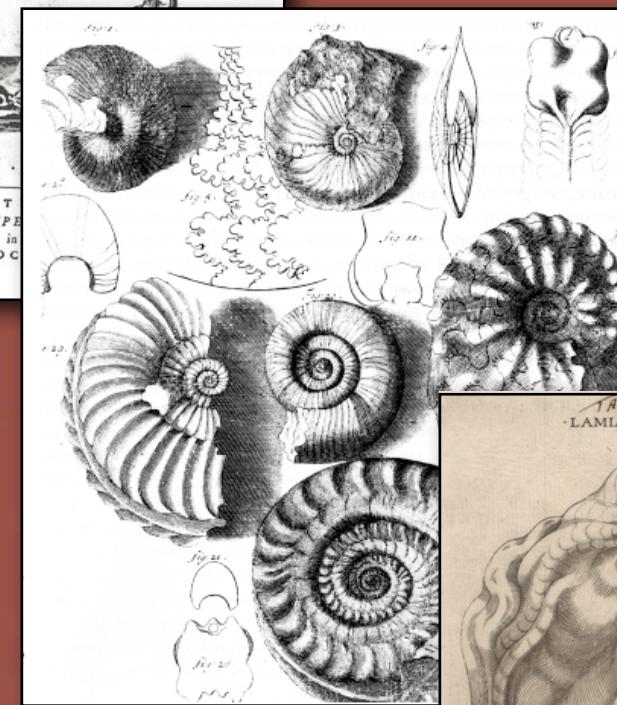
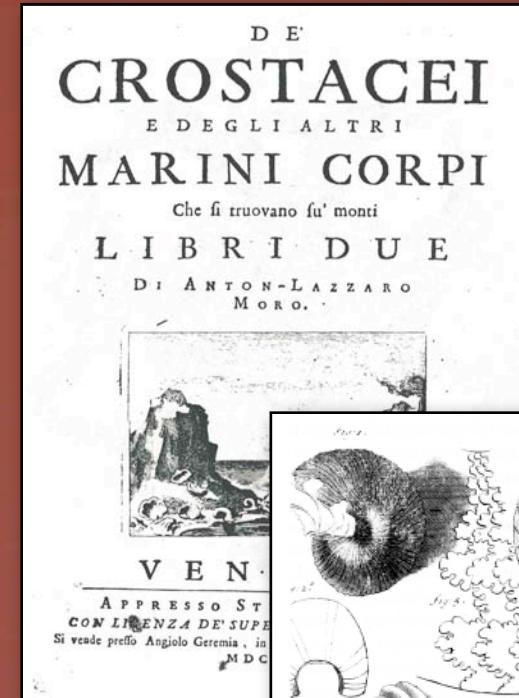
IMAGE OF “THE FIRST FOSSIL HUNTERS PALEONTOLOGY IN GREEK AND ROMAN TIMES,” ADRIENNE MAYOR, REMOVED DUE TO COPYRIGHT RESTRICTIONS.

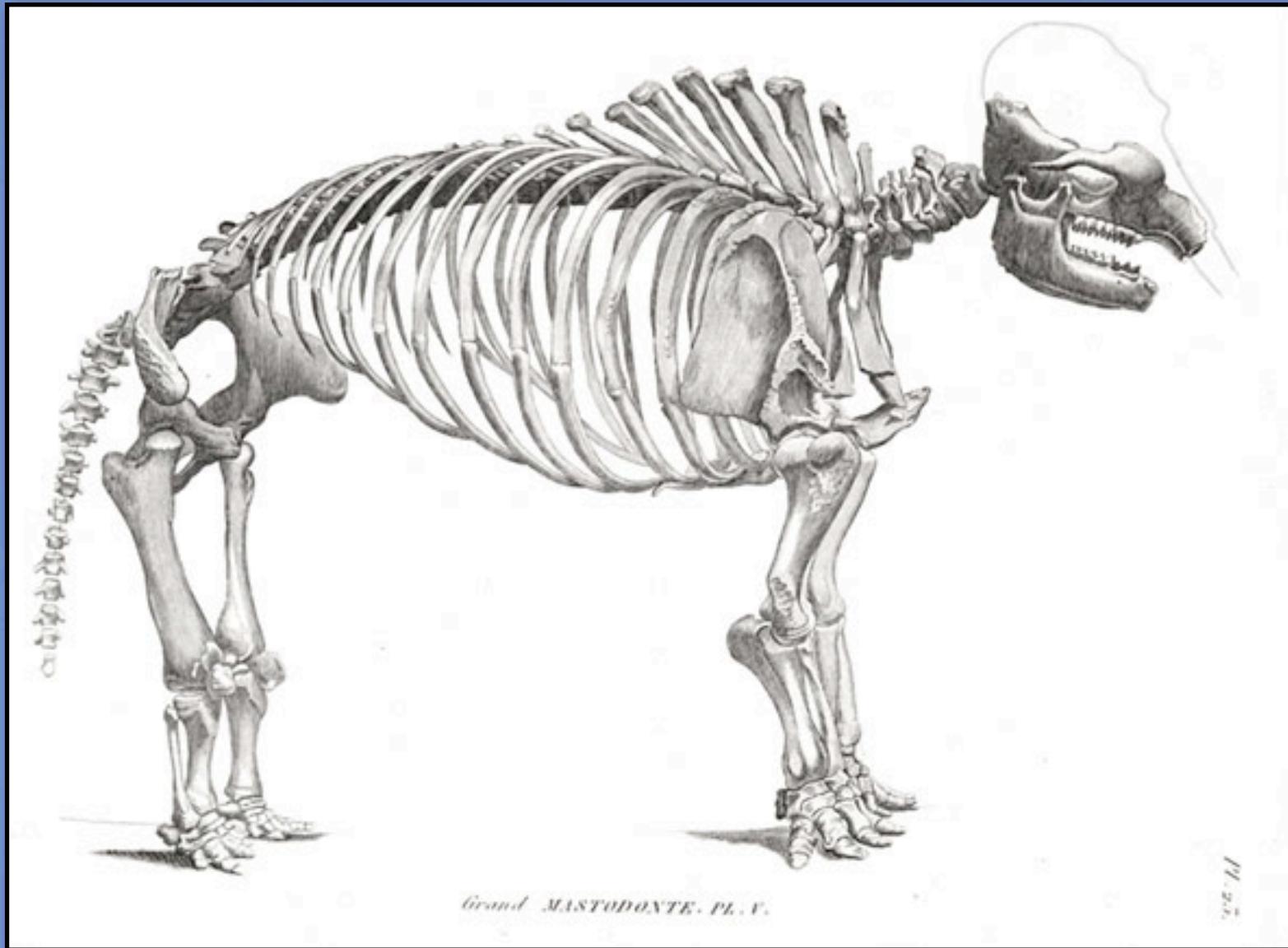


Photo courtesy of [IslesPunkFan](#) on Flickr.

# Fossil Theories, c. 1600-1720

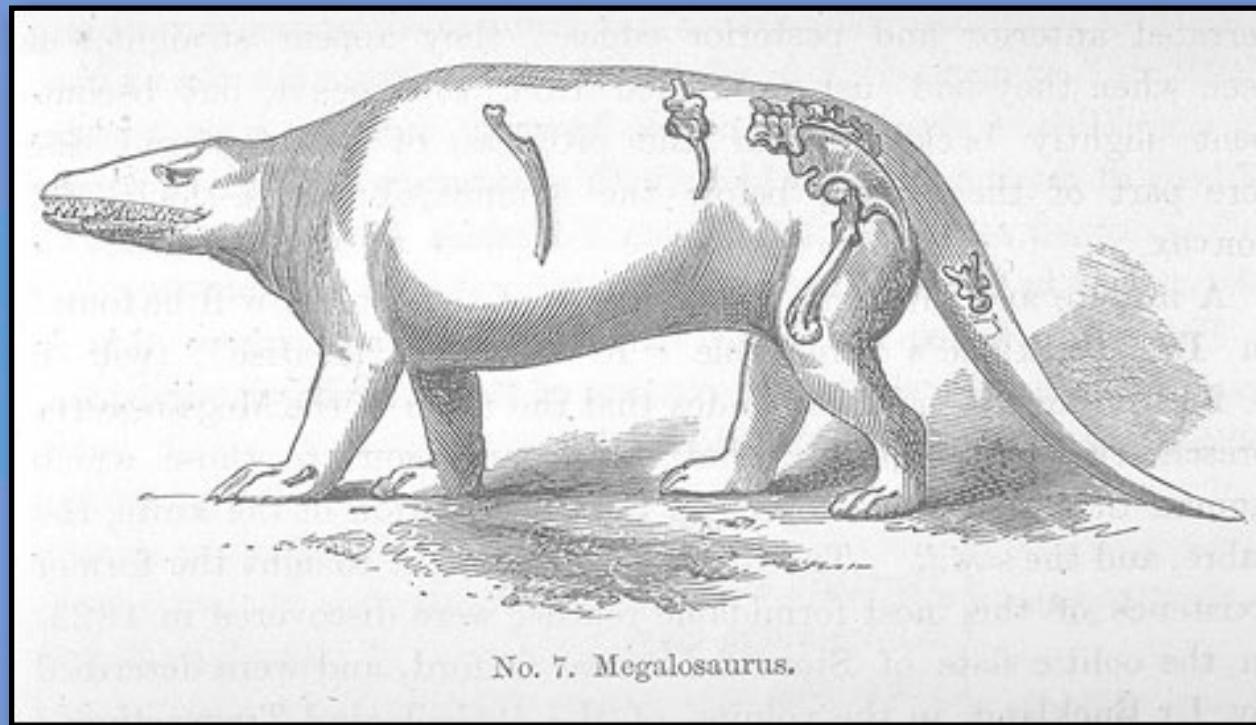
- Athanasius Kircher: “spiritus plasticus”
- Nicolaas Steno, analogies of fossil and living shark teeth
- Robert Hooke: remains can be found in various stages of mineralization
- Anton Lazarro Moro: rising volcanoes and fossils on mountains

