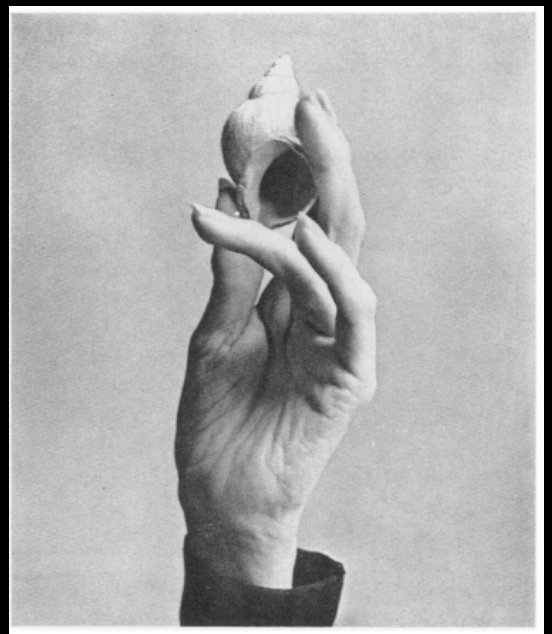
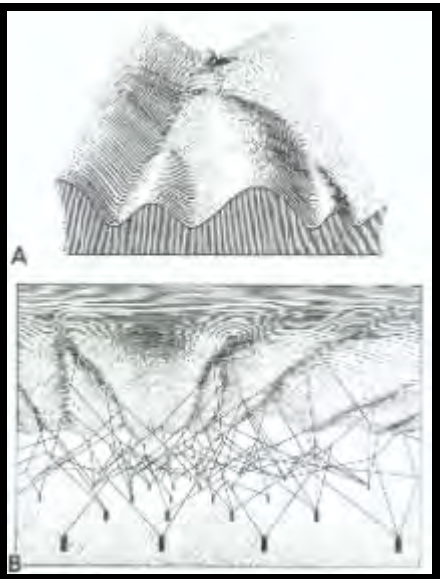


Edith Sitwell's hand holding a helical shell. (From 1958 Christmas card of Eve and Lance Whyte.)

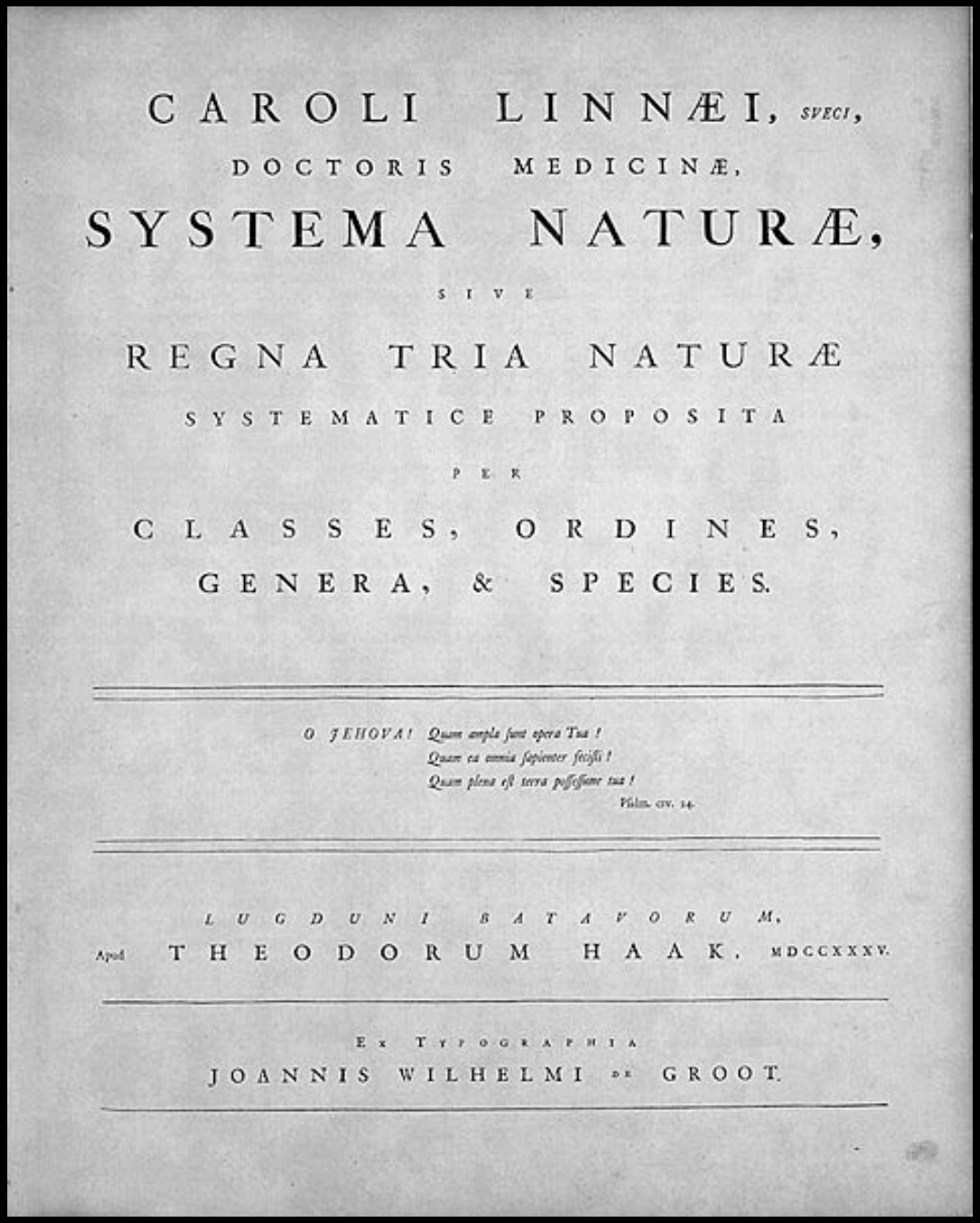


Conrad Waddington, Epigenetic Landscape, 1957

HUAS 6312-001
20537
BIOS: Art, Architecture, Design, and Biology
Dr. Charissa N. Terranova
University of Texas at Dallas
Spring 2014
Monday 4:00-6:45
JO 3.532

Office Hours: Monday 1:00-4:00
Office Location: JO 3.920
Contact: terranova@utdallas.edu

02/03/2014
EPIGENESIS AND MEMETICS



CAROLI LINNÆI, SVECI,

DOCTORIS MEDICINÆ,

SYSTEMA NATURÆ,

SIVE

REGNA TRIA NATURÆ

SYSTEMATICE PROPOSITA

PER

CLASSES, ORDINES,

GENERA, & SPECIES.

O JEHOVA! Quam ampla sunt opera Tua!
Quam ea omnia sapienter fecisti!
Quam plena est terra possessione tua!
Psalm. civ. 24.

LUGDