Theories of Species Change (Evolution) Prior to Darwin's *Origin of Species*

Theories of Species Change Prior to Darwin Entangled with:

1. Theories of geological change.
2. Theories of heredity.
3. And theories of ontogenesis, that is, of individual development– embryology.


TIMEO
ET IC

Notions of Species in the Classical Period of Greece

Plato: the essence or form of an organism is eternal and unchanging; embodiment only the appearance of that form.

Aristotle: the essence or form of an organism is incorporated in the physical body; the only kind of eternity enjoyed is through continued reproduction.

Theories of Species Change in the Early Modern Period

Descartes: gradual evolution of physical system according to fix laws (*Discourse on Method*, 1628).

Buffon (1707-88) and Linnaeus (1707-78): God created a limited number of species, but through hybridization and impact of environment, new species appear.

Kant: evolutionary development from earth possible only if earth already construed as purposive; species change possible but no evidence (*Critique of Judgment*, 1790).

which fossils are subject (as we have seen on p. 811) as the result of shearing-stresses in the solid rock.

Fig. 519 is an outline diagram of a typical Scaroid fish. Let us deform its rectilinear coordinates into a system of (approximately) coaxial circles, as in Fig. 520, and then filling into the new system,

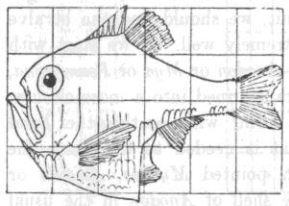


Fig. 517. *Argyropelecus Olfersi.*

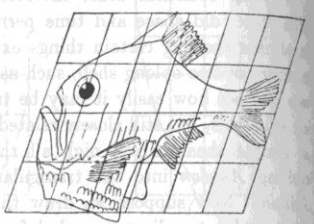


Fig. 518. *Sternoptyx diaphana.*

space by space and point by point, our former diagram of *Scarus*, we obtain a very good outline of an allied fish, belonging to a neighbouring family, of the genus *Pomacanthus*. This case is all the more interesting, because upon the body of our *Pomacanthus* there are striking colour bands, which correspond in direction very closely

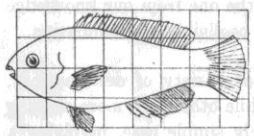


Fig. 519. *Scarus* sp.

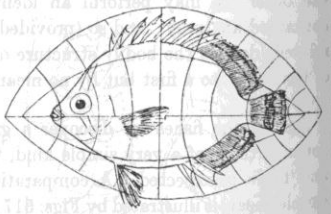


Fig. 520. *Pomacanthus.*

to the lines of our new curved ordinates. In like manner, the still more bizarre outlines of other fishes of the same family of Chaetodonts will be found to correspond to very slight modifications of similar coordinates; in other words, to small variations in the values of the constants of the coaxial curves.

In Figs. 521–524 I have represented another series of Acanthopterygian fishes, not very distantly related to the foregoing. If we

start this series with the figure of *Polyprion*, in Fig. 521, we see that the outlines of *Pseudopriacanthus* (Fig. 522) and of *Sebastes* or *Scorpaena* (Fig. 523) are easily derived by substituting a system

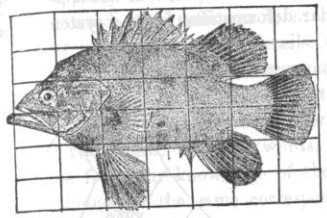


Fig. 521. *Polyprion.*

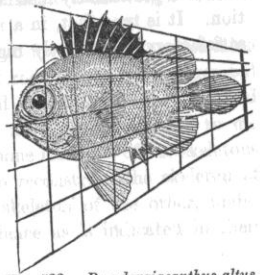


Fig. 522. *Pseudopriacanthus altus.*

of triangular, or radial, coordinates for the rectangular ones in which we had inscribed *Polyprion*. The very curious fish *Antigonia capros*, an oceanic relative of our own boar-fish, conforms closely to the peculiar deformation represented in Fig. 524.

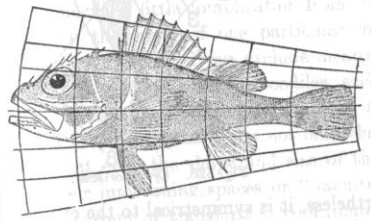


Fig. 523. *Scorpaena* sp.

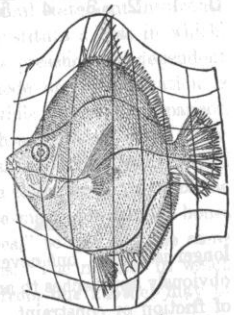
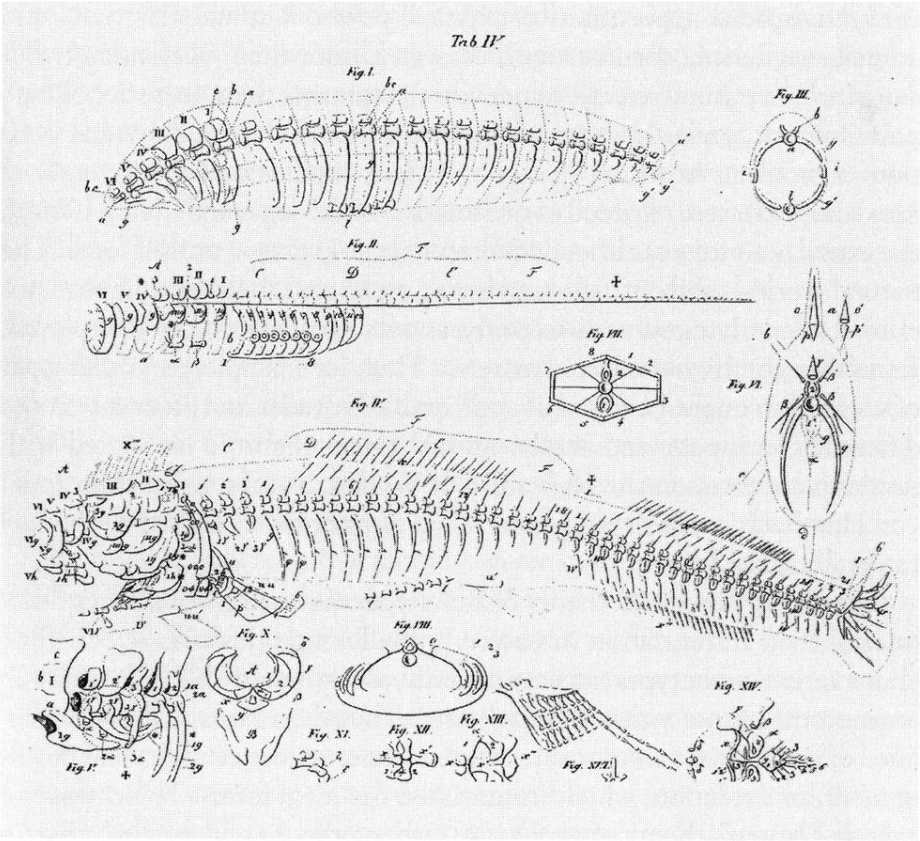


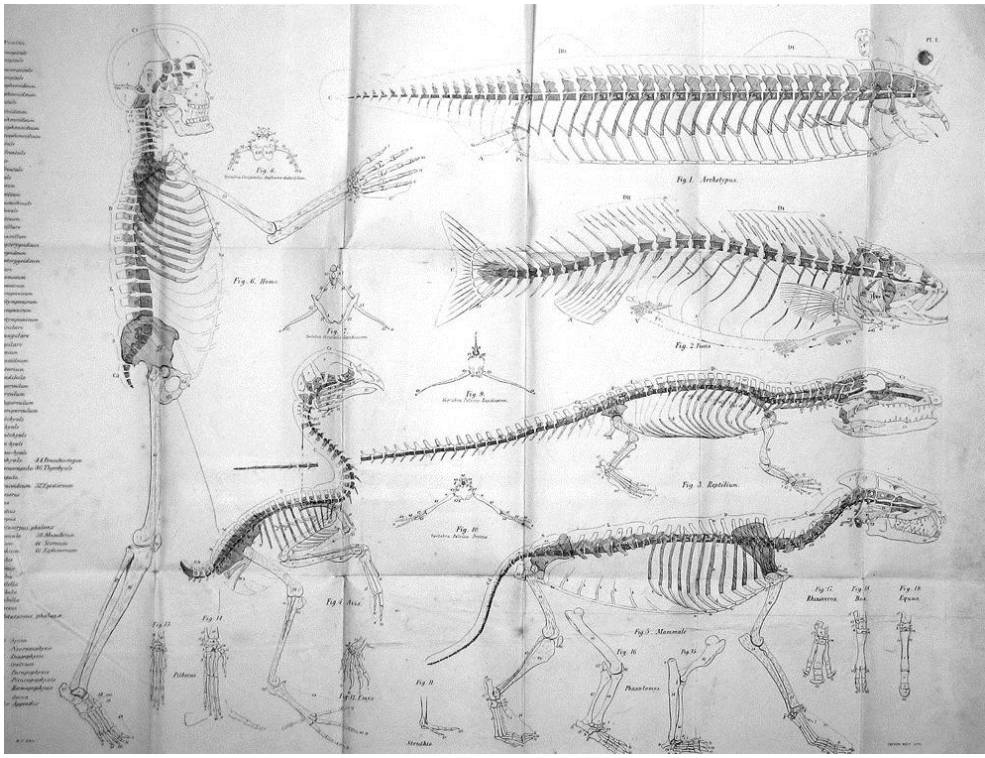
Fig. 524. *Antigonia capros.*

Fig. 525 is a common, typical *Diodon* or porcupine-fish, and in Fig. 526 I have deformed its vertical coordinates into a system of concentric circles, and its horizontal coordinates into a system of curves which, approximately and provisionally, are made to resemble

Transformation of one species into another through change of scaling, from D'Arcy Thompson, *On Growth and Form* (1942).