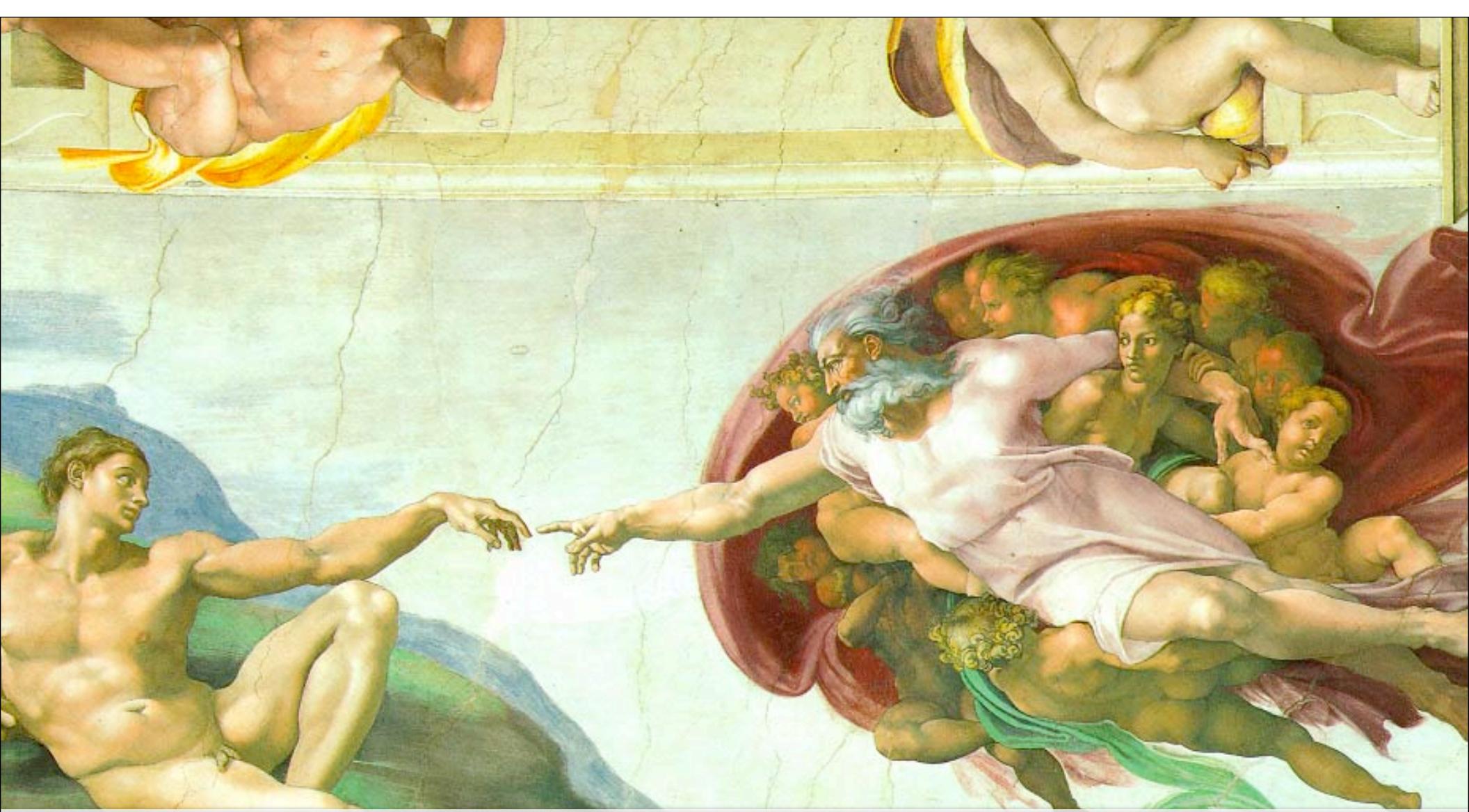




# Mysterious Bones: Mastodon On display in Philadelphia, 1801

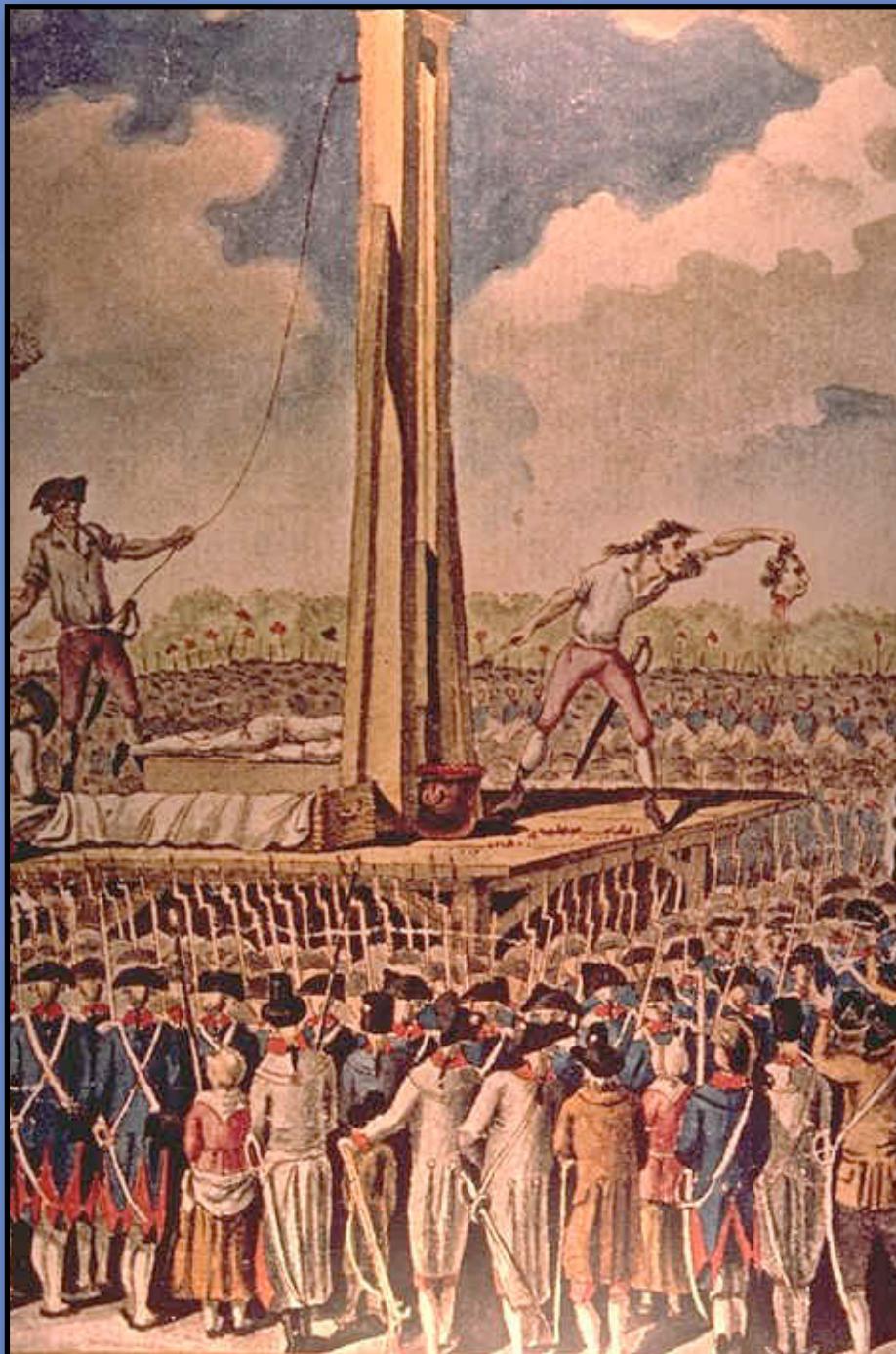
# “Dinosaur”: Richard Owen, 1842

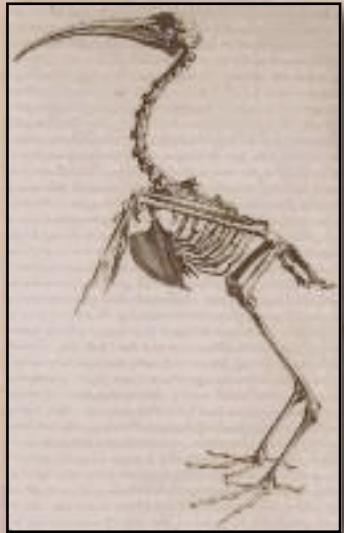




"And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind ... And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven ... And God said, Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind: and it was so ... God created man in his own image."

# Revolutions, Evolution, Catastrophe, and Extinction

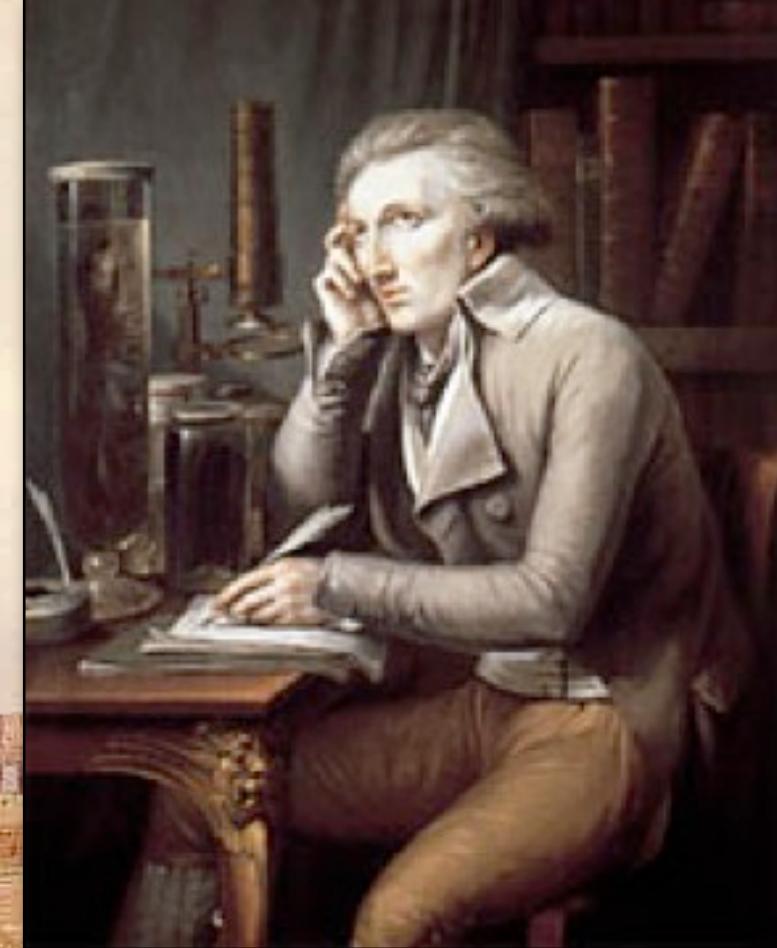




Mummified

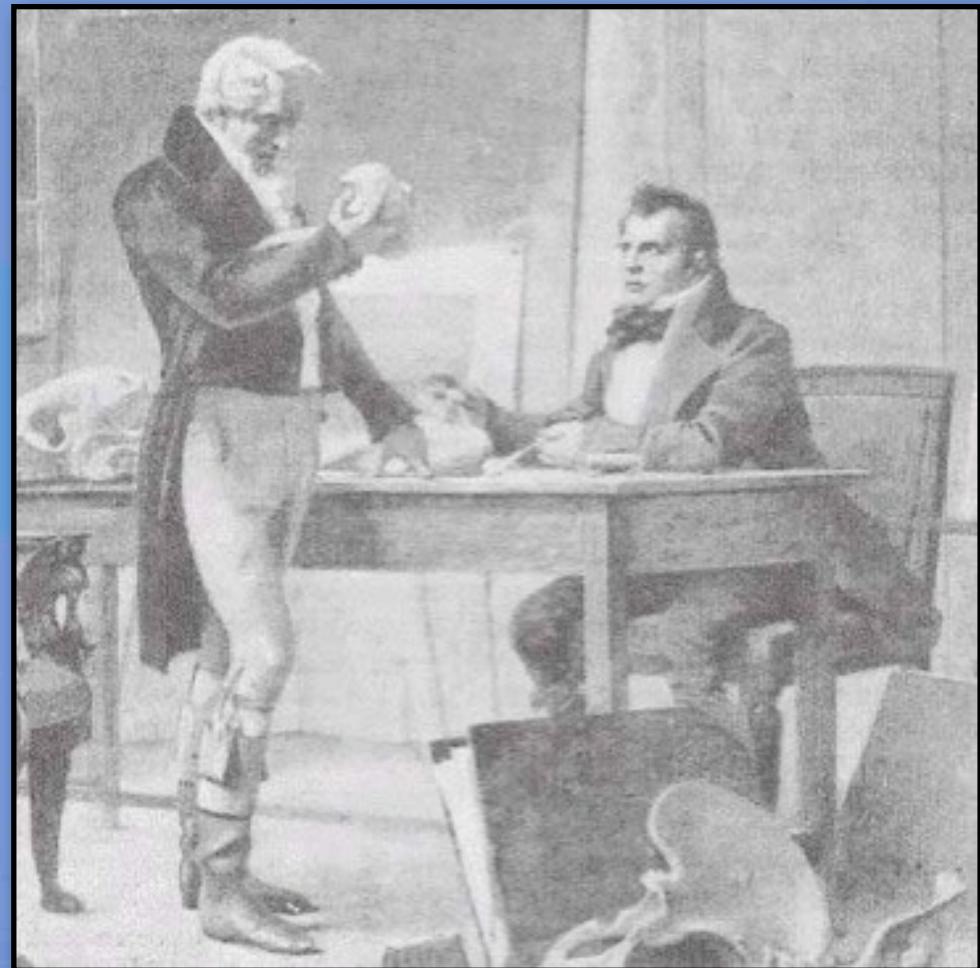


Modern



# Georges Cuvier's Egyptian Specimens: Fixity of Species

# Cuvier, Extinctions, Environmental Catastrophes





# Romanticism and Transmutation

Organic Life beneath the shoreless waves  
Was born and nurs'd in Ocean's pearly caves  
First forms minute, unseen by spheric glass,  
Move on the mud, or pierce the watery mass;  
These, as successive generations bloom,  
New powers acquire, and larger limbs assume;  
Whence countless groups of vegetation spring,  
And breathing realms of fin, and feet, and wing.

-- Erasmus Darwin, 1803

# Darwins and Wedgwoods



# Medical School and Surgery

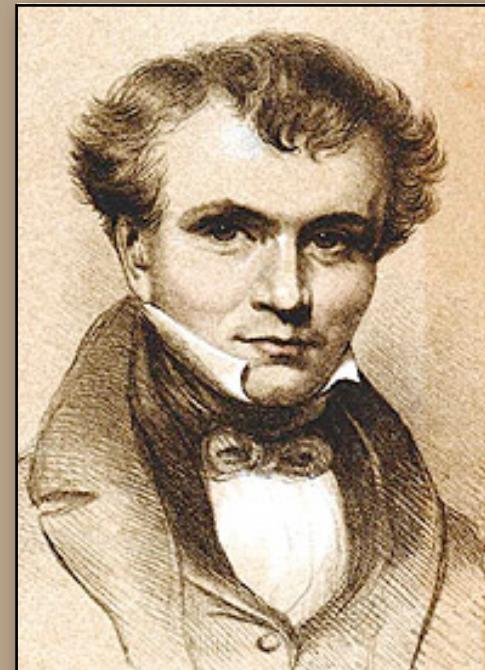




## William Paley: “Design must have had a designer”

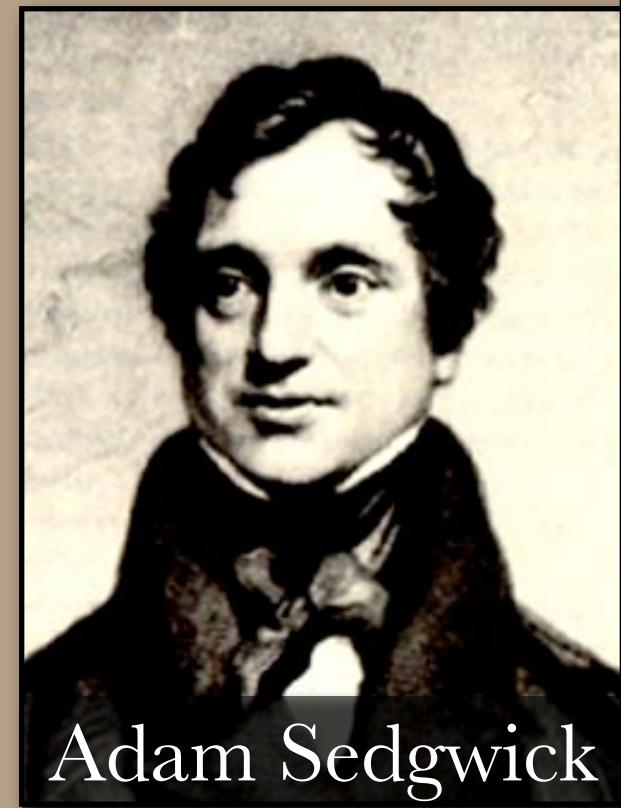
Photo of Christ College, University of Cambridge, removed due copyright restrictions.

William Whewell:  
“inexplicable and unintelligible, except  
by ... an intelligent author”

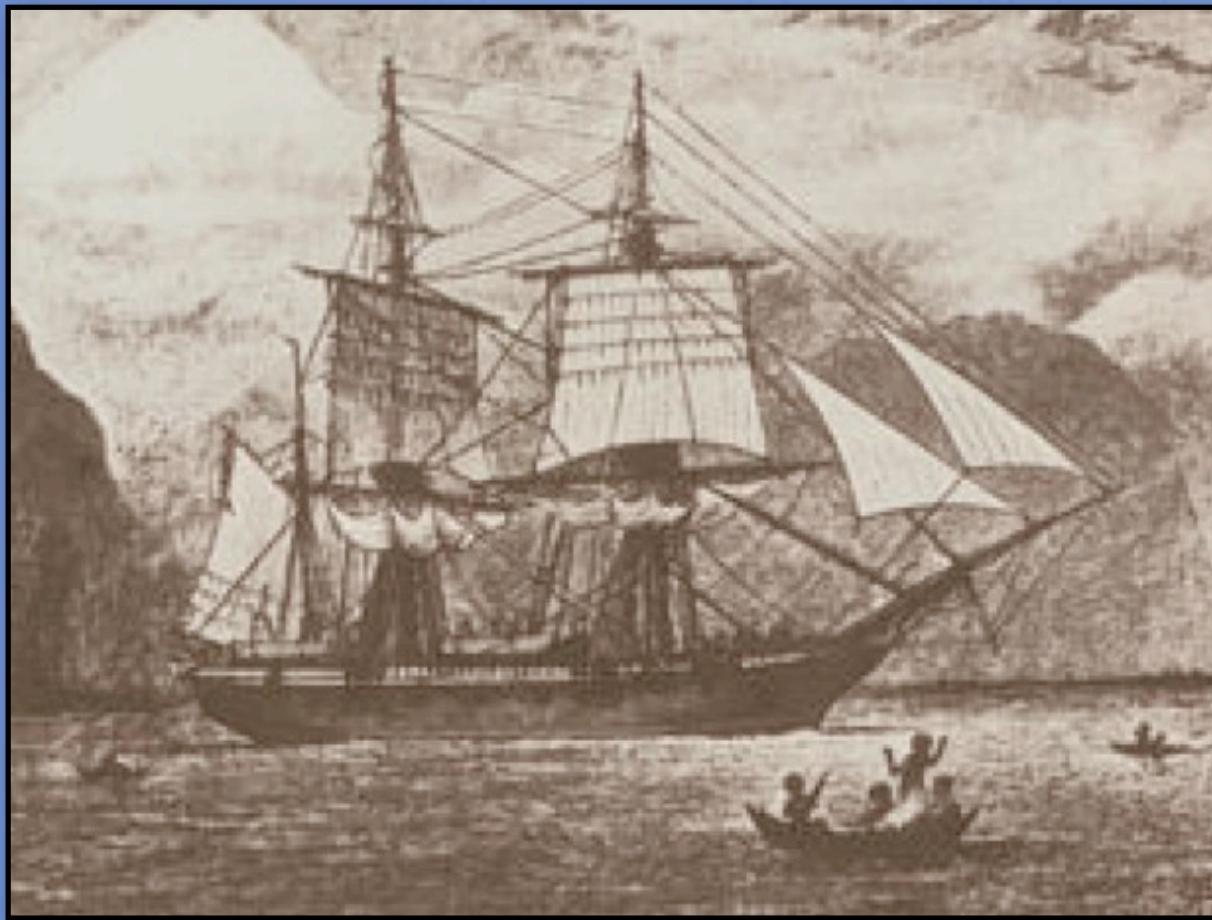


# Geology of Wales, Summer 1831

Photo of the Welsh countryside removed due to copyright restrictions.