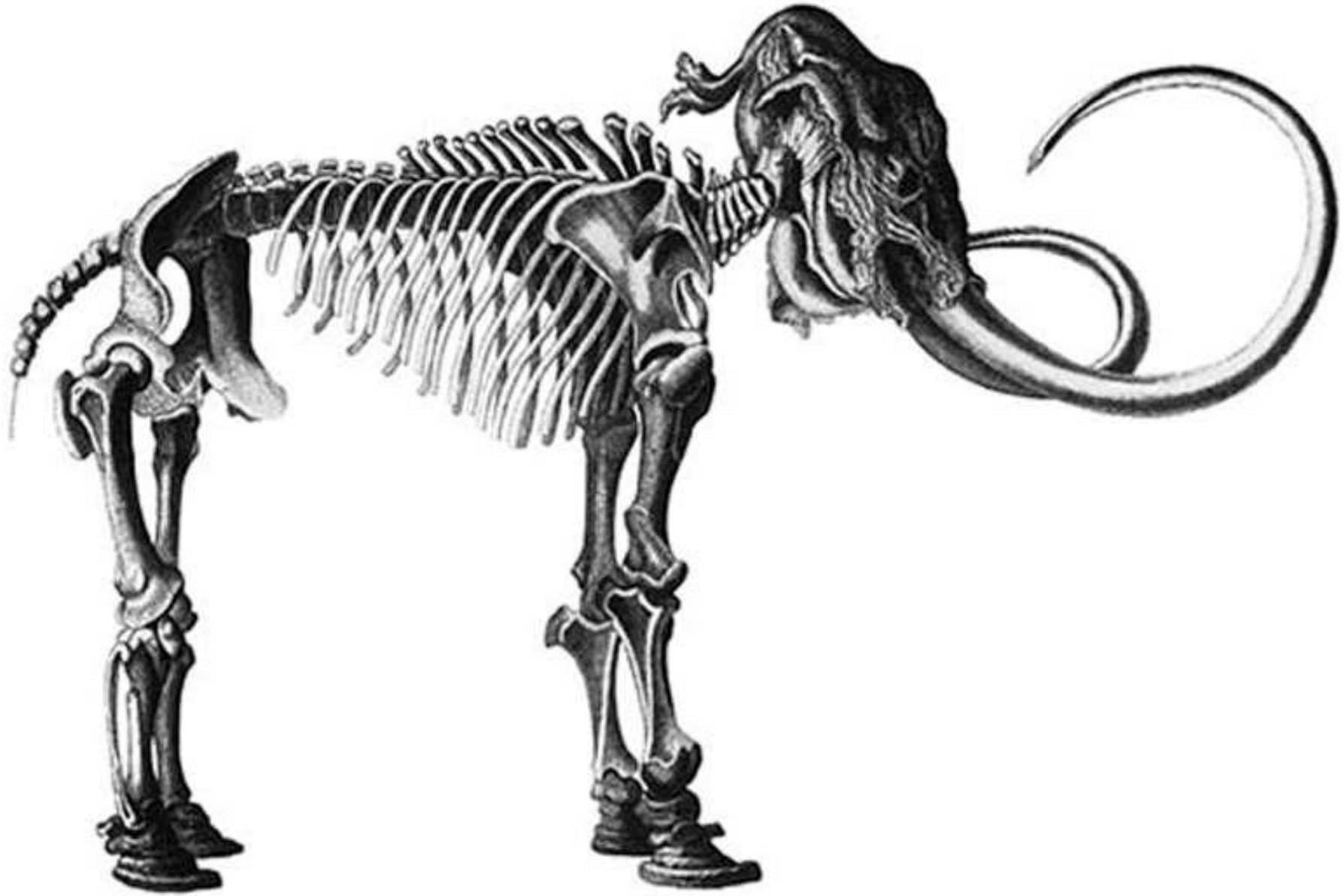
Carus's illustration of the archetype



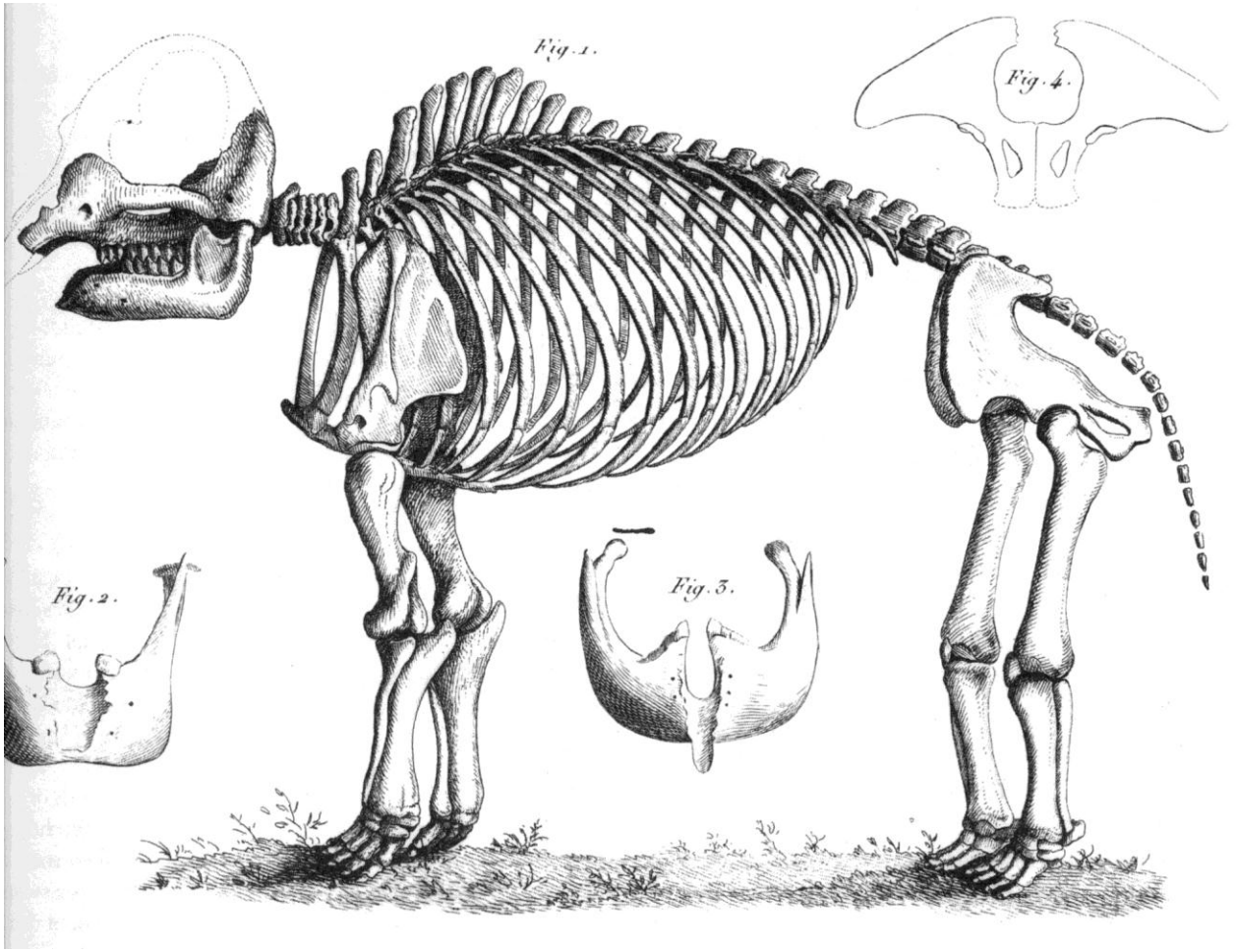
Richard Owen's illustration of the archetype, from his *On the Nature of Limbs* (1849)

Georges Cuvier (1769-1832). Portrait by François-André Vincent

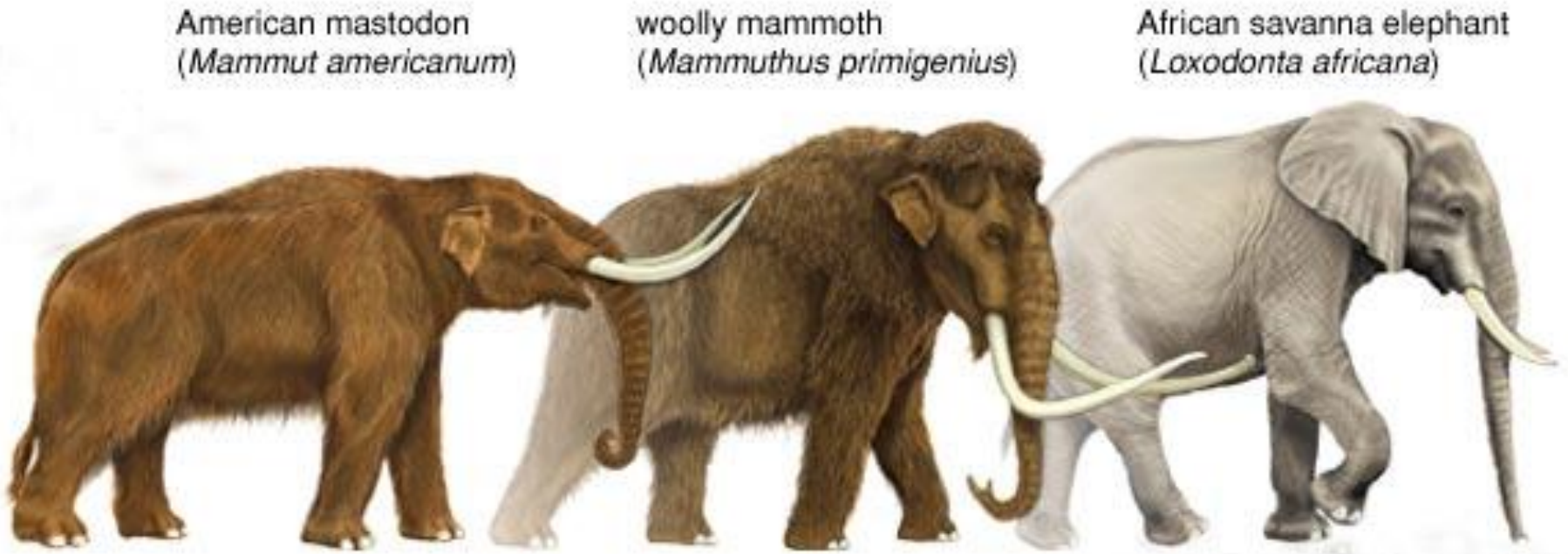
Adam's Mammoth, found in Siberia in 18th century; St. Petersburg Natural History Museum

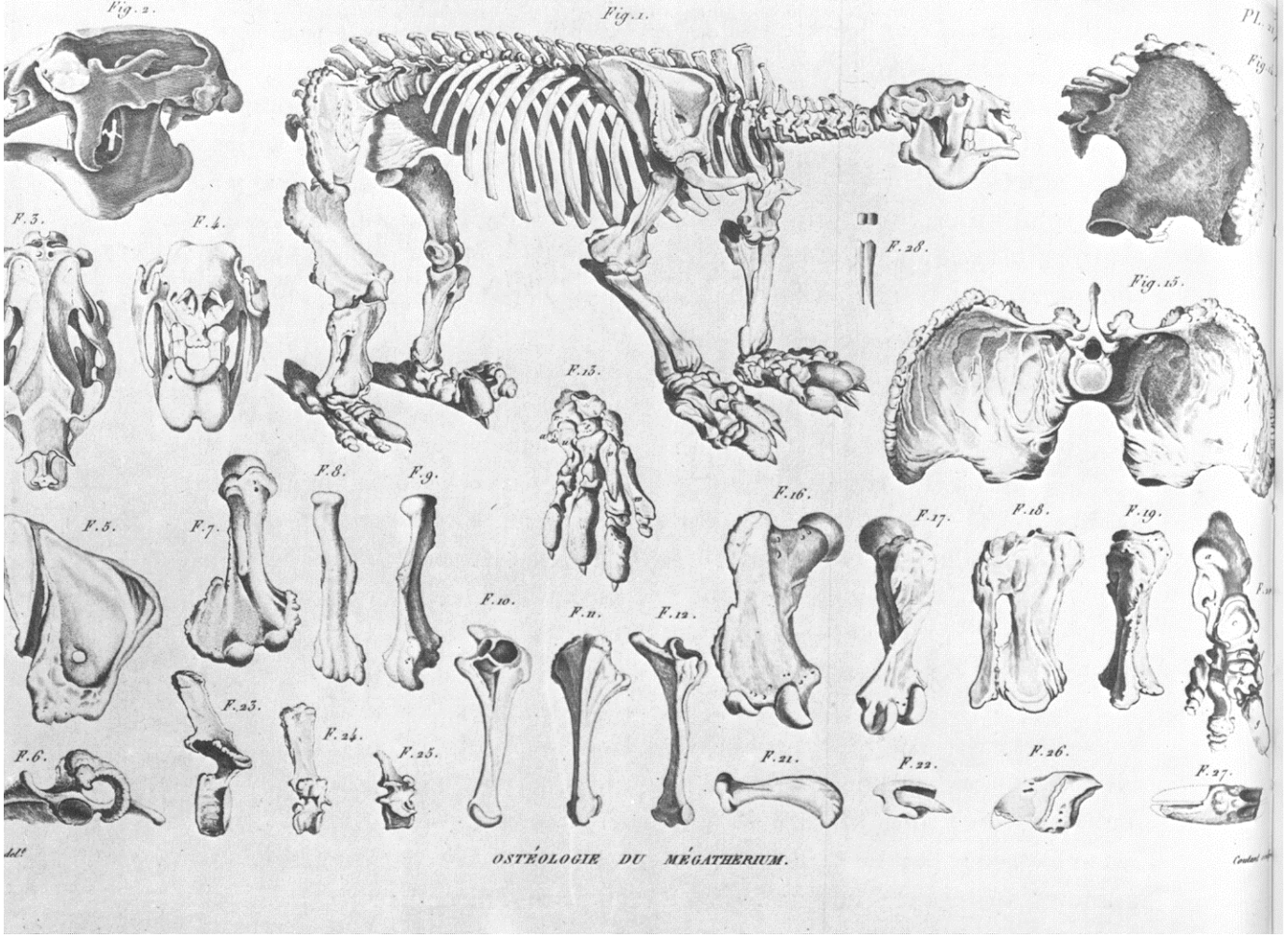


Cuvier’s illustration of the Siberian mammoth; he identified it as an extinct species of elephant (1796).

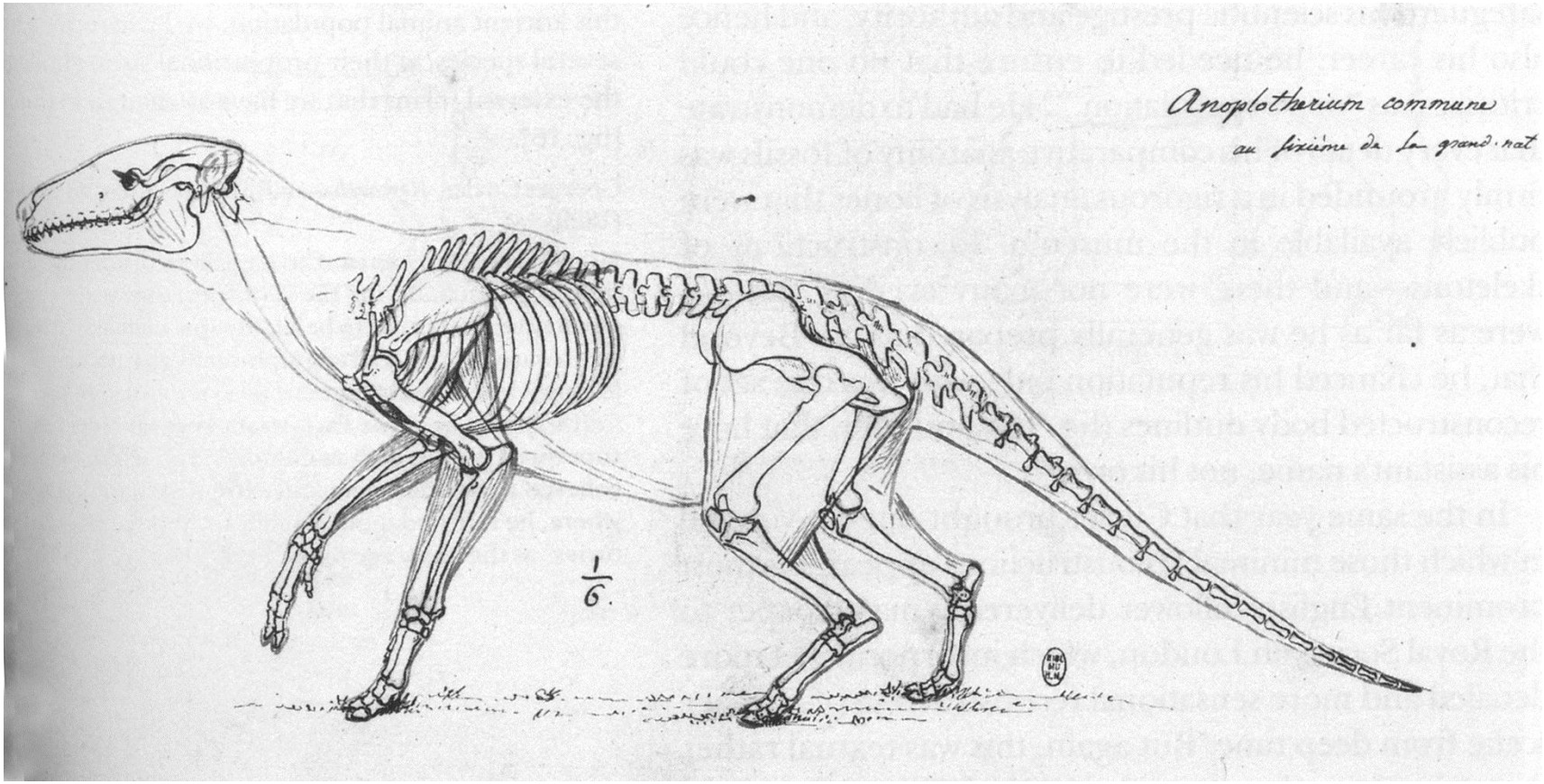


Cuvier's illustration of the "Ohio Animal," which he named "mastodon."

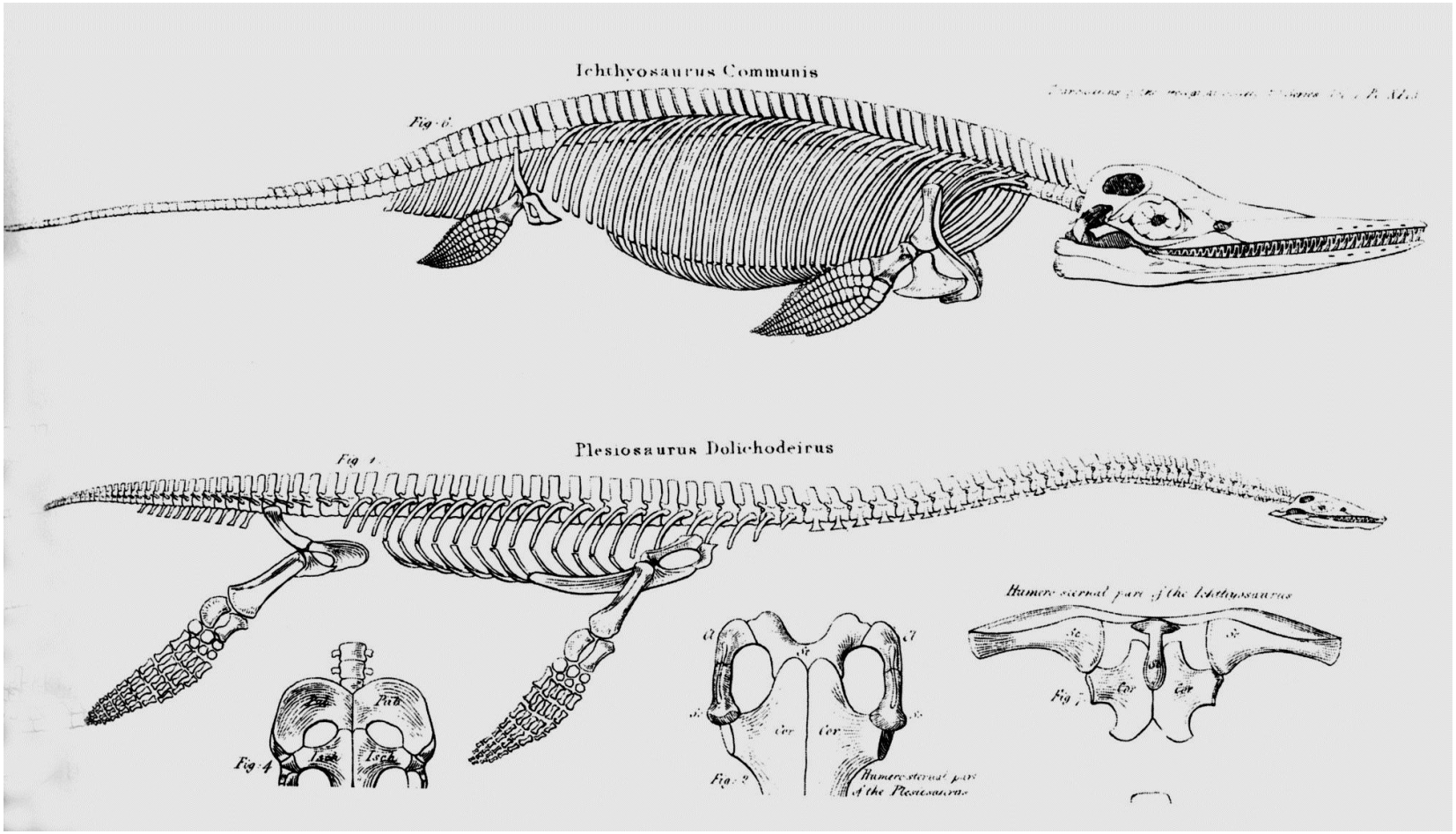

American mastodon
(*Mammut americanum*)
woolly mammoth
(*Mammuthus primigenius*)
African savanna elephant
(*Loxodonta africana*)