Adam Sedgwick

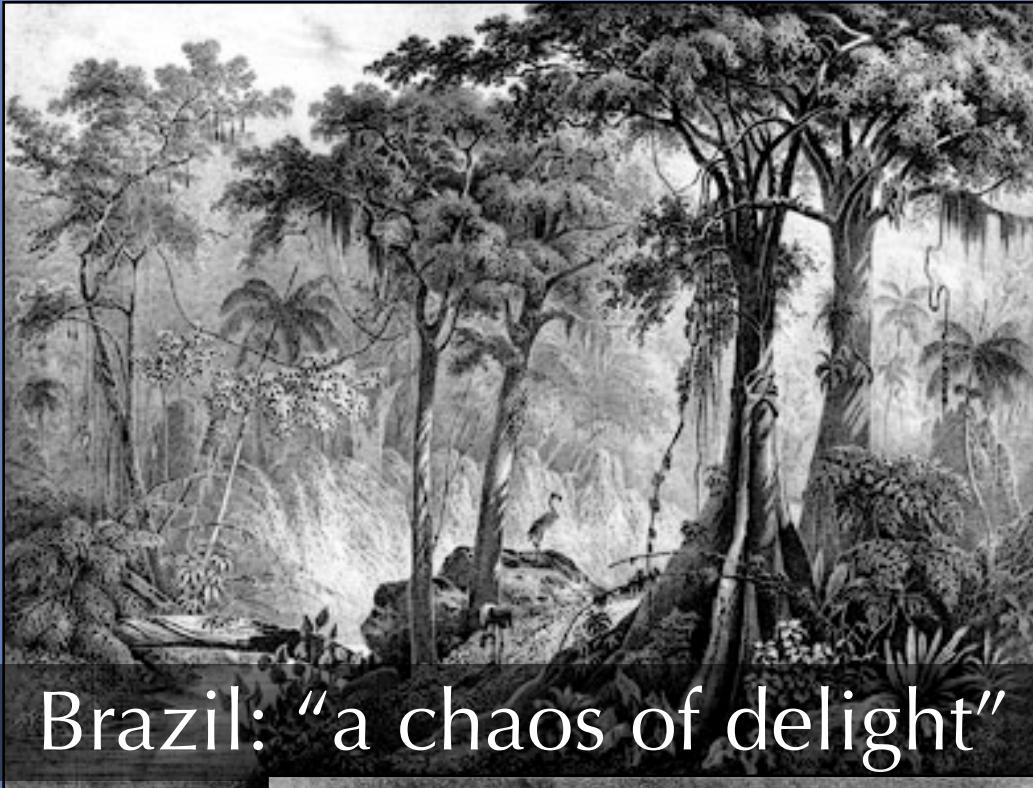


H.M.S. Beagle,  
1831-1836  
Capt. Robert Fitzroy

Map showing the course of the *Beagle* removed due to copyright restrictions.

“most exquisite in their  
forms & rich colors”





Brazil: "a chaos of delight"



Cape Horn, December 1832



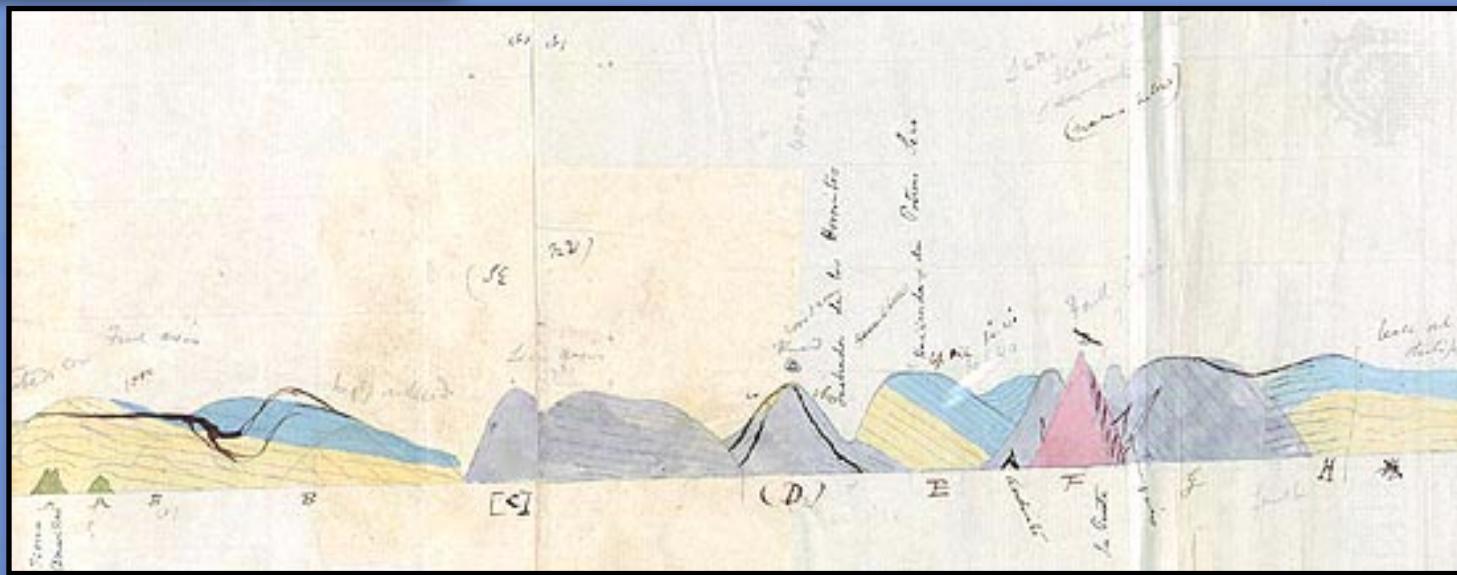
Fuegians



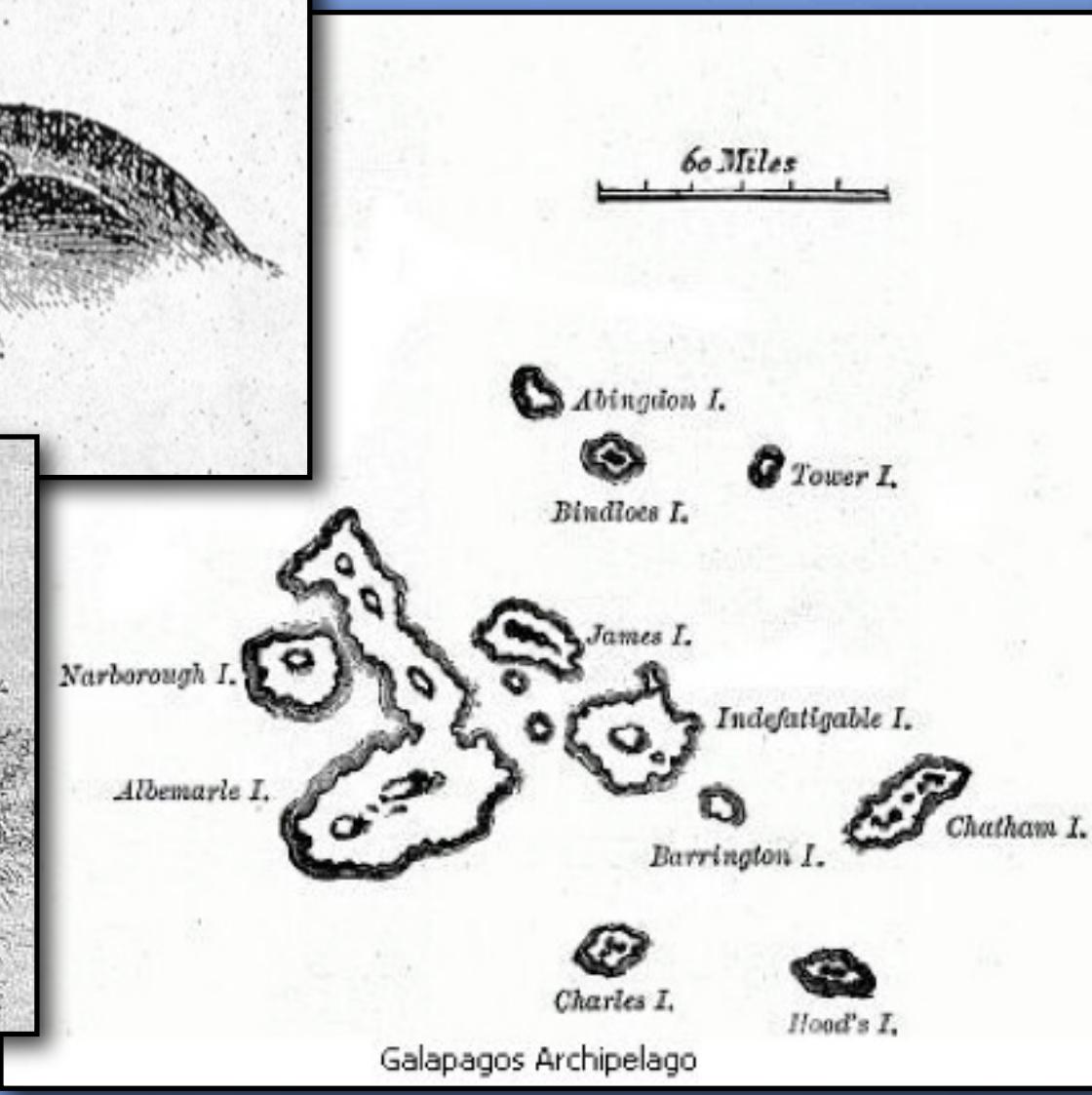
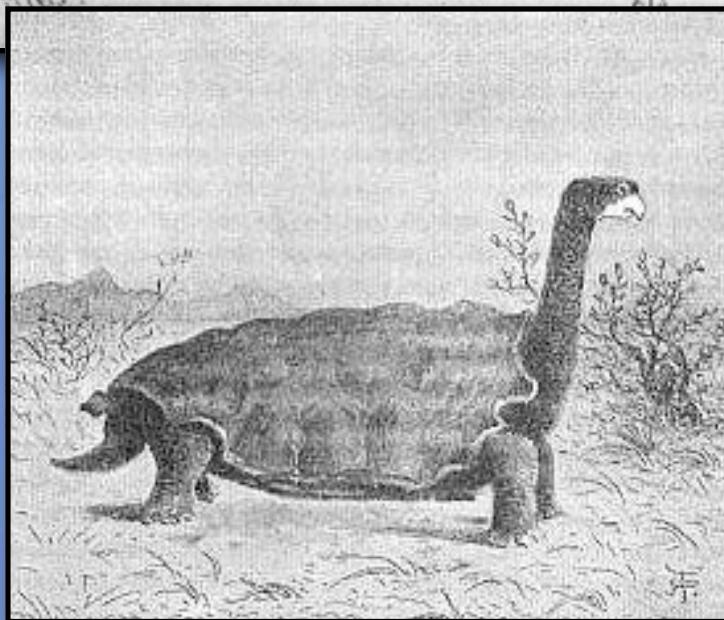
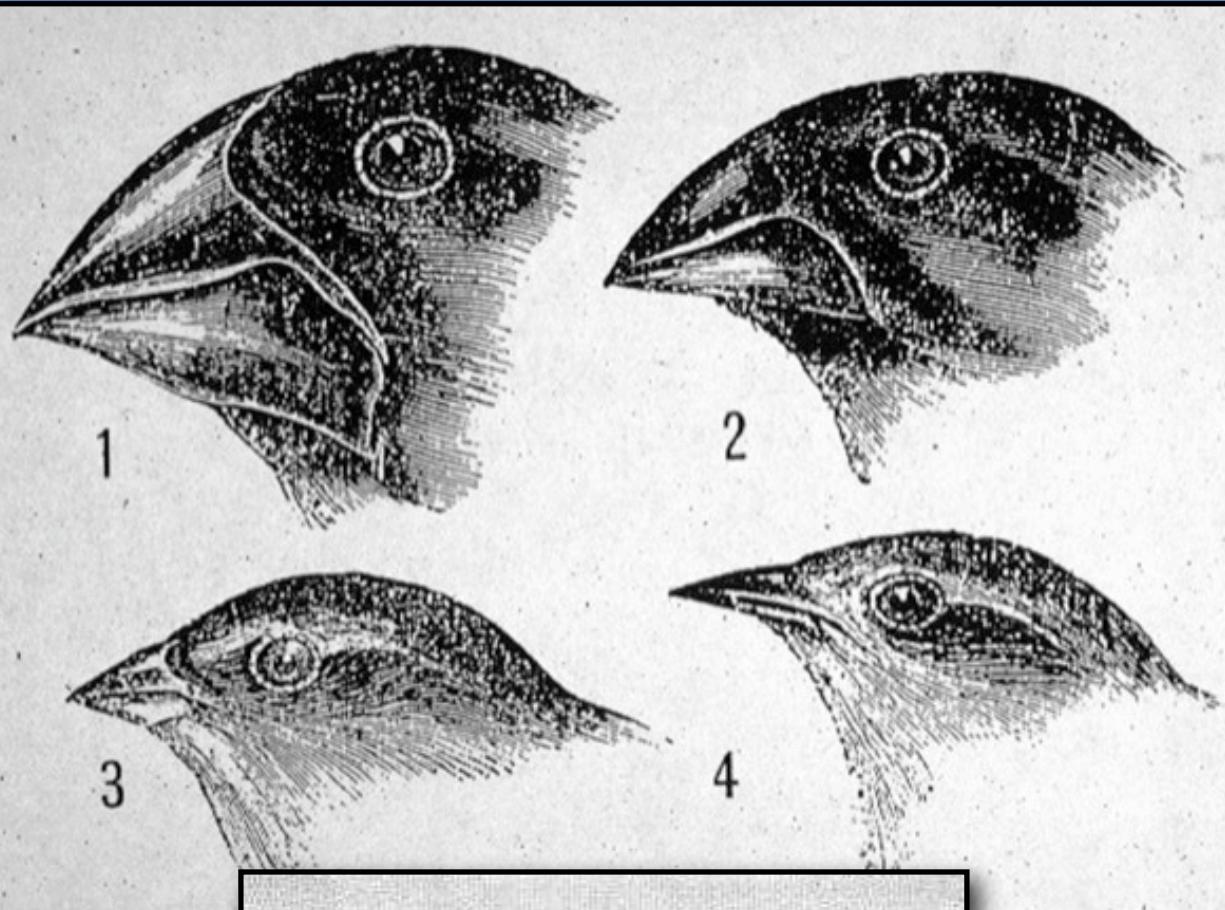
# Ruins of Concepcion, 20 February 1835

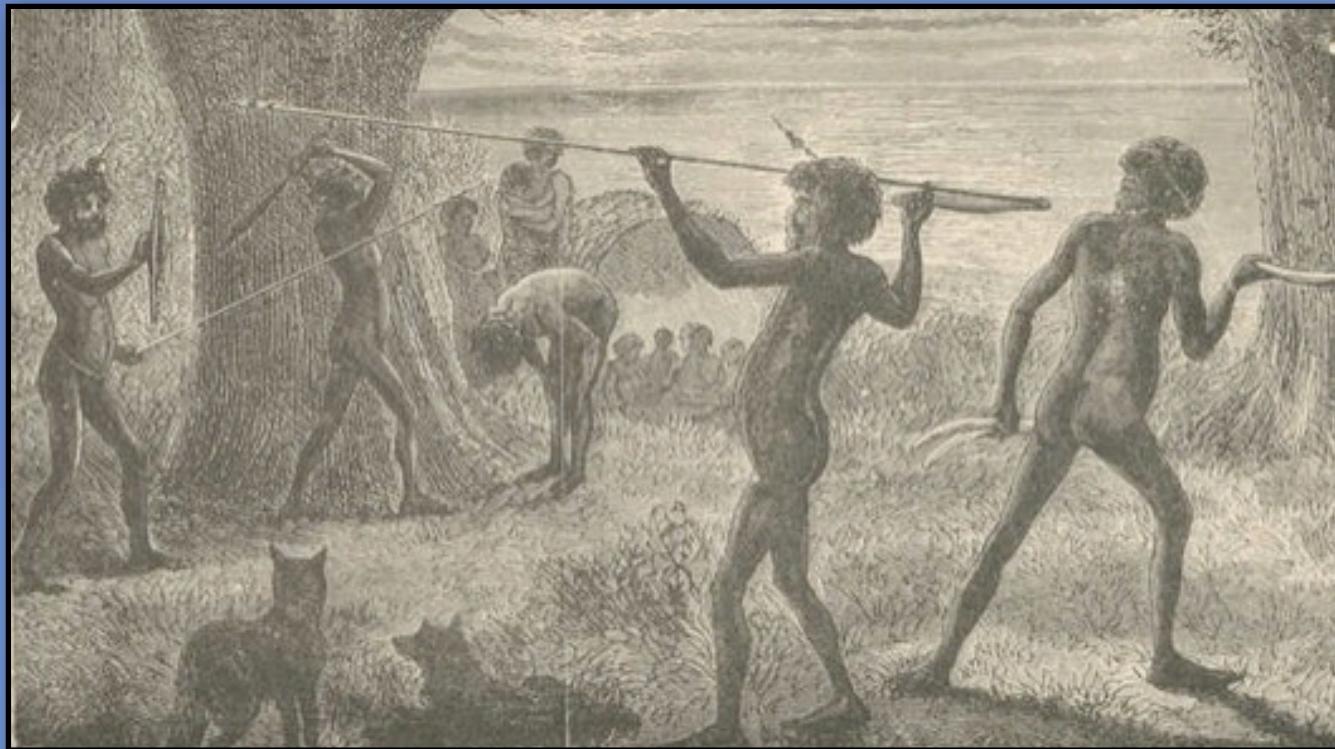


# Exploring and Mapping the Andes, 1834-1835

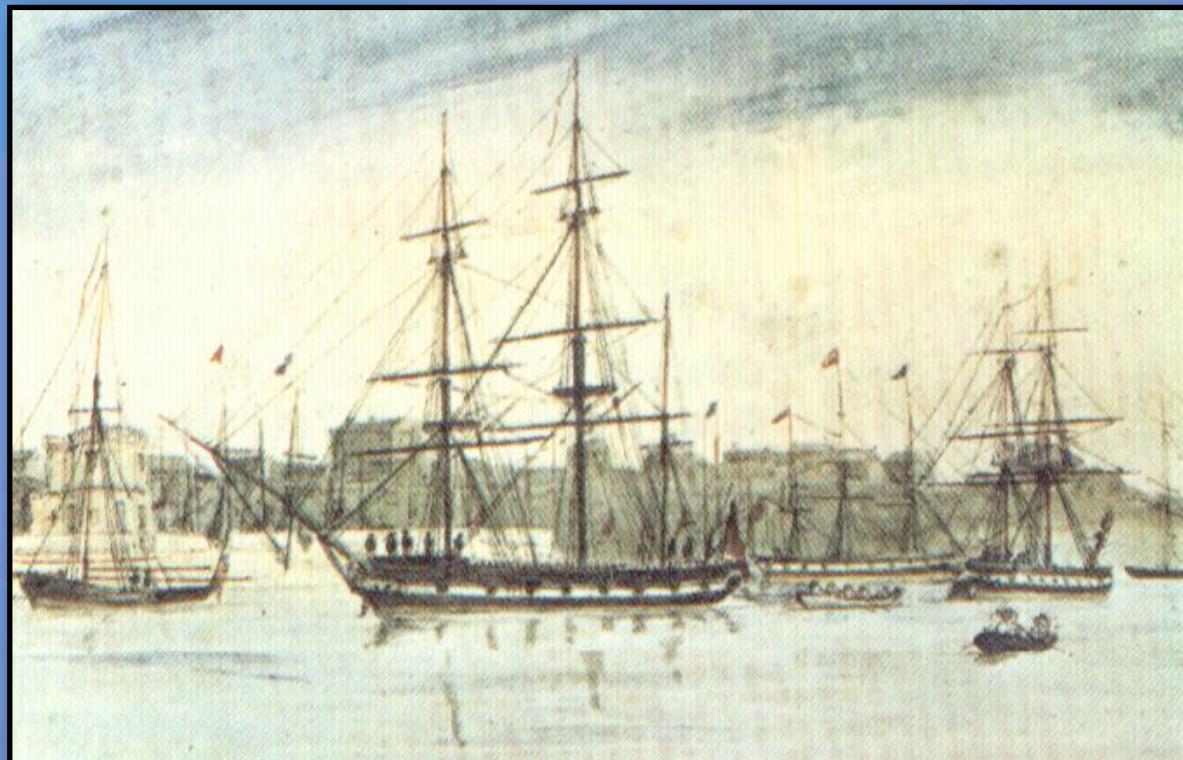


# Galapagos, September 1835





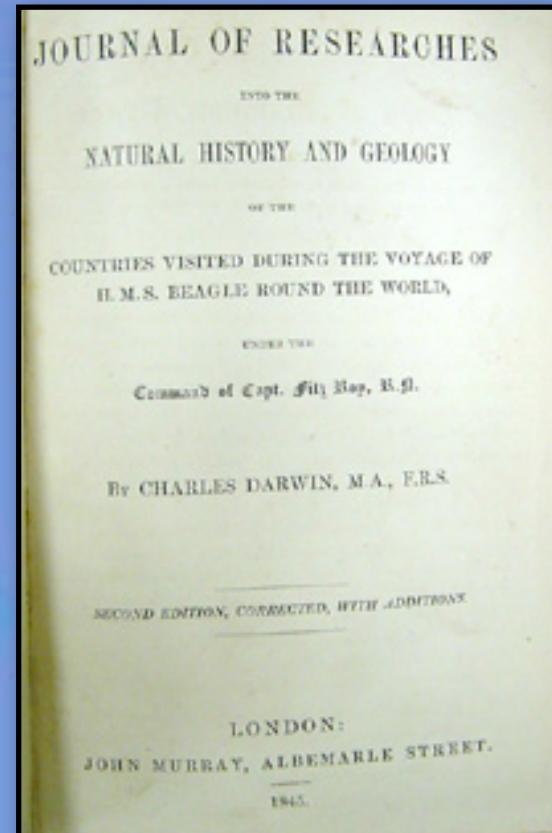
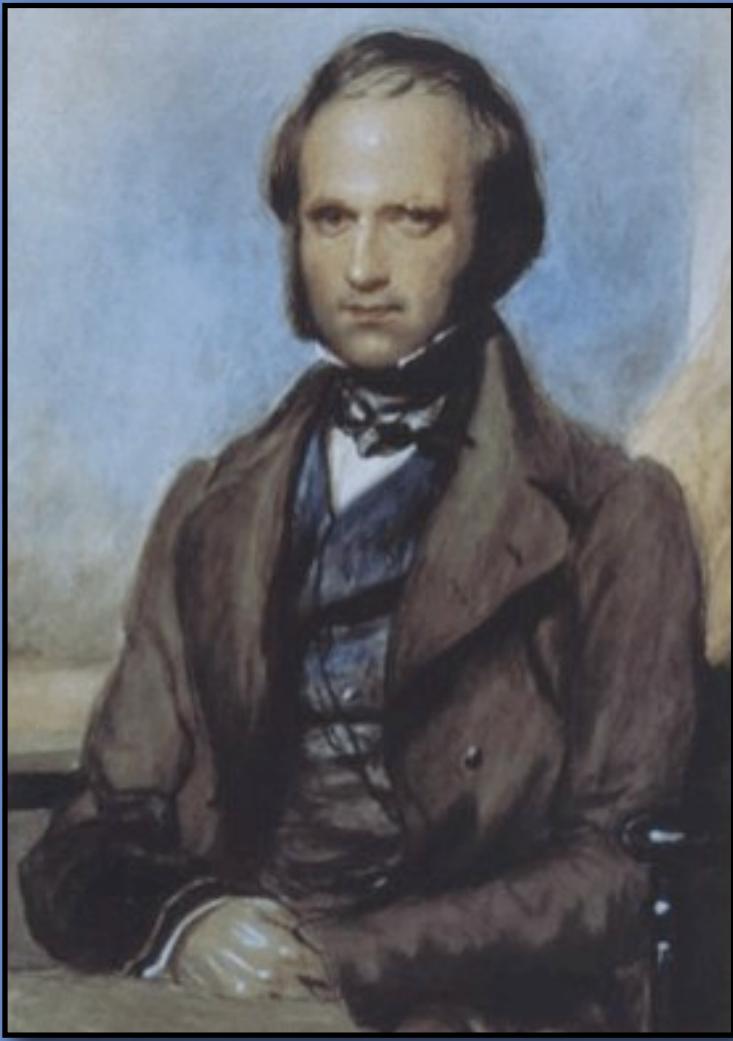
Australia,  
January 1836



# Darwin's Collections

- Writings:
  - Diary, 770 pages
  - Geology notes, 1383 pages
  - Zoology notes, 368 pages
- Specimens:
  - In alcohol: 1529
  - Skins, Bones, others: 3907



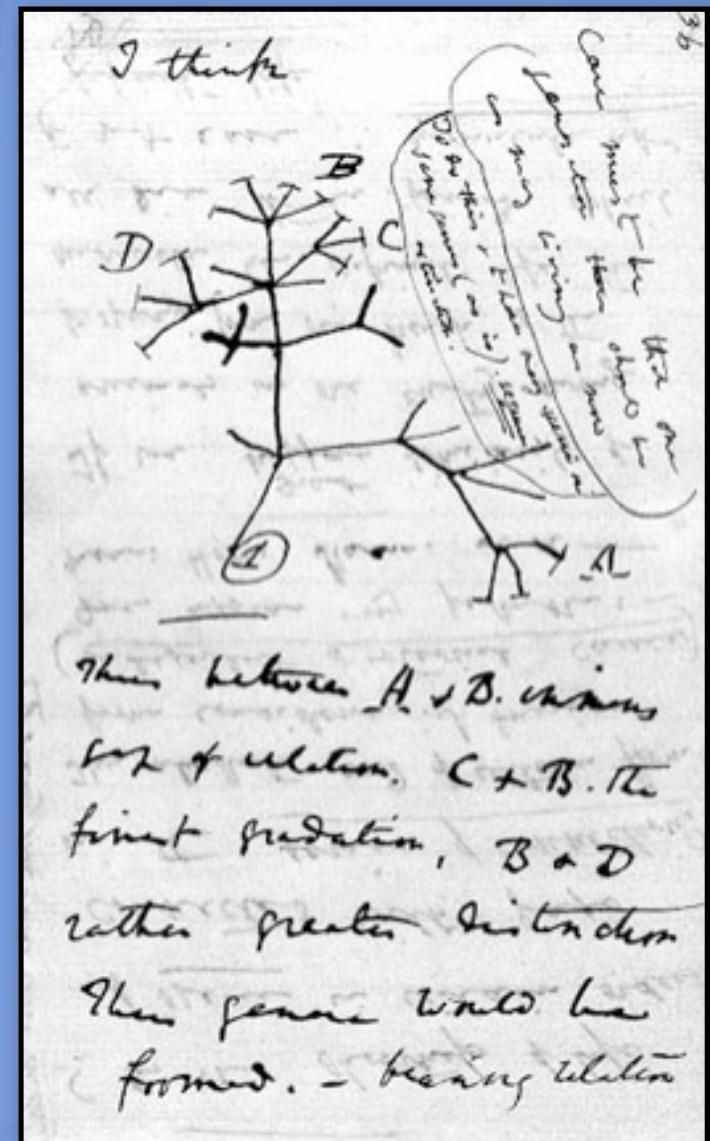


Darwin in London:  
Paper on Andes at Geological Society, January 1837  
*Journal of Researches*, 1839

Photo of finch specimens removed due to copyright restrictions.