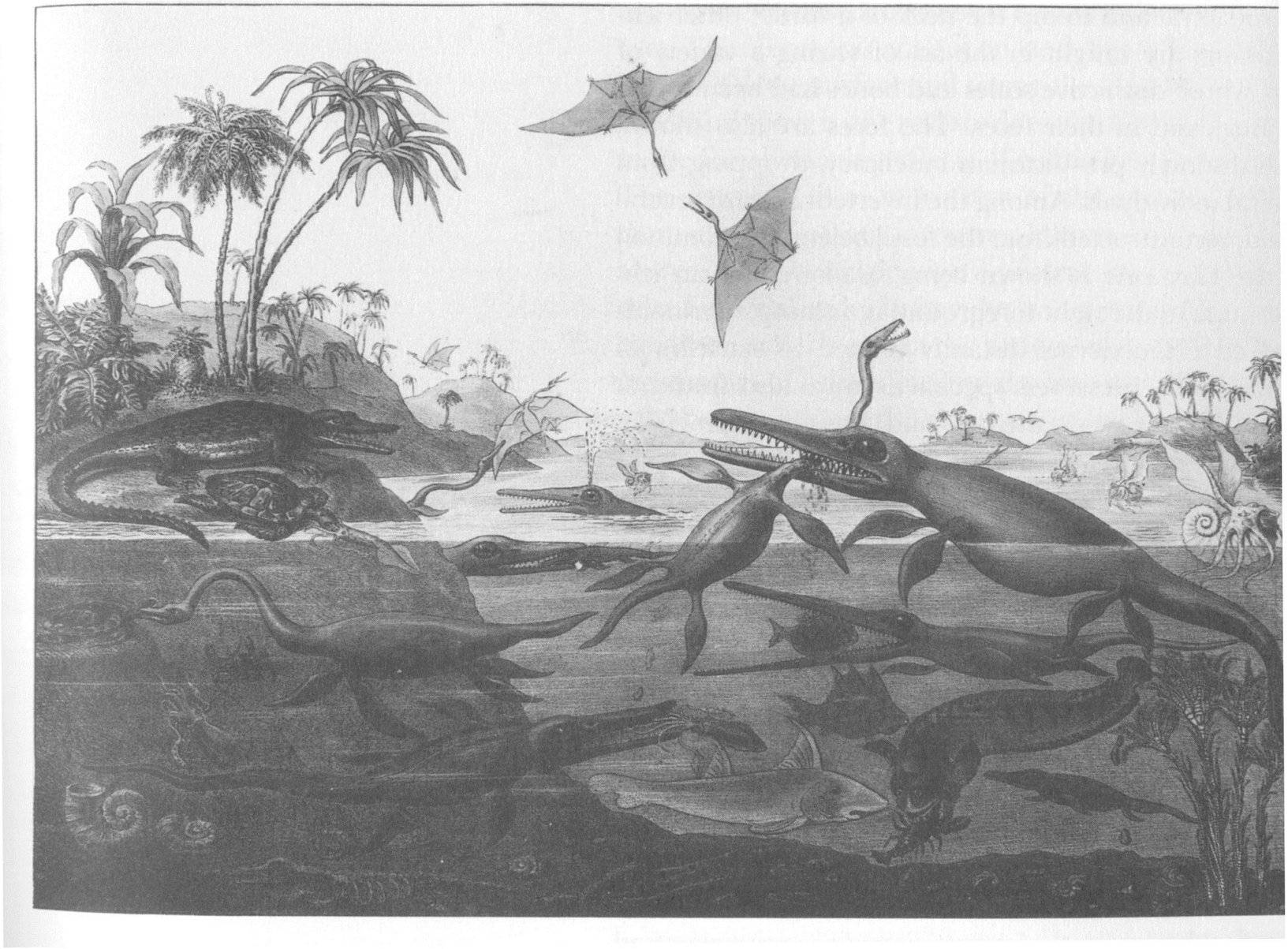
Megatherium (i.e., “large animal”), discovered in South America, described by Cuvier as an extinct creature similar to the modern sloth. Remains also found by Darwin during his work in Argentina.



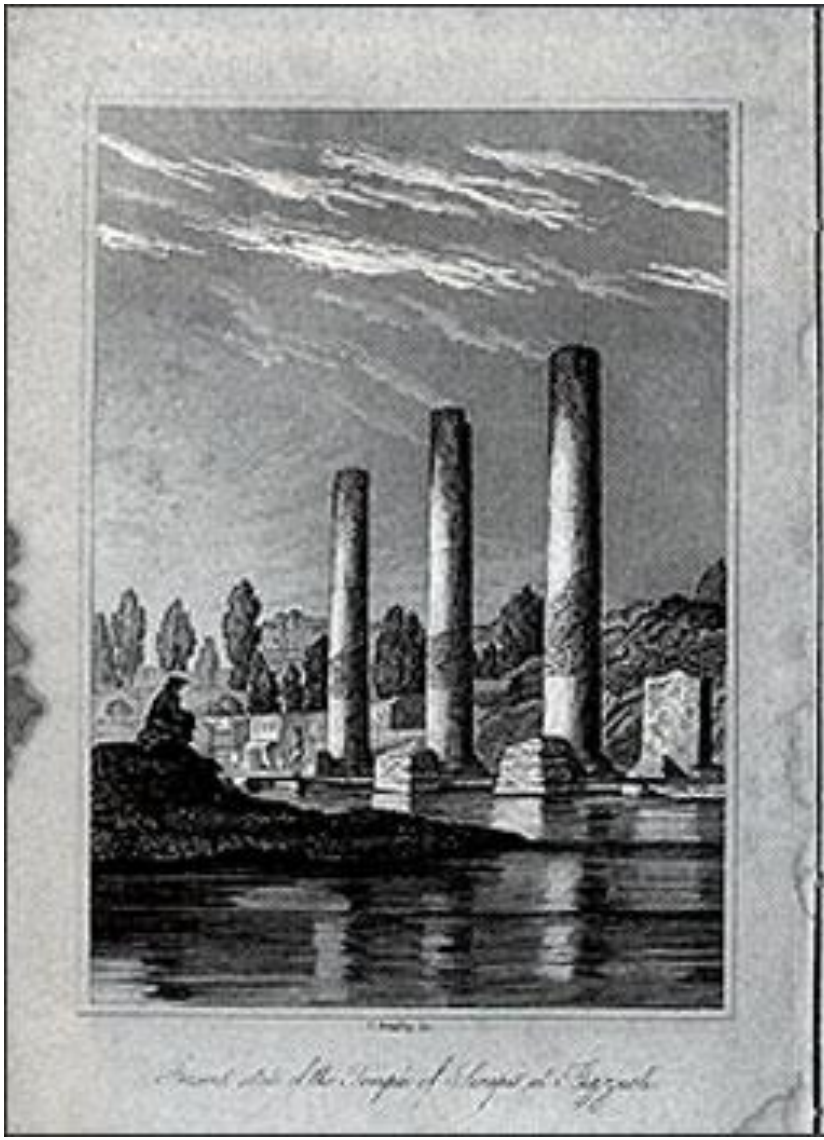
Cuvier's drawing of the fossil remains of a mammal he called Anoplotherium commune.



Illustrations of Ichthyosaurus (fish-like reptile) and Plesiosaurus (almost reptile), from Daniel Coynbeare (1787-1857) paper for the *Transactions of the Geological Society of London* (1824).



Thomas Henry De La Beche (1796-1855), sketch of life in ancient Dorset, 1830.



PRINCIPLES

OF

GEOLOGY,

BEING

AN ATTEMPT TO EXPLAIN THE FORMER CHANGES
OF THE EARTH'S SURFACE,

BY REFERENCE TO CAUSES NOW IN OPERATION.