# Finches and Geographic Speciation, March 1838





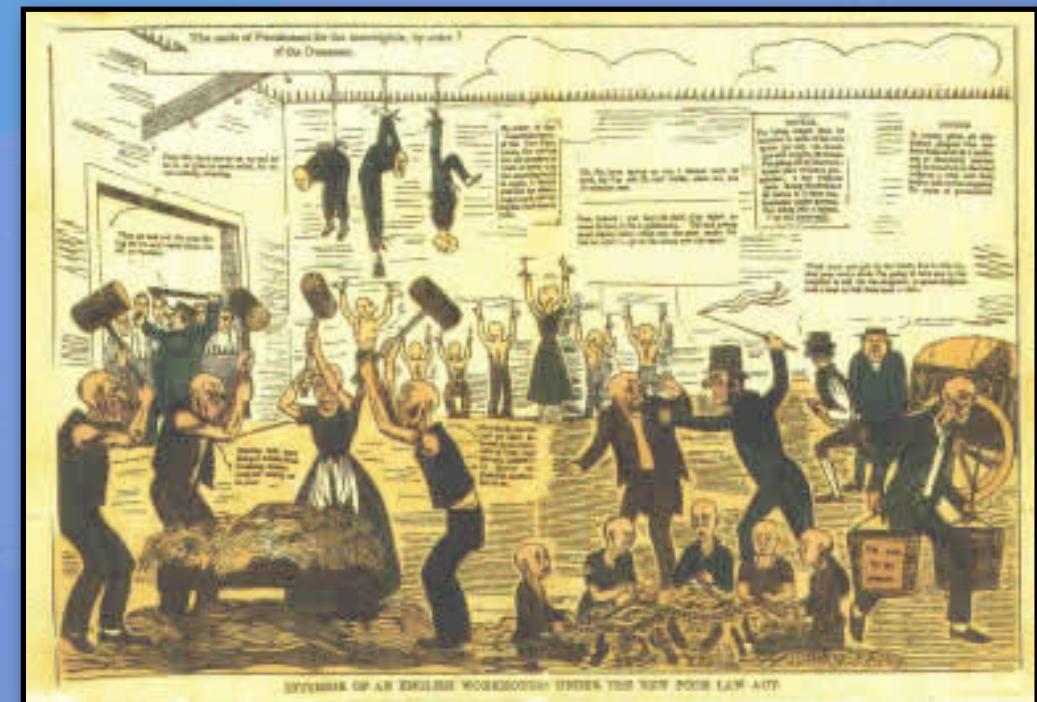
Darwin Reads Malthus, September 1838

AN  
A C T  
FOR THE  
AMENDMENT AND BETTER ADMINISTRATION  
OF THE  
Laws relating to the Poor  
IN  
ENGLAND AND WALES.



LONDON:  
PRINTED BY GEORGE EYRE AND ANDREW SPOTTISWOODE,  
PRINTERS TO THE KING'S MOST EXCELLENT MAJESTY.  
1835.

Unrest and Backlash  
Economies and Theories?

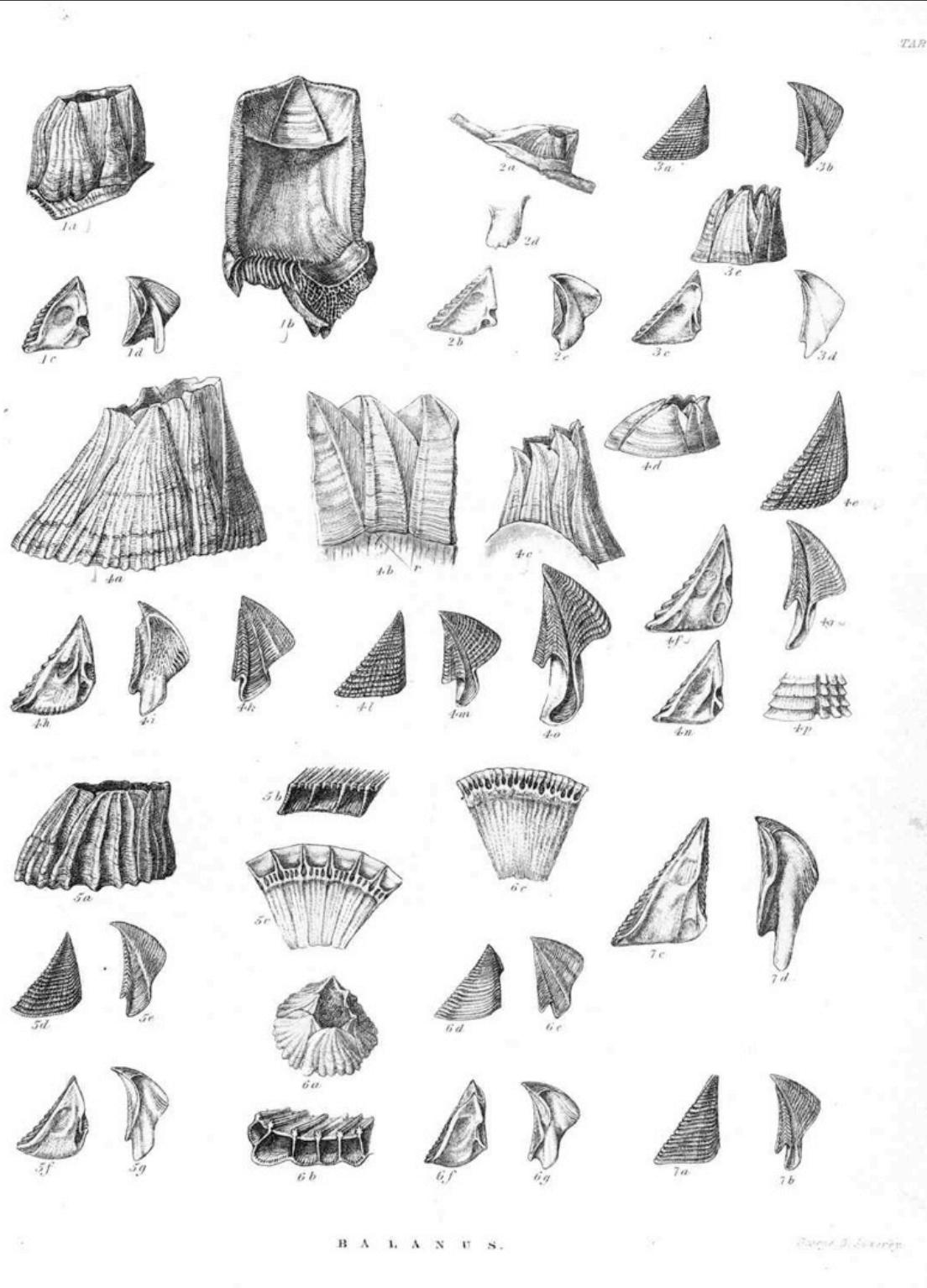


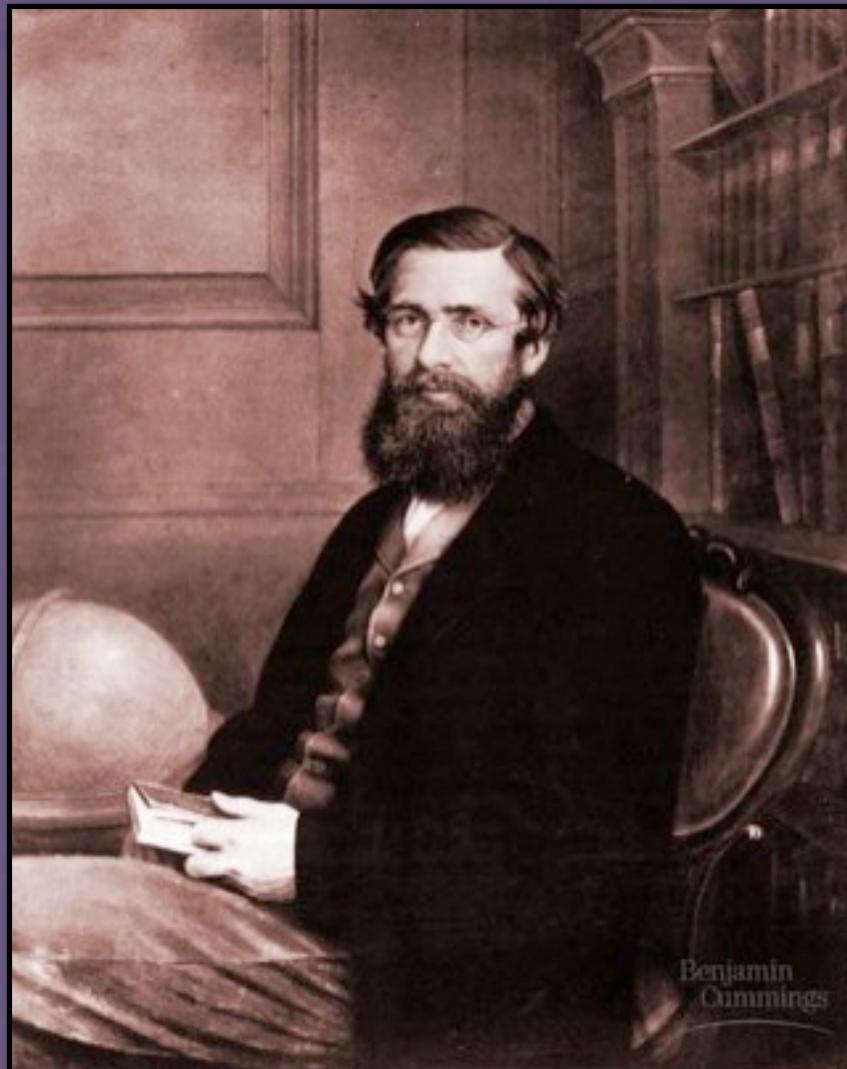
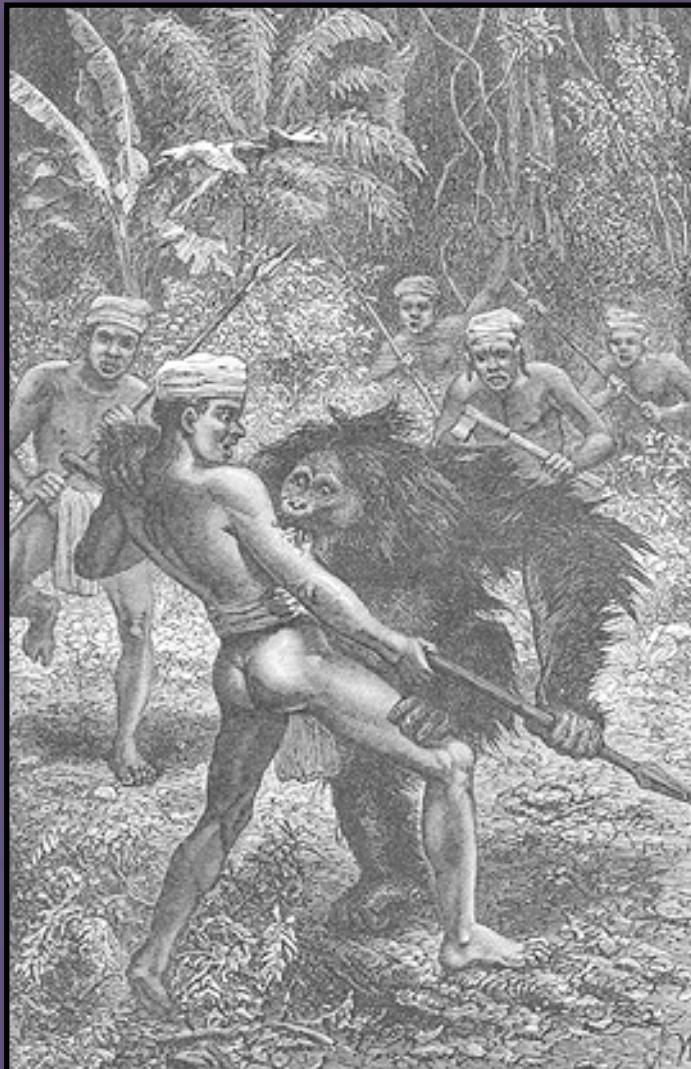


1839: Marries Emma Wedgwood

1842: Moves from London to Kent

# 1846-1854: Three books about barnacles





Alfred Russel Wallace, 18 June 1858:  
“The life of wild animals is a struggle for existence”



"How fleeting are the wishes and efforts of man! how short his time! and consequently how poor will his products be, compared with those accumulated by nature during whole geological periods."