BY

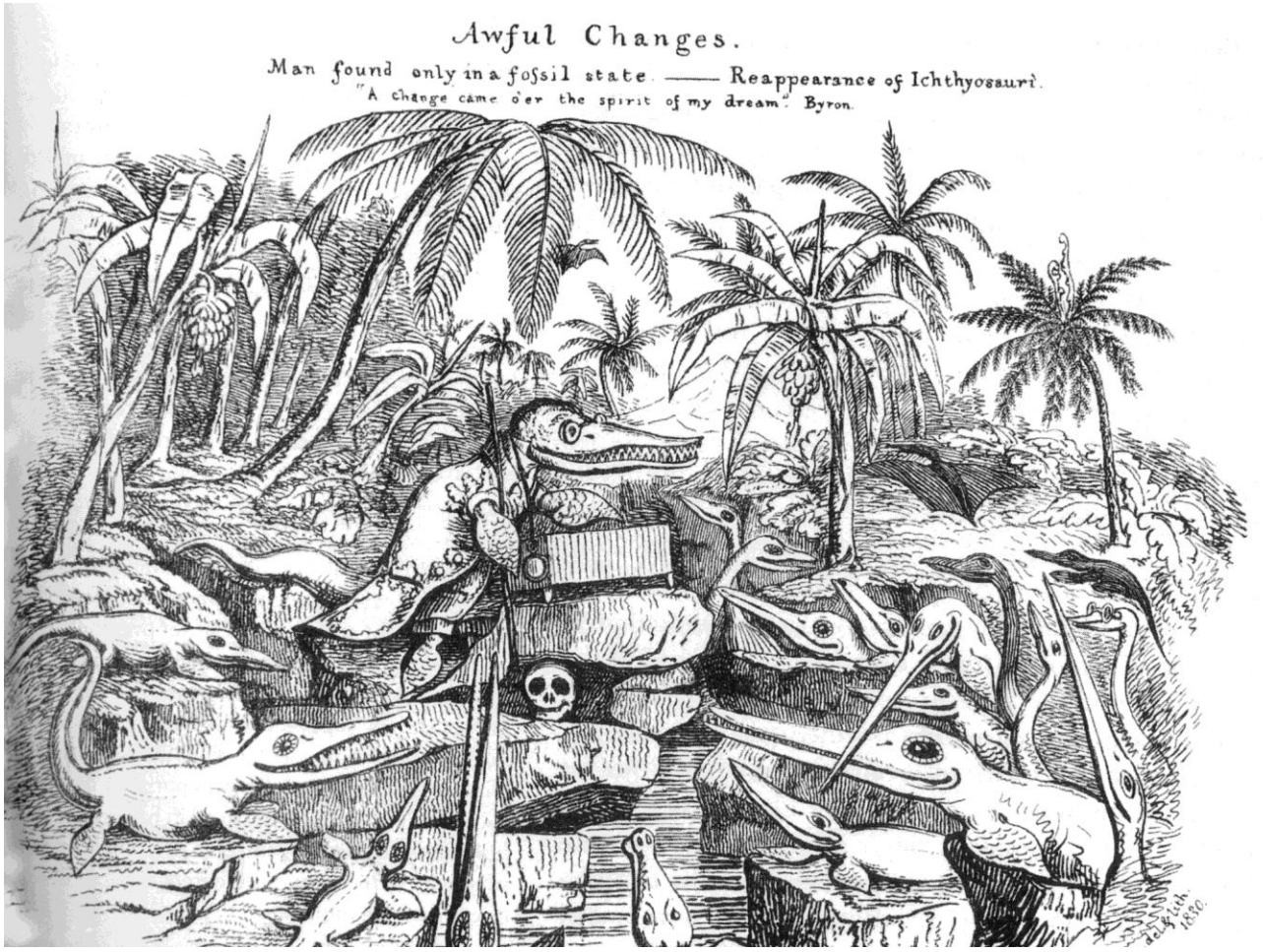
CHARLES LYELL, Esq., F.R.S.

IN TWO VOLUMES.

Vol. I.

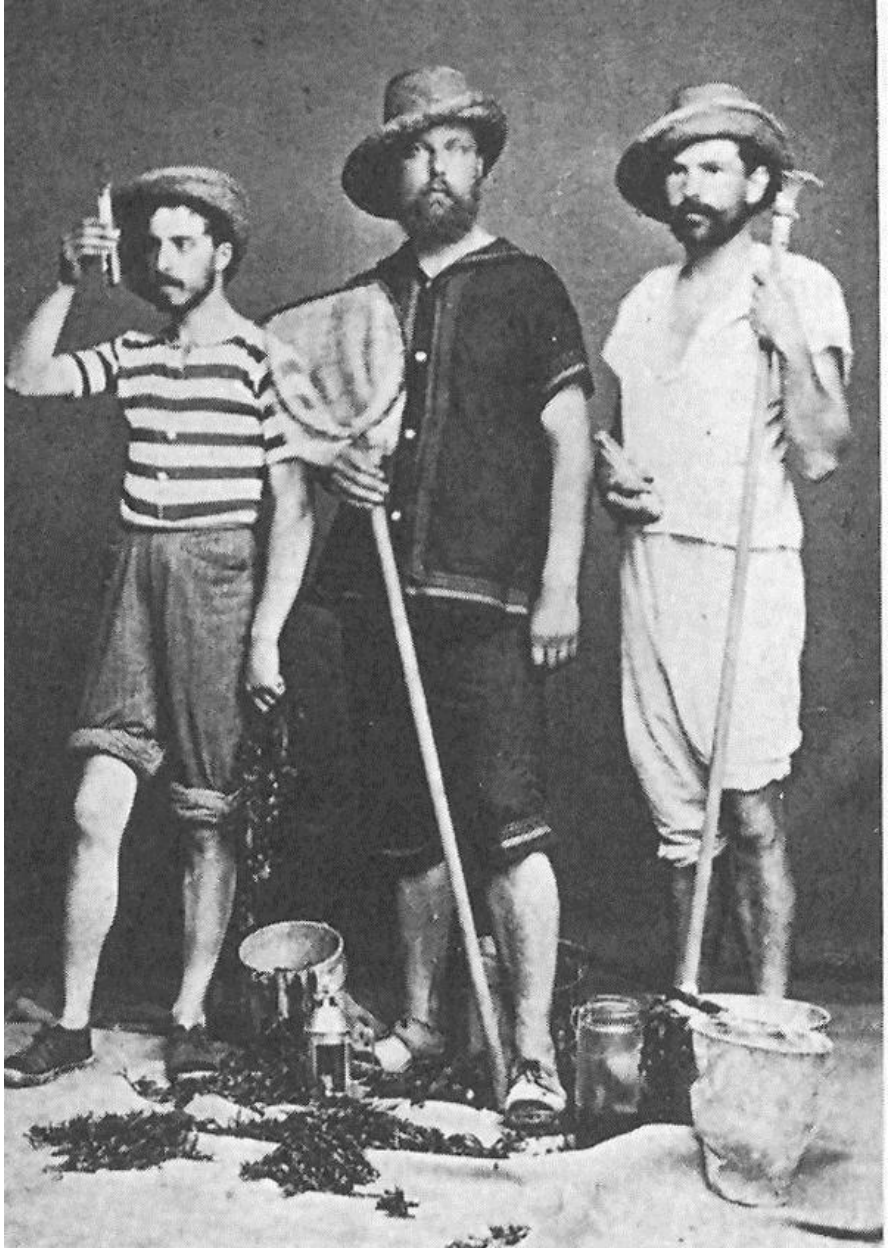
LONDON:
JOHN MURRAY, ALBEMARLE-STREET.

Frontispiece: Temple of Serapis, Naples

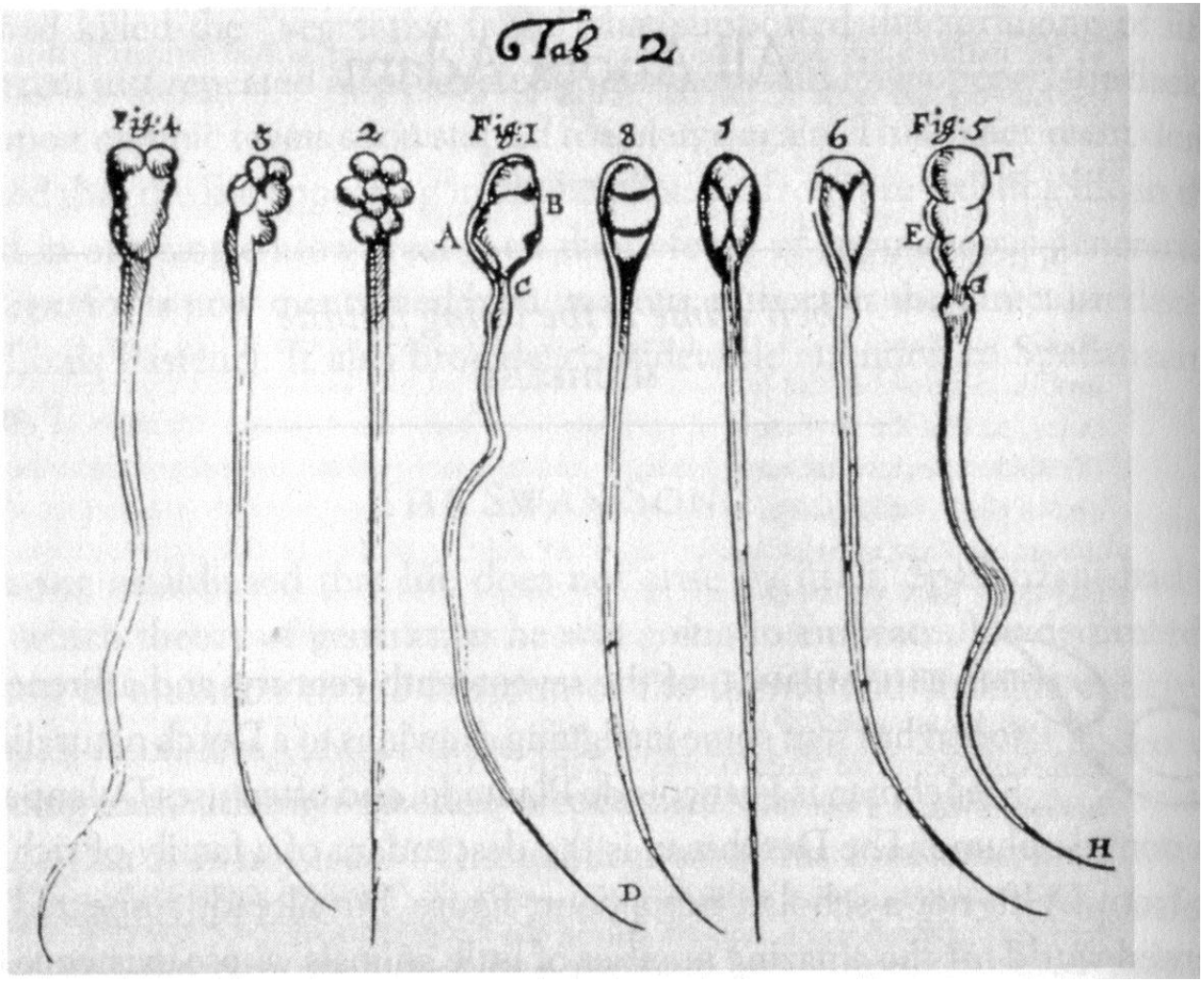


De La Beche's lampoon of Lyell (1830). Professor Ichthyosaurus is lecturing: "You will at once perceive," continued Professor Ichthyosaurus, "that the skull before us belonged to some of the lower order of animals: the teeth are very insignificant; the power of the jaws trifling; and altogether it seems wonderful how the creature could have procured food."