ON

# THE ORIGIN OF SPECIES

BY MEANS OF NATURAL SELECTION,

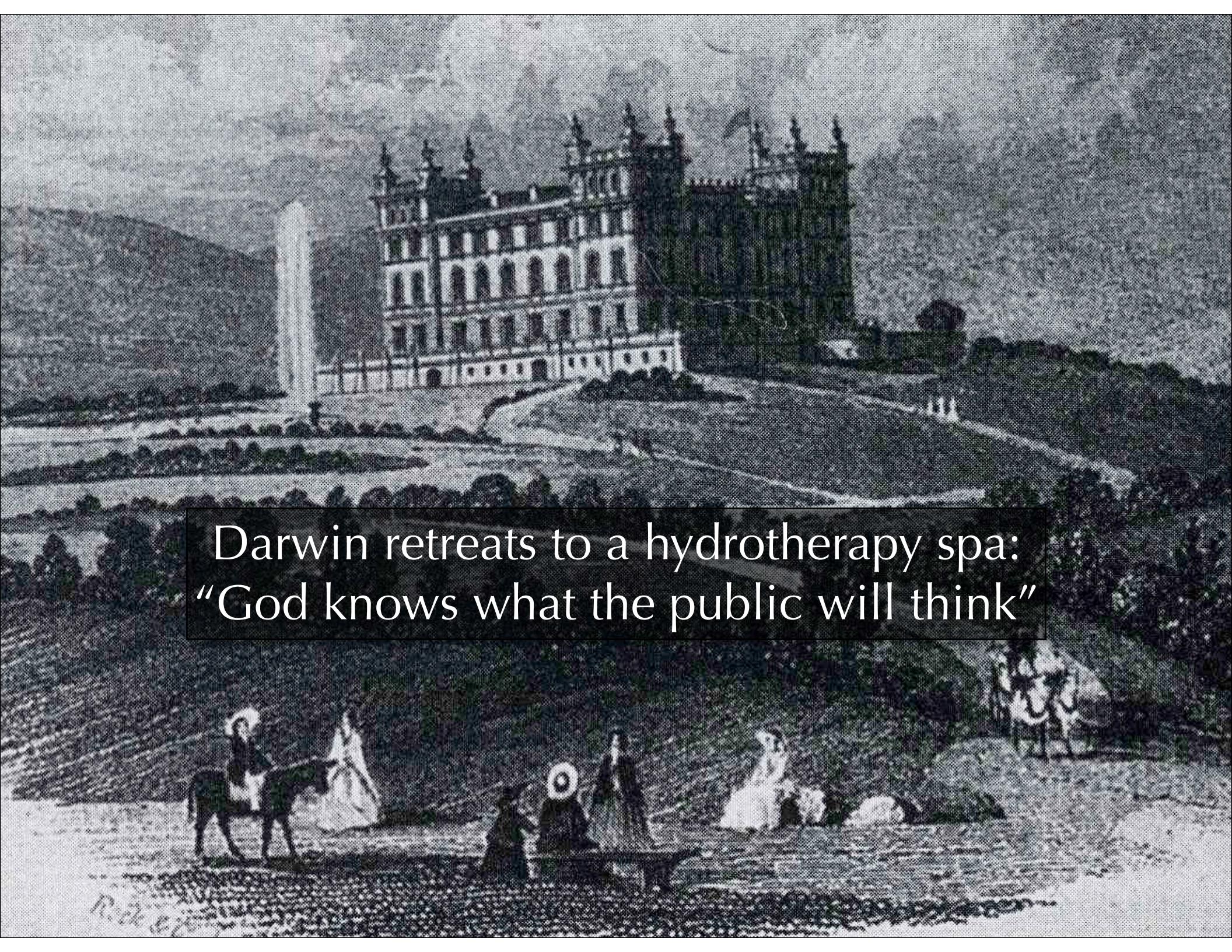
OR THE

PRESERVATION OF FAVOURED RACES IN THE STRUGGLE  
FOR LIFE.

BY CHARLES DARWIN, M.A.,  
FELLOW OF THE ROYAL, GEOLOGICAL, LINNAEAN, ETC., SOCIETIES;  
AUTHOR OF "JOURNAL OF RESEARCHES DURING H. M. S. BEAGLE'S VOYAGE  
ROUND THE WORLD."

LONDON:  
JOHN MURRAY, ALBEMARLE STREET.  
1859.

*The right of Translation is reserved.*



Darwin retreats to a hydrotherapy spa:  
“God knows what the public will think”

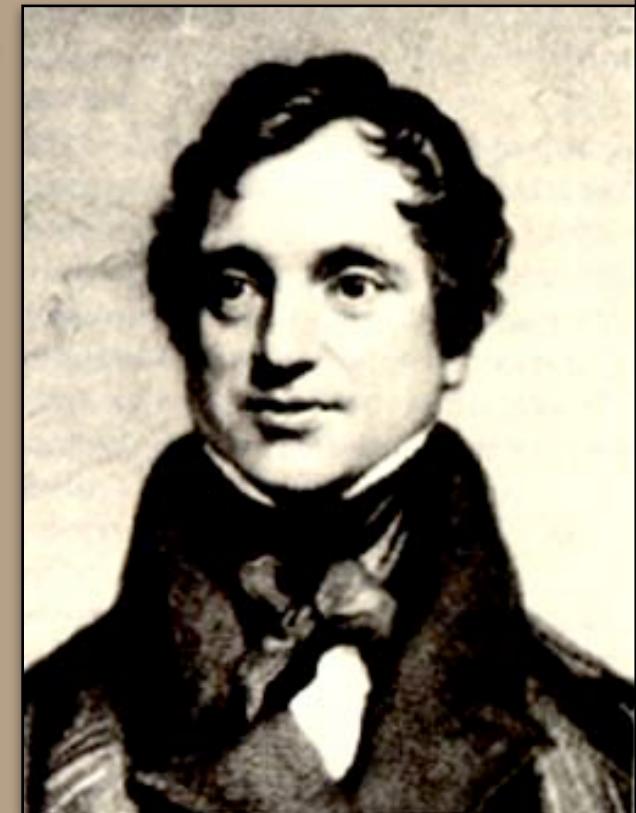


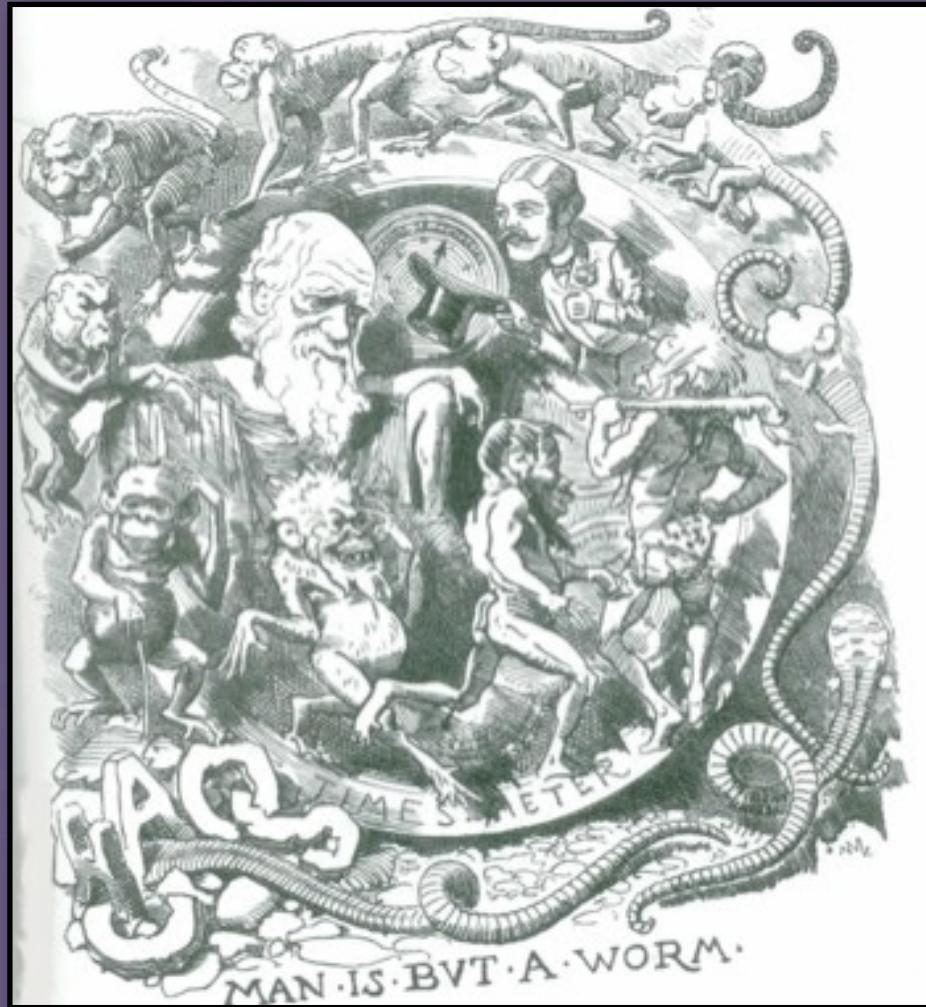
“A system which is repudiated by history, by the traditions of all peoples, by exact science, by the observation of facts, and even by reason itself, would seem to have no need at all of refutation.”

-- Pope Pius IX

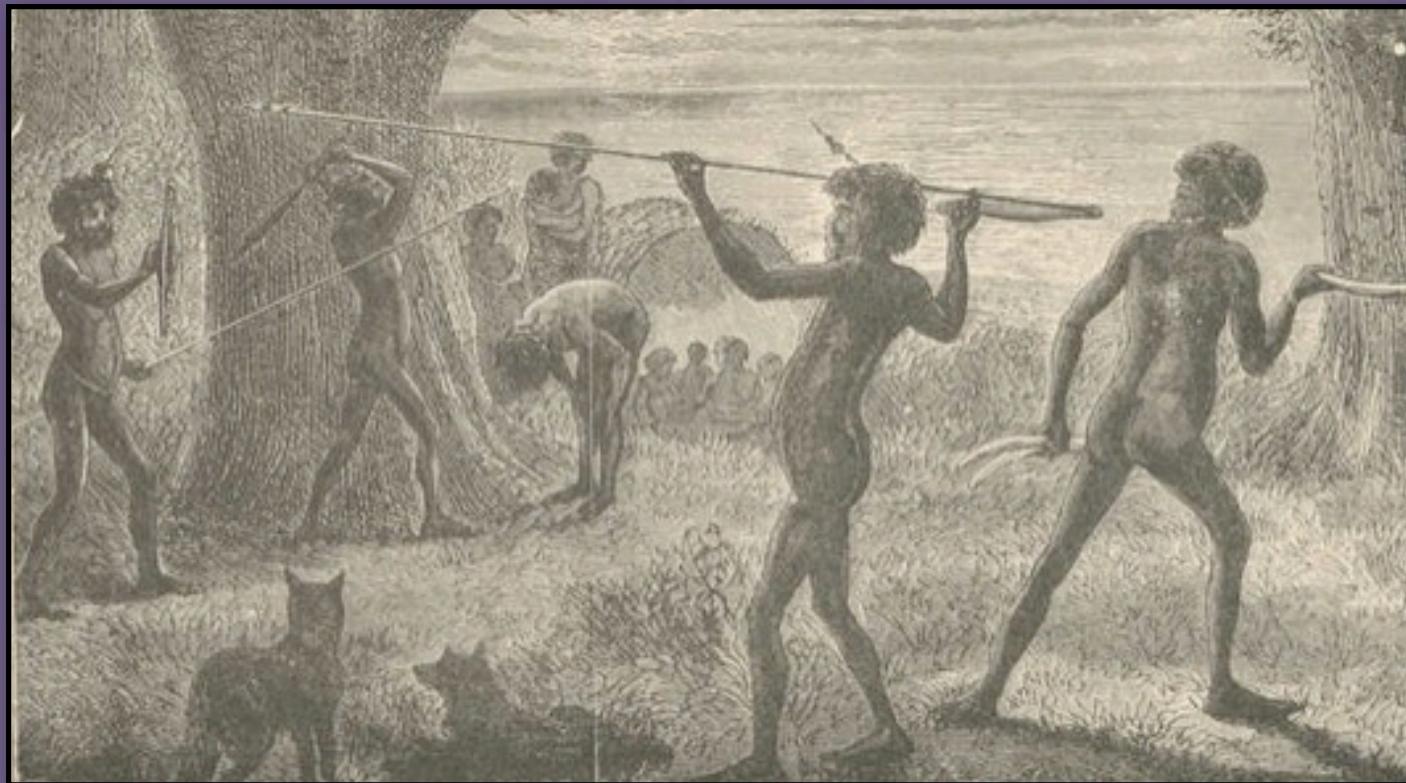
"I cannot conclude without expressing my detestation of the theory, because of its unflinching materialism;--because it has deserted the inductive track, the only track that leads to physical truth;--because it utterly repudiates final causes, and thereby indicates a demoralized understanding on the part of its advocates." -- Adam Sedgwick

Photo of Christ College, University of Cambridge, removed due copyright restrictions.





Evolution Accepted,  
Natural Selection Rejected

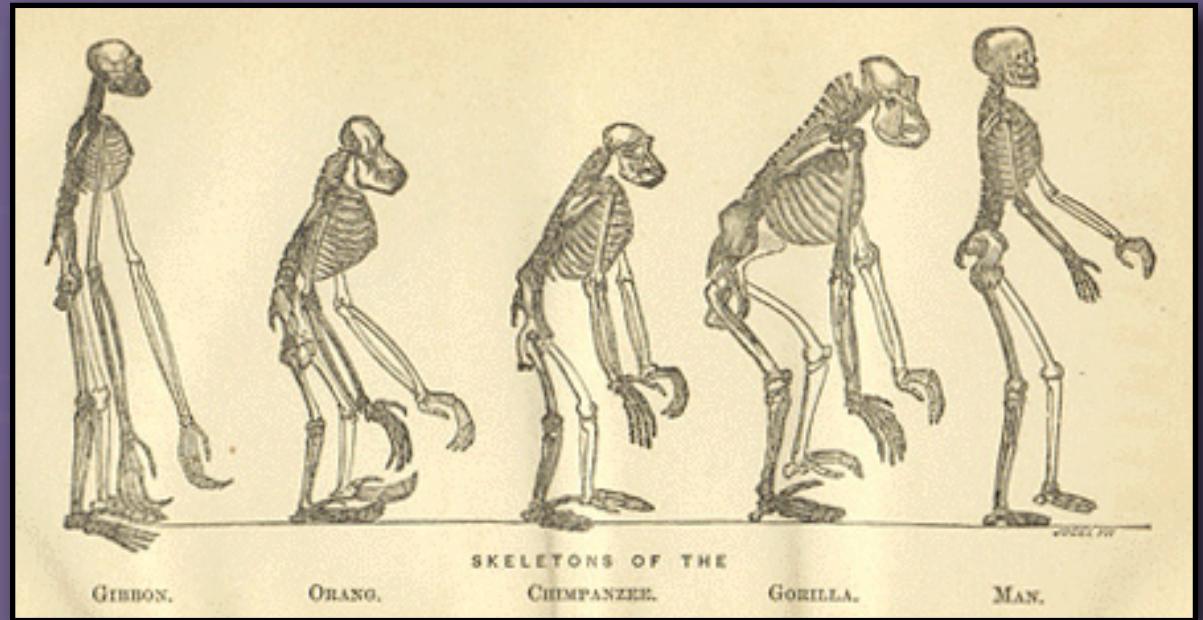


“Much light will be thrown on the  
origin of man and his history”  
-- Darwin, Origin of Species