Gregor Mendel (1822-1884), the Augustinian priest whose paper "Experiments on Plant Hybridization" was published to no acclaim in 1866



August Weismann, center, (1834-1914), on a marine collecting trip in 1880.



Antoni van Leeuwenhoek's (1632-1723) observation of small animals, animaculae, in the sperm of different animals; from *Philosophical Transactions of the Royal Society* (1679).

Illustration little man in male sperm by Nicolas Hartsoeker (1656-1725), in his Éssai de dioptrique, 1694.

Charles Bonnet (1720-1793), illustration of the Great Chain of Being.

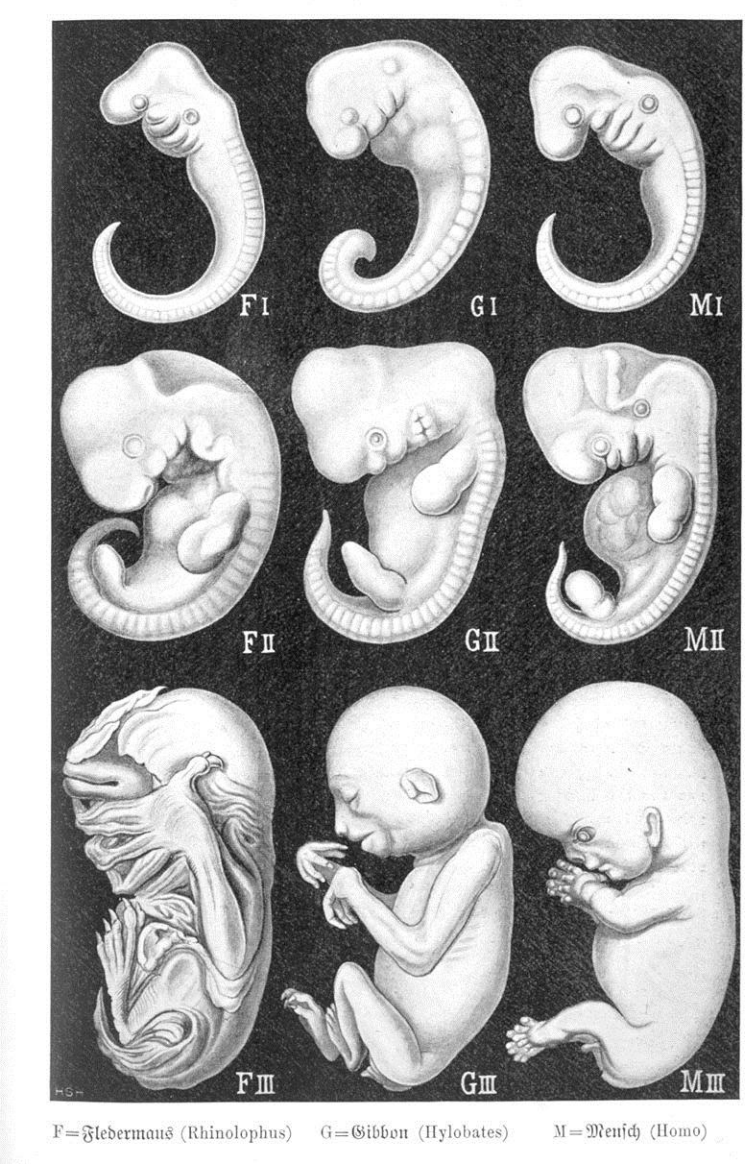
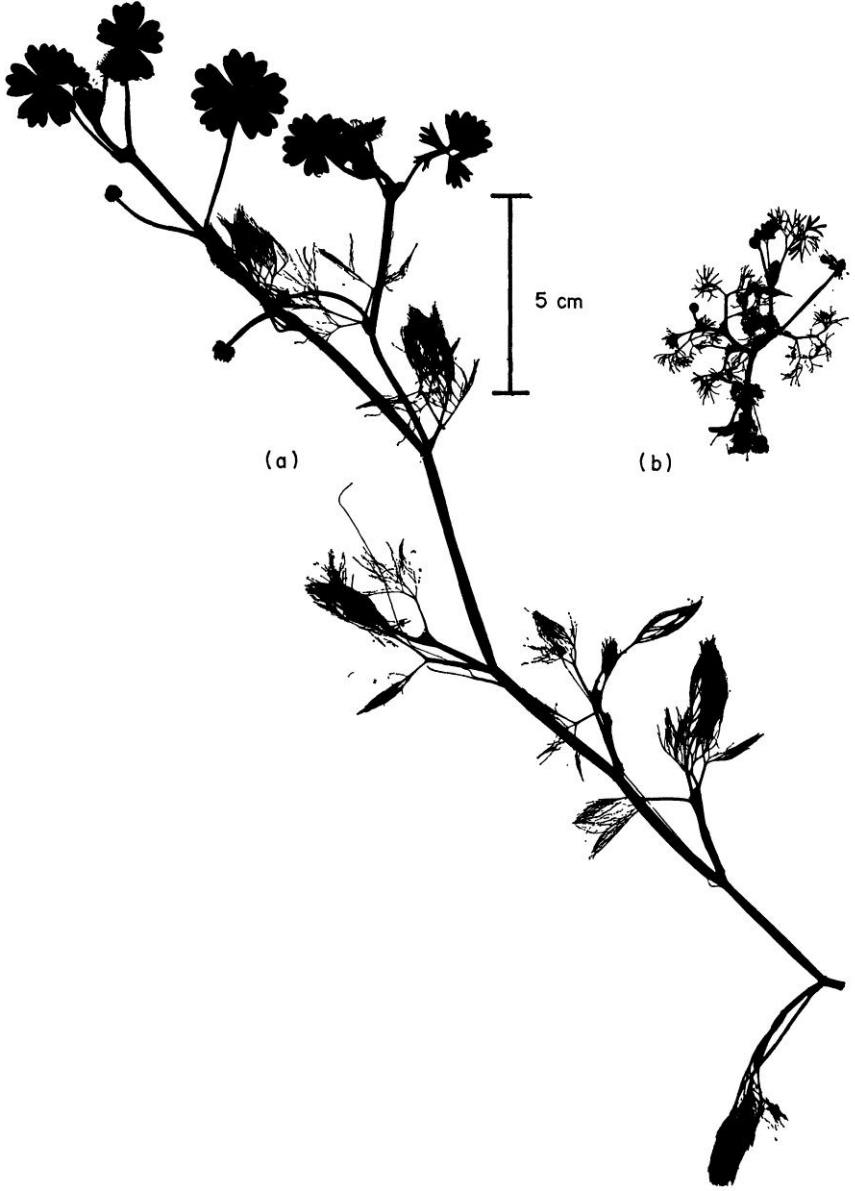


Illustration of the biogenetic law, from Haeckel's lecture in 1905

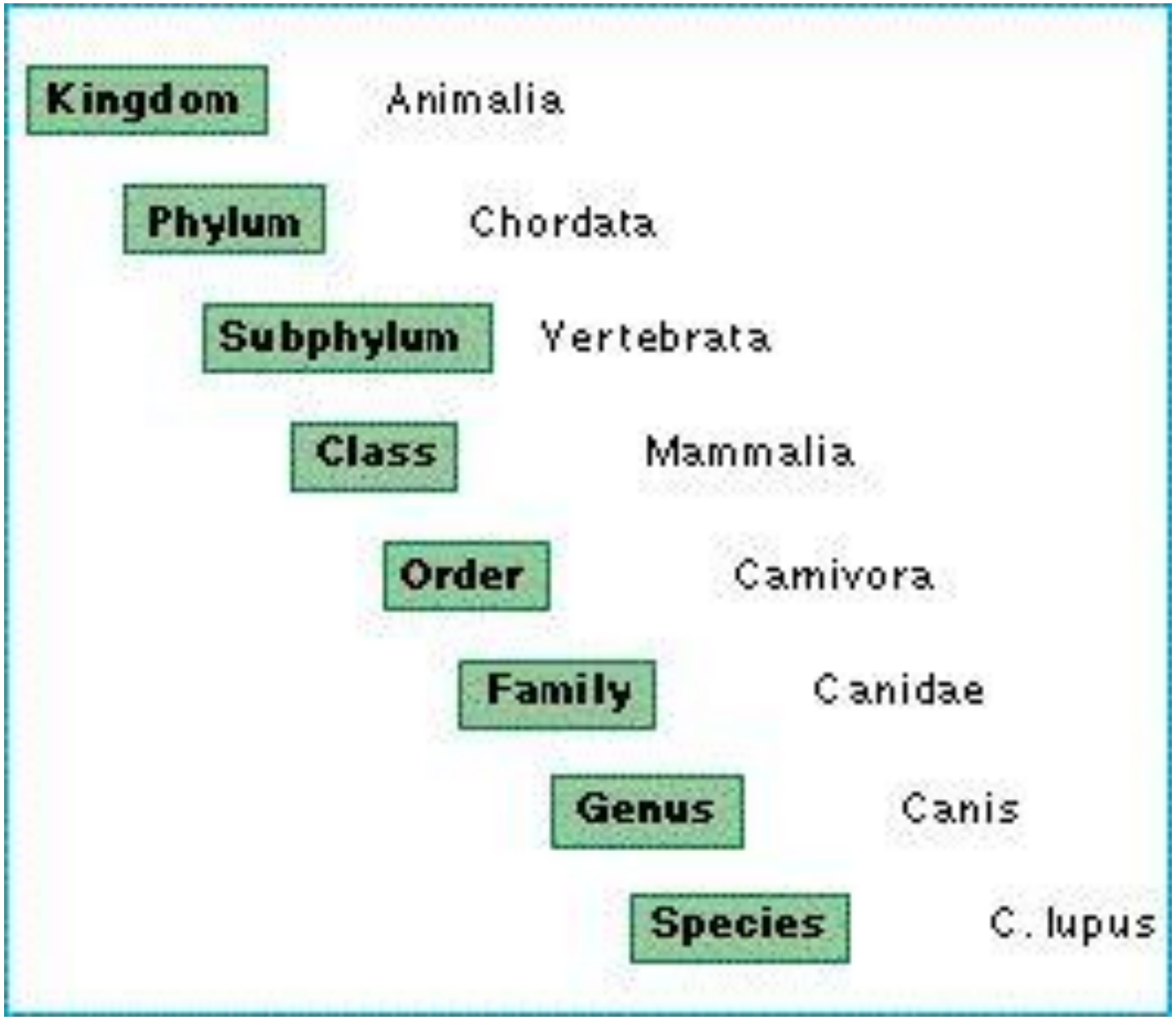
Erasmus Darwin (1732-1802)

Jean-Baptiste de Lamarck (1744-1829)

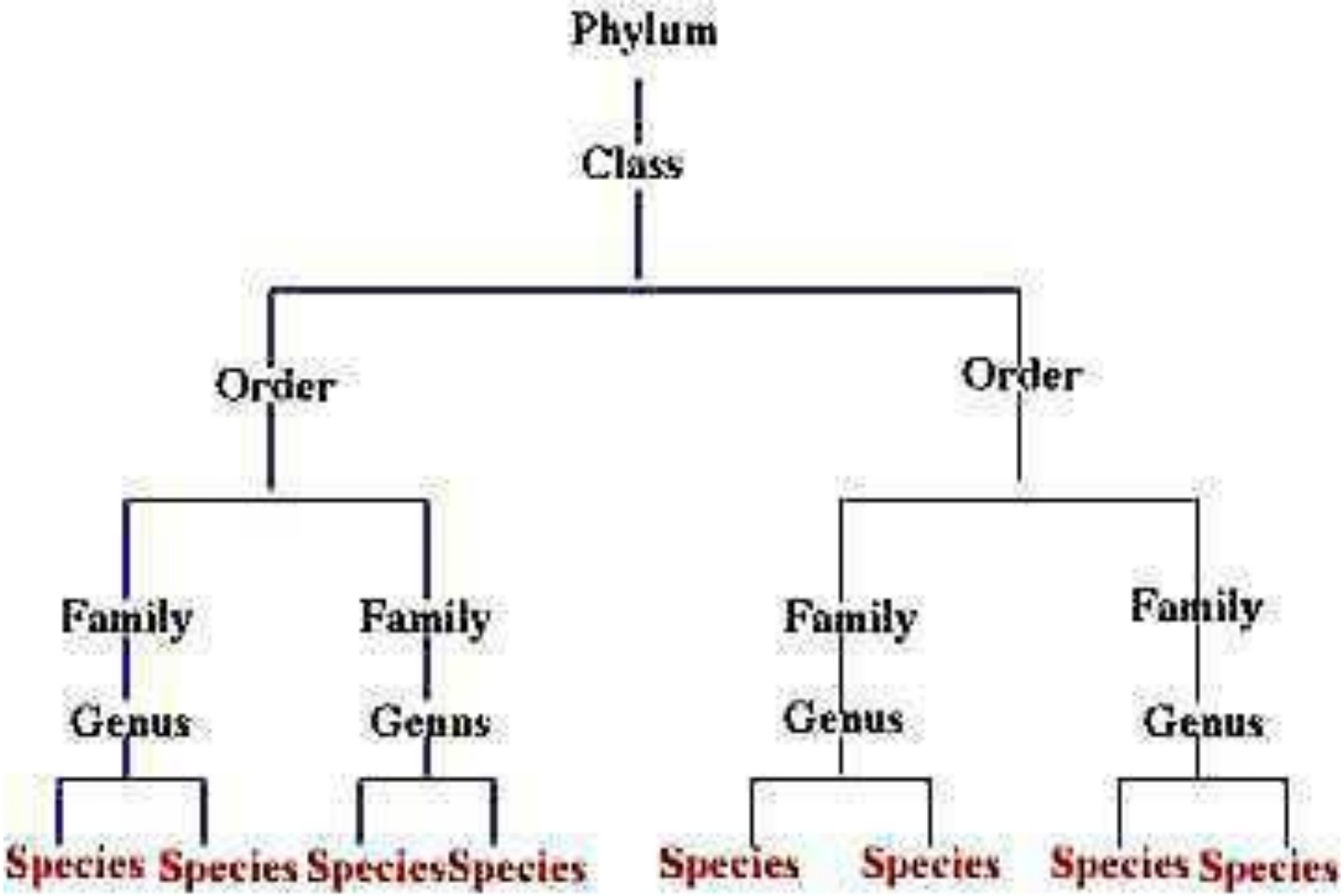


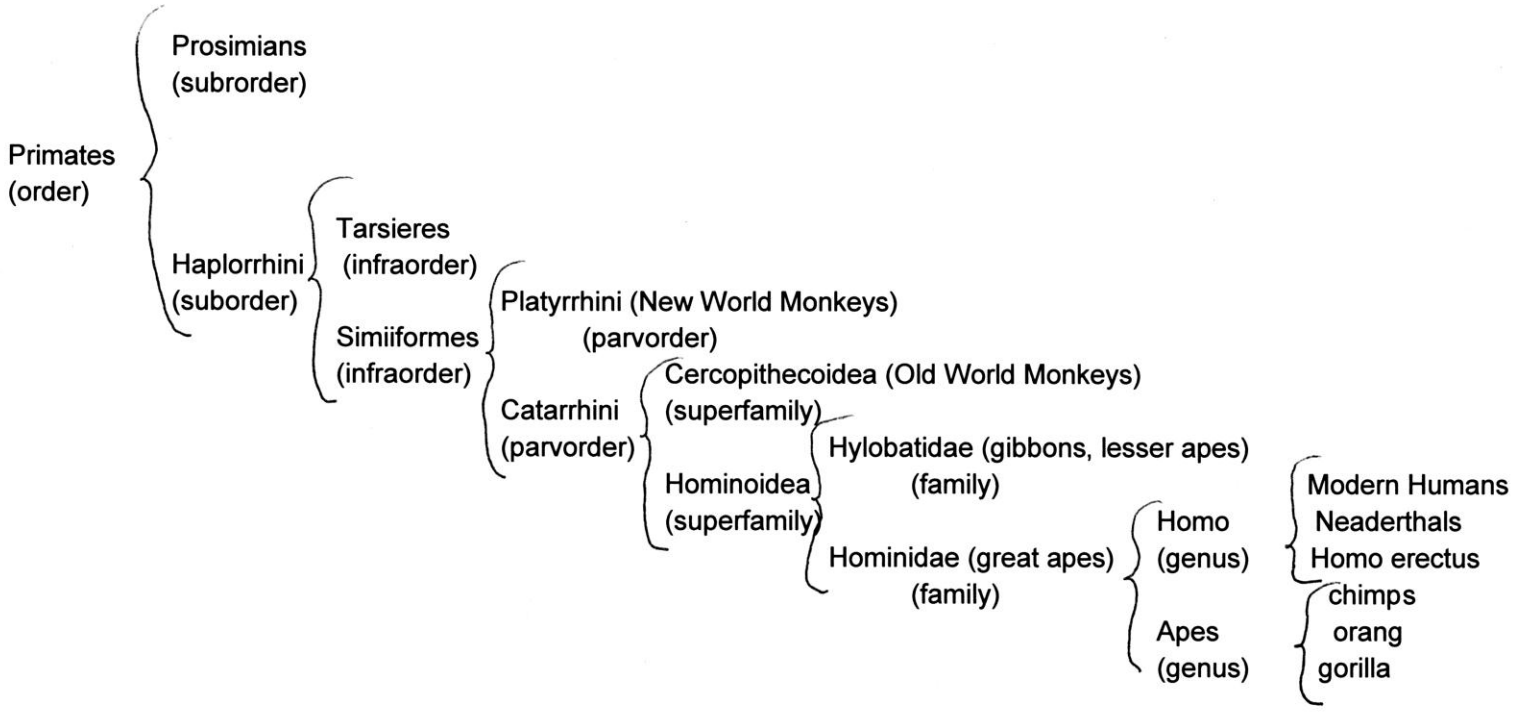
Ranunculus aquatis: a) grown in water, with leaves below underwater and leaves above in air; b) grown in the ground. From C. D. Cook, “On the Determination of Leaf Form in Ranunculus Aquatilis, *New Phytologist* 68 (1969): 469-80.

Flounder, a flatfish with eyes on the same side of body; when a fry, eyes are on either side and the fish swims vertically.