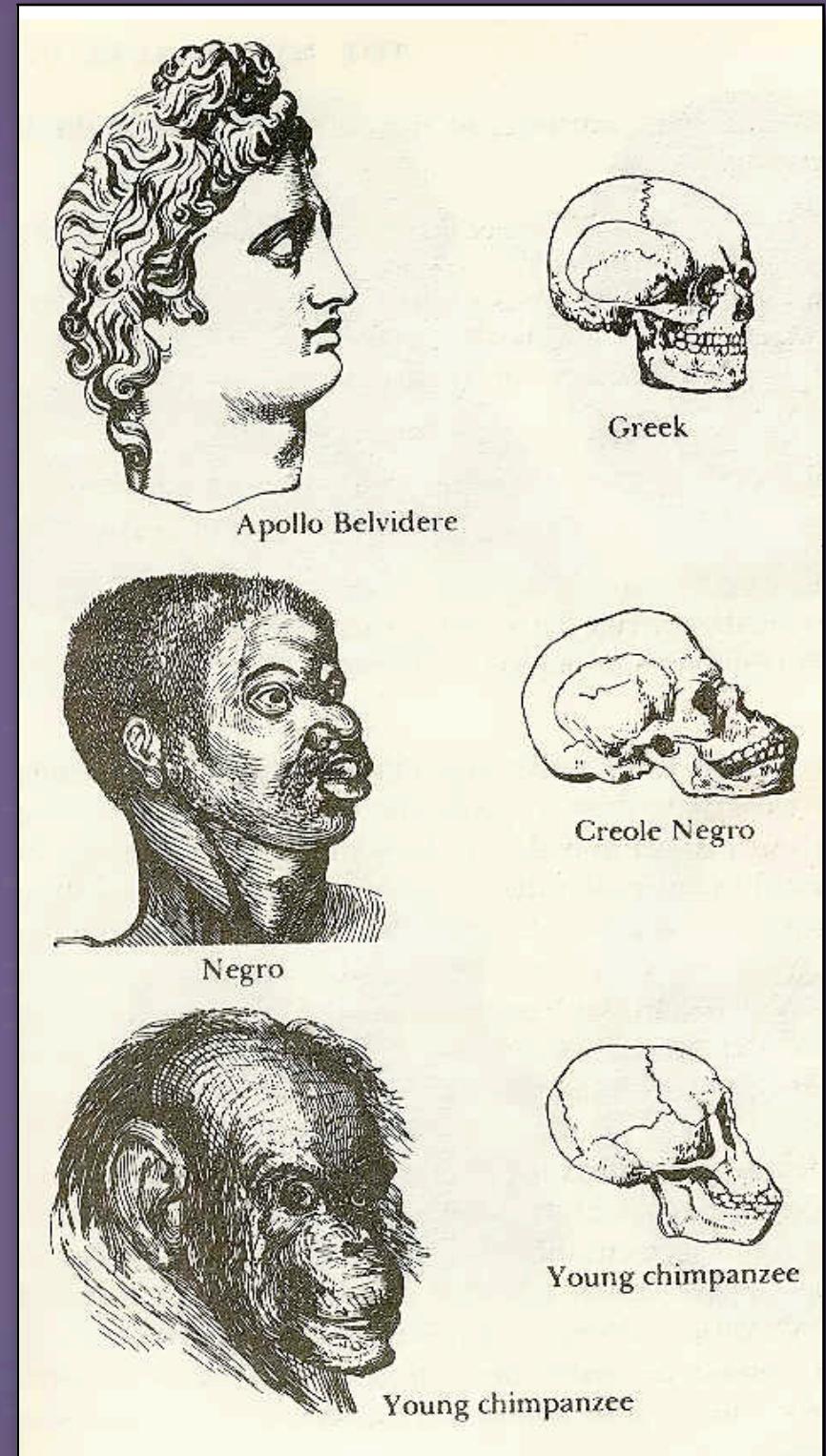
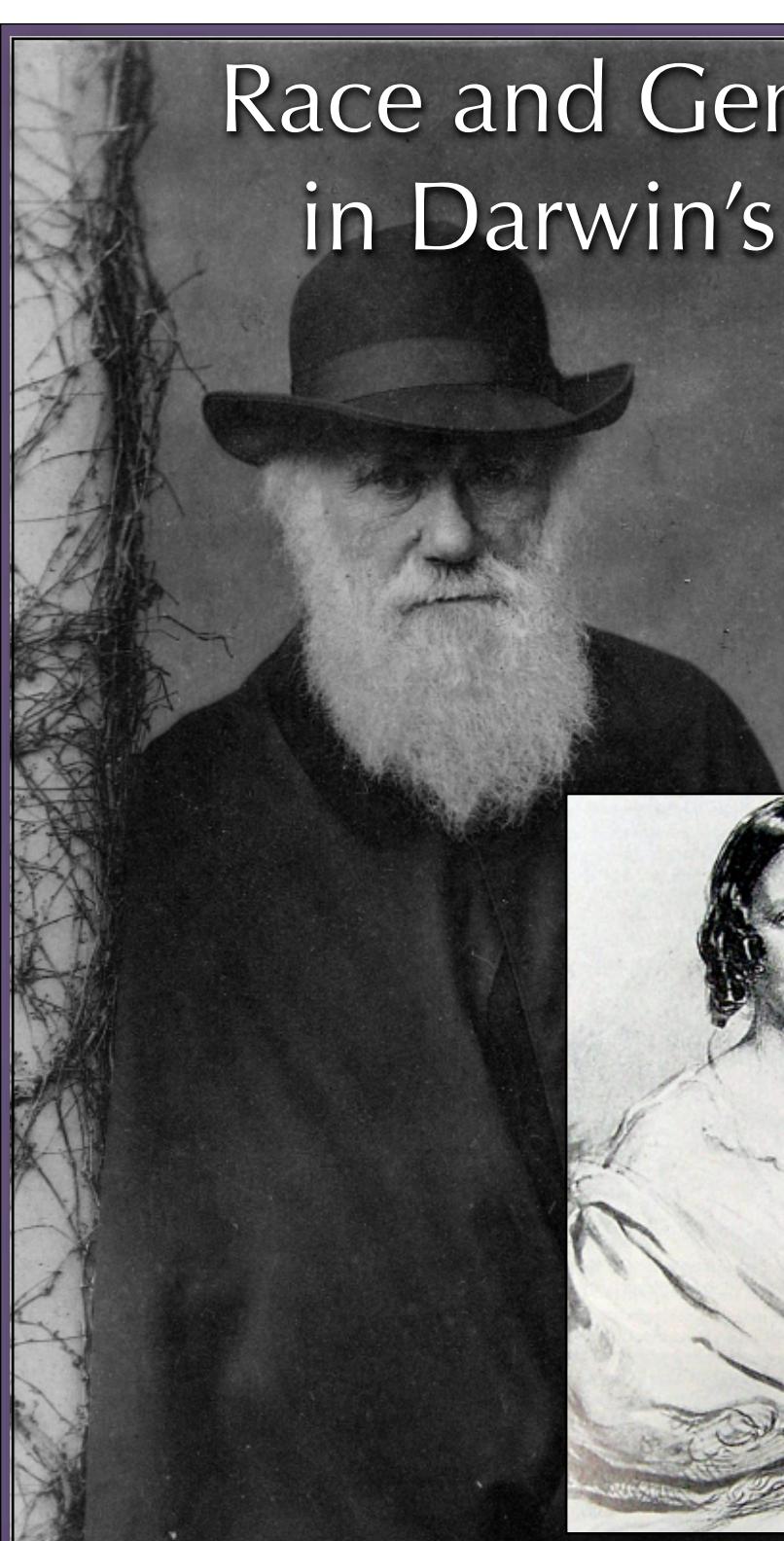
“One’s mind hurries back over past centuries, & then asks could our progenitors be such as these?”

-- Darwin, *Origin of Species*

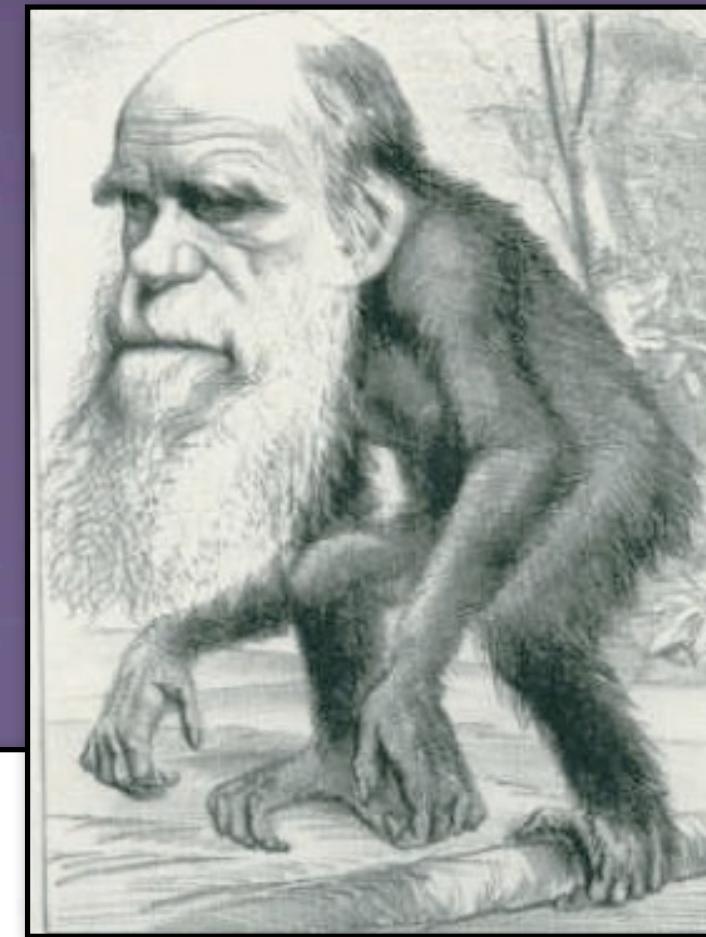
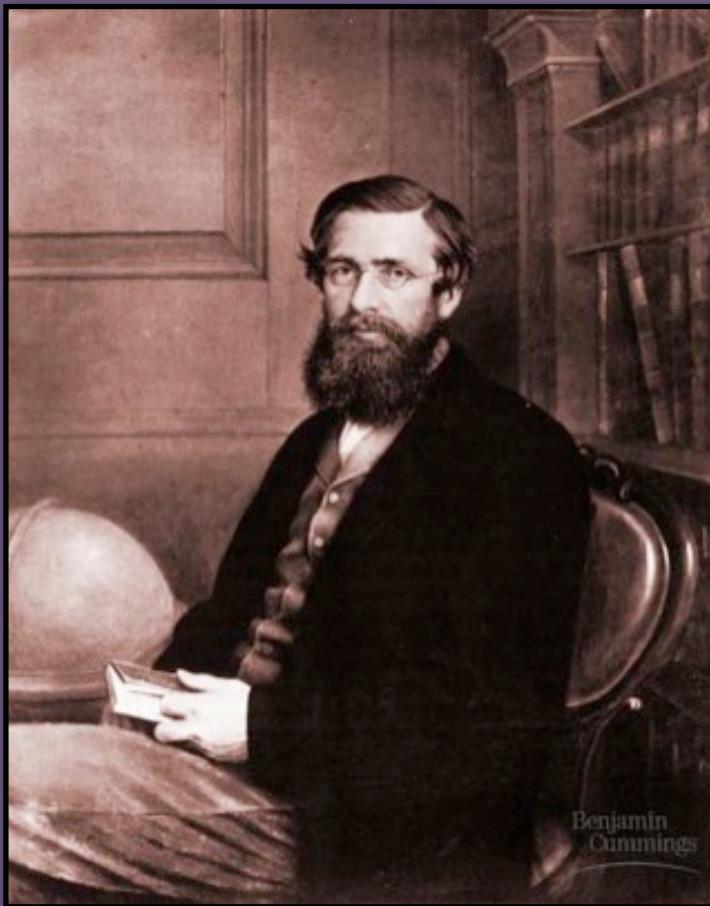


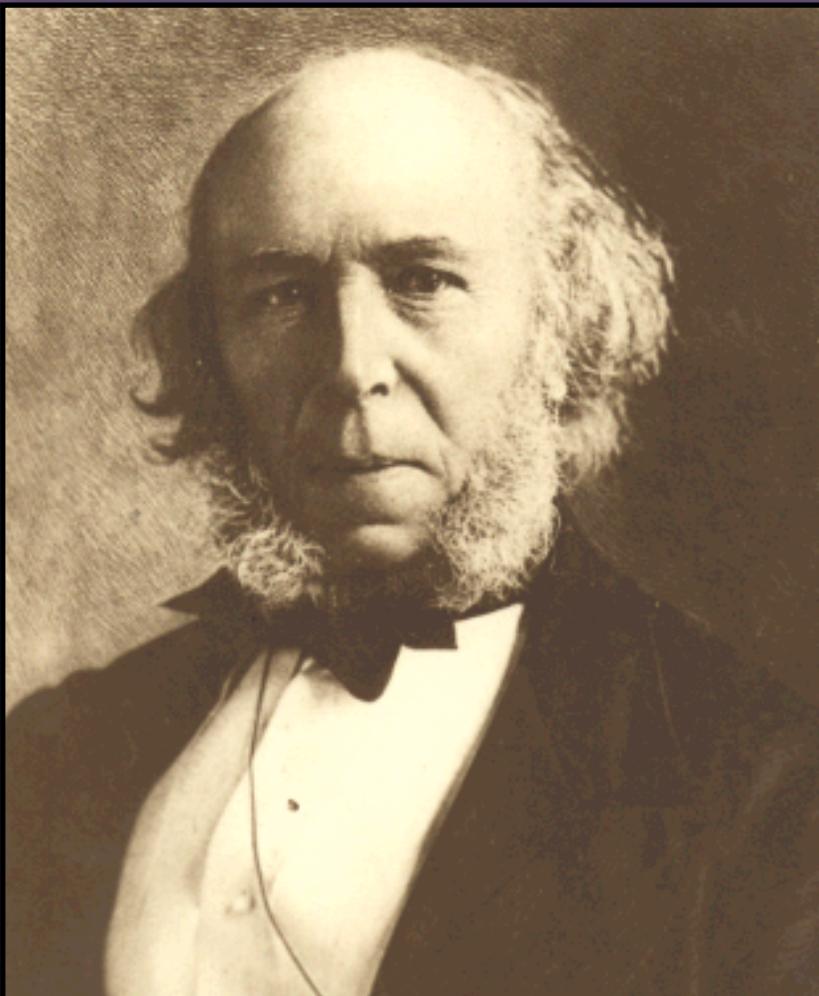
*The Descent of Man, and Selection in Relation to Sex, 2 vol. (1871)*  
*The Expression of the Emotions in Man and Animals (1872)*