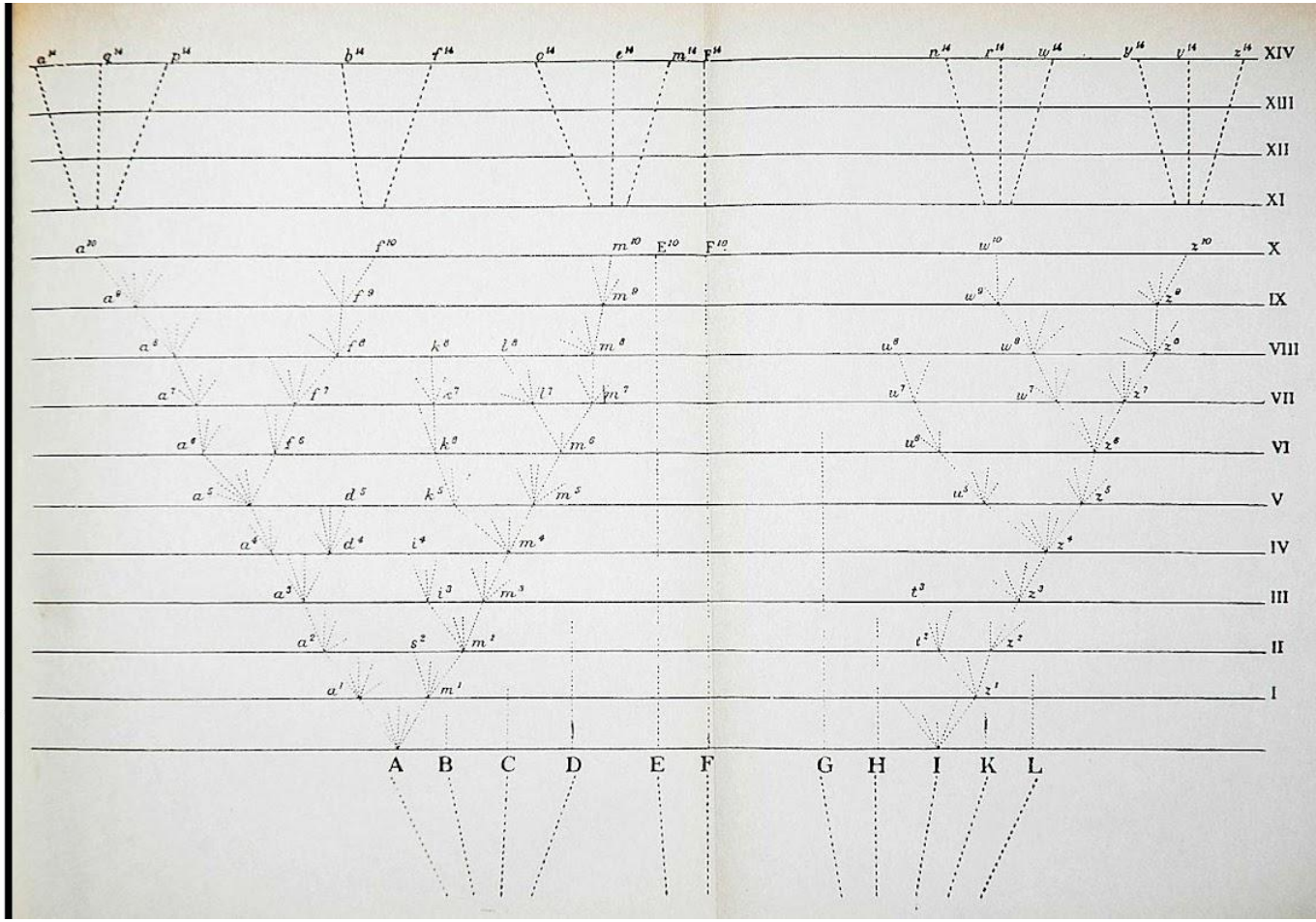
Linnaean classification of the Gray Wolf


Phylum
Class
Order
Order
Family
Family
Family
Family
Genus
Genus
Genus
Genus
Species
Species
Species
Species
Species
Species
Species
Species


Primates
(order)
Prosimians
(subrorder)
Haplorrhini
(suborder)
Tarsieres
(infraorder)
Simiiformes
(infraorder)
Platyrrhini (New World Monkeys)
(parvorder)
Catarrhini
(parvorder)
Cercopithecoidea (Old World Monkeys)
(superfamily)
Hominoidea
(superfamily)
Hylobatidae (gibbons, lesser apes)
(family)
Hominidae (great apes)
(family)
Homo
(genus)
Apes
(genus)
Modern Humans
Neaderthals
Homo erectus
chimps
orang
gorilla

I think

Then between A & B. various
kinds of relation. C & B. the
first gradation, B & D
rather greater distinction
Then genera would be
formed. — Bearing relation



Pachyderm

Pigs

Warthog

African Elephant

Asian Elephant.

Mammoth

Mastodon

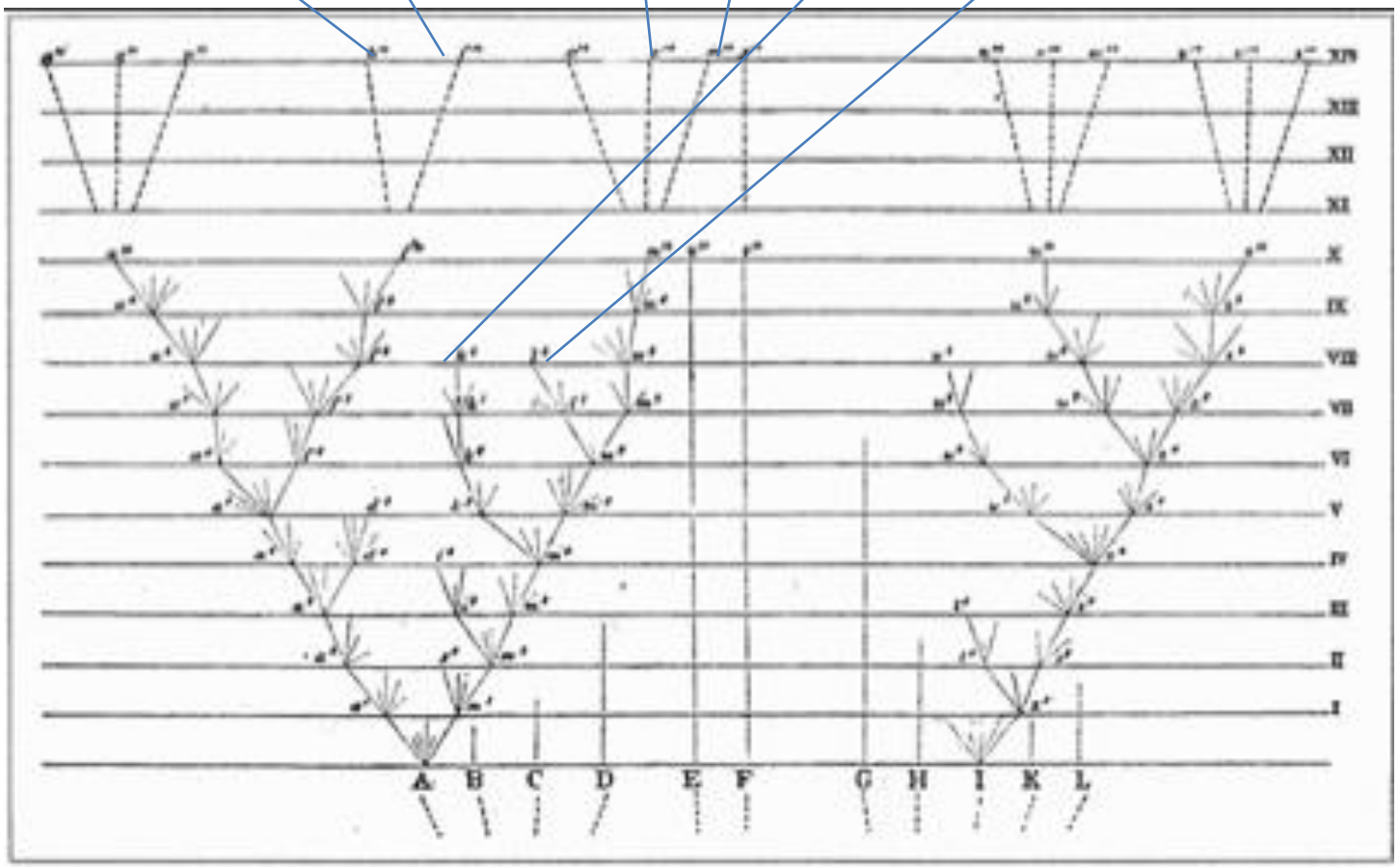
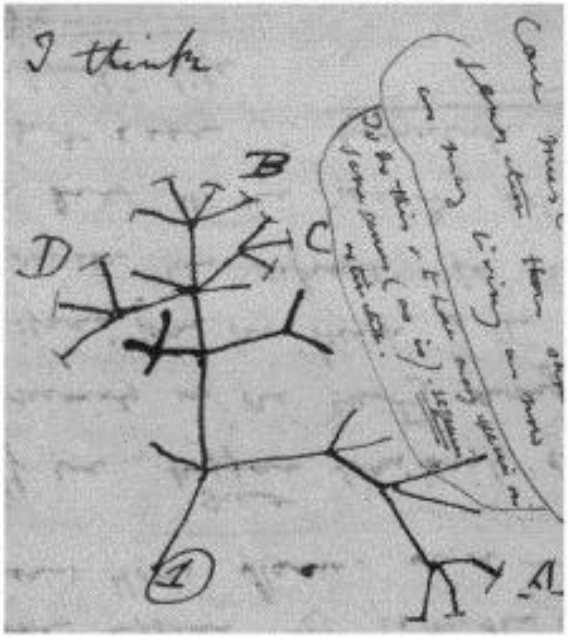
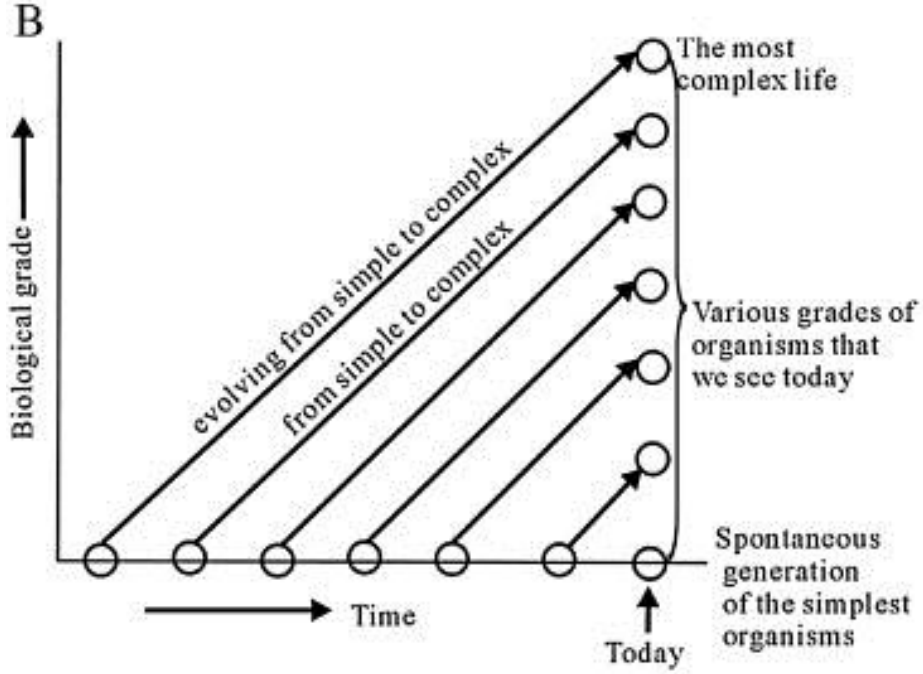


FIGURE 3-1 Darwin's Tree of Life.

A


I think
B
C
D
A

B


Biological grade
evolving from simple to complex
from simple to complex
The most complex life
Various grades of organisms that we see today
Spontaneous generation of the simplest organisms
Time
Today