# Race and Gender Bias in Darwin's Theories

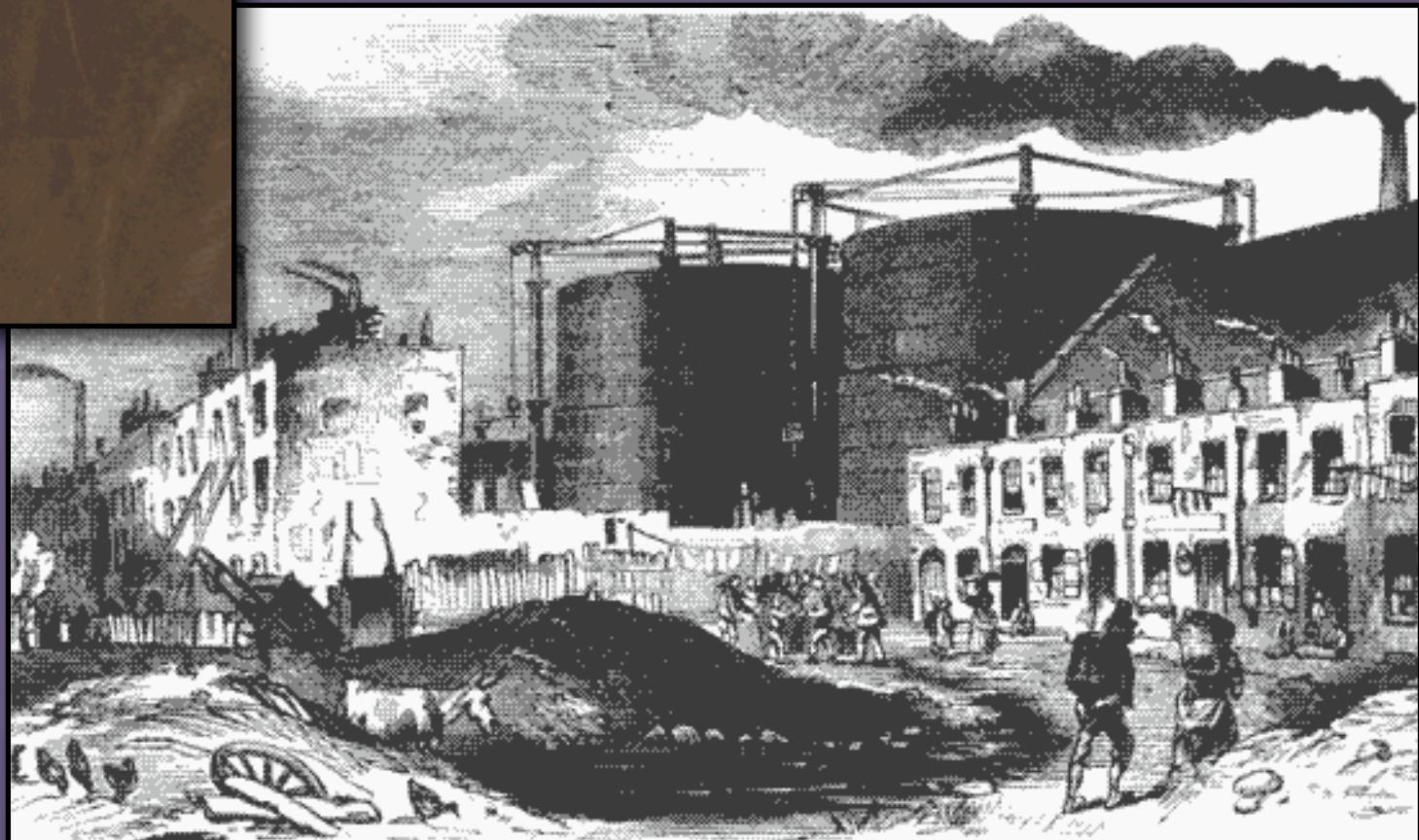


# Discomfort with *Descent of Man*





# Herbert Spencer, Social Darwinism “survival of the fittest”

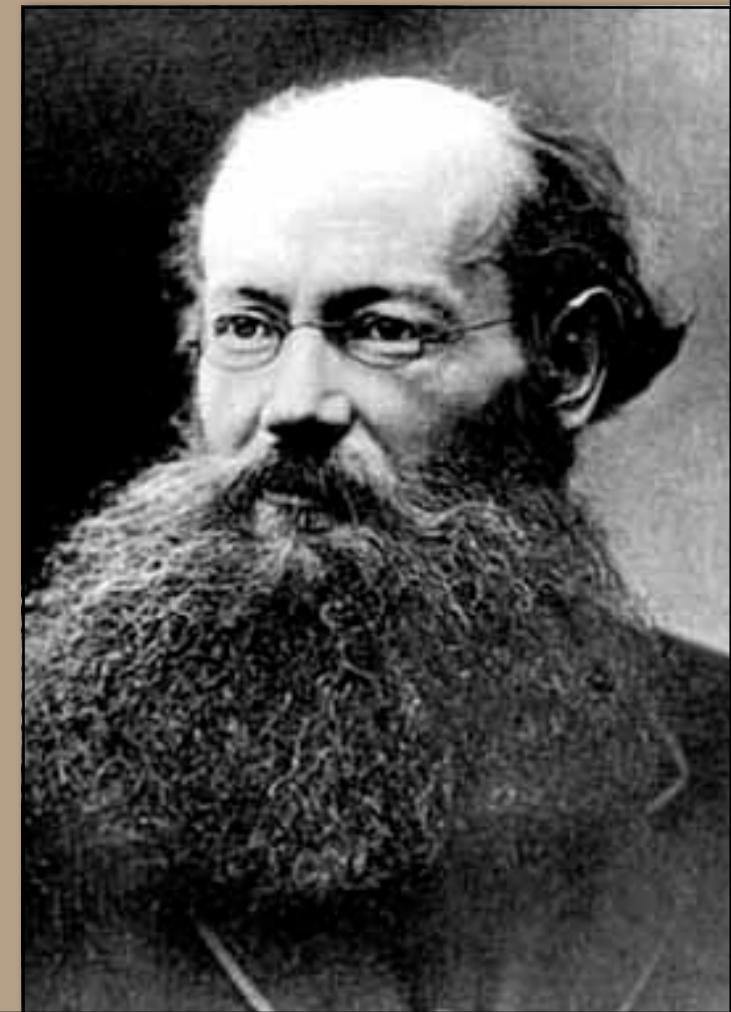


# Theory and Justifications of Empire

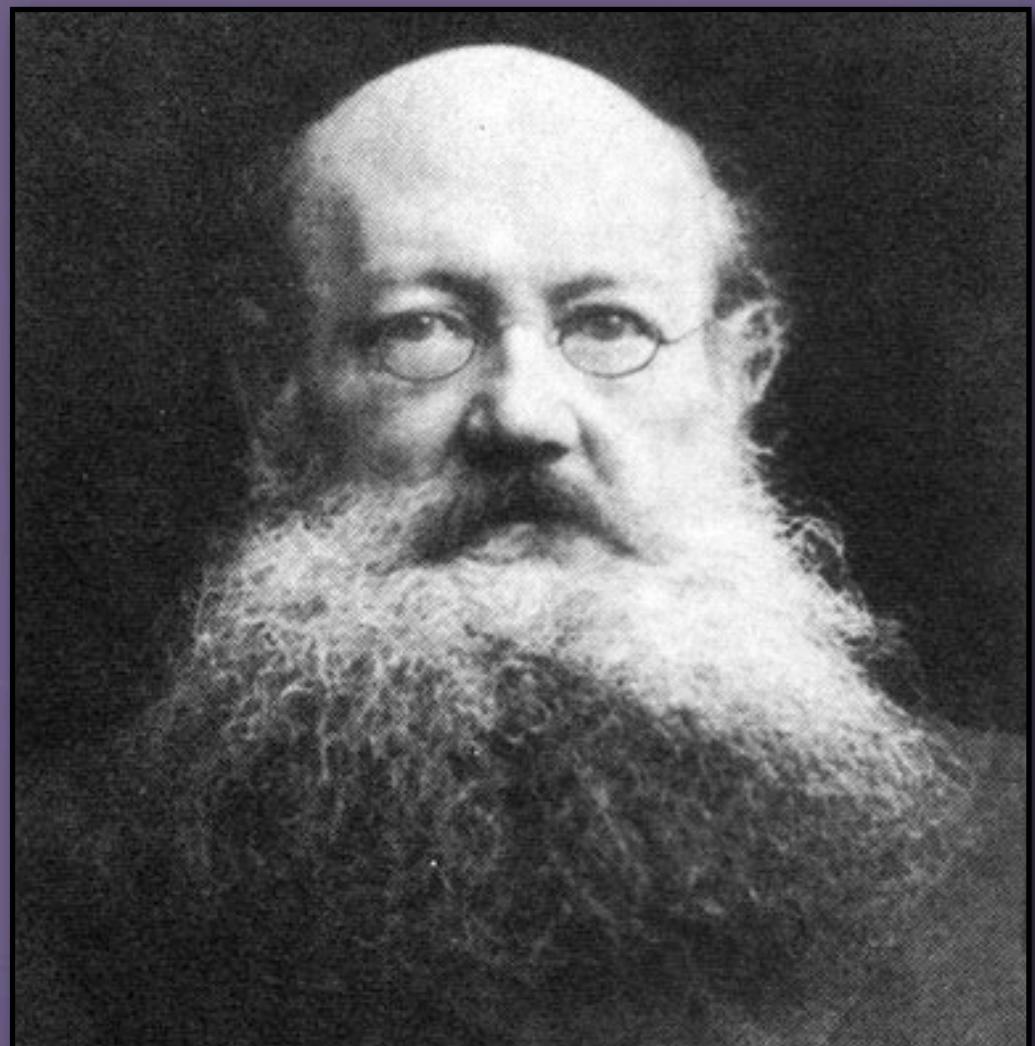
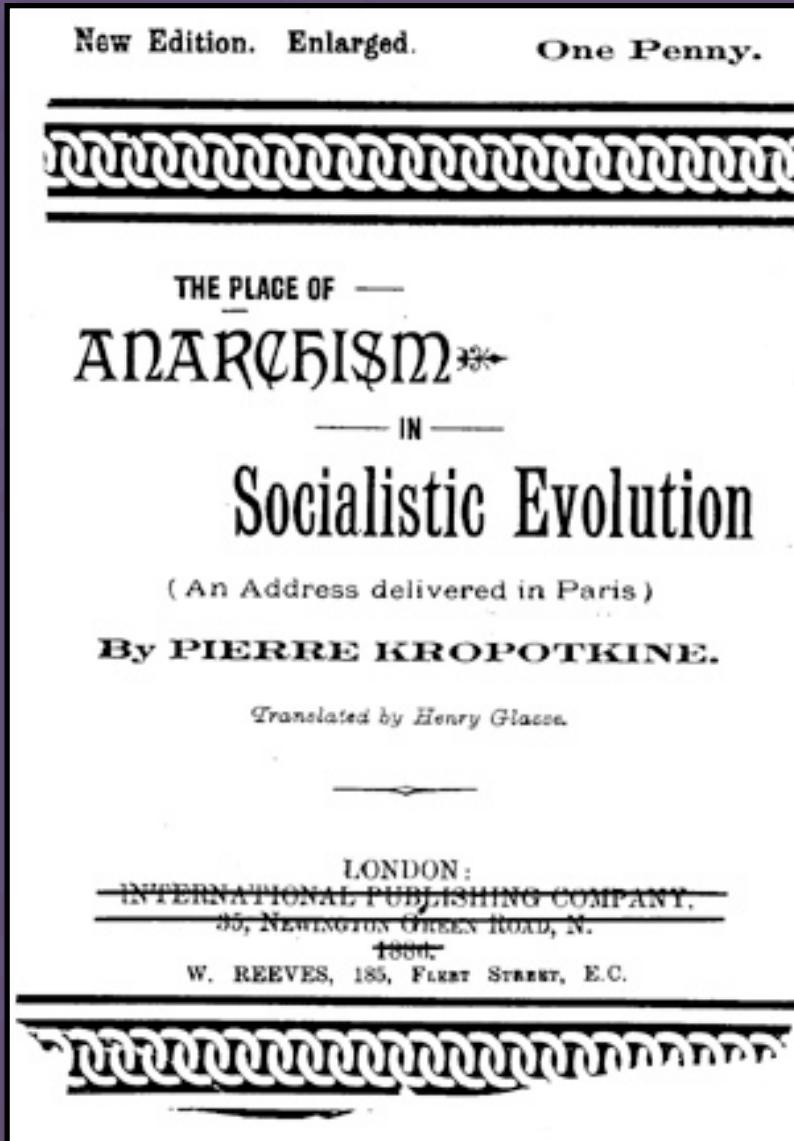


# Peter Kropotkin, on life in Siberia: Cooperation, Not Competition

Photo of dog sledding removed due copyright restrictions.



# Evolution and Ideology



# Review:

- Undeniable evidence that species change over time  
-- but what mechanism?
- Darwin's theory bore striking parallels to the economic and political conditions in which he wrote
- His theories were quickly applied in economic and political policy
- Debates over place of humans in nature

## Second Paper Assignment

**Due date:** Monday, 18 October 2010, in class. *No late papers will be accepted.*

**Length:** 1800 - 2100 words (6-7 double spaced pages).

**Grade:** Your grade on Paper 2 will contribute 15% of your final course grade. This paper will be re-written as part of the CI requirement. The rewrite will be due Wednesday, November 10, and will contribute another 15% of the final course grade. Further details will be provided closer to that due date.

Few areas of modern science have become more contentious than global warming. Is warming happening? Are humans causing it? Must we restructure our energy production and economy to minimize its consequences? The debates engage the central questions of our Nature block: what is the relation between humans and nature, are the things of nature changing or unchanging, and what are the relations between science and commerce.

Find two primary sources (from newspapers, magazines, scientific journals, blogs, websites, movies, etc.) that offer conflicting perspectives on global warming. *Do not offer a judgment about which is right or wrong.* Instead, informed by the article by Oreskes and Conway and the ideas presented in lectures, *offer an interpretation / make an argument about why the disagreement exists.* For example, do the authors reflect competing commercial or political interests? Do they rely on different assumptions about the relationship between humans and nature? The type of arguments that you choose to make will depend on the details of your sources and your own interests.

Your task will be easier if you find two good sources. What is a good source? Something concise (a 1-2 page op ed) is easier to work with than a movie. Something which makes its own argument will provide better fodder for your own arguments. Something with authors who can be identified and situated (i.e., you can determine where the author is coming from) is more useful than something with unclear authorship.

# Paper 1 Feedback

- Ungrounded generalizations, assertions made without evidence or citations
- Misreading and misunderstanding of the sources
- Quoting from sources without explaining relevance
- Illogical or inconsistently executed arguments
- Problems with organization, grammar, style

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STS.003 The Rise of Modern Science  
Fall 2010

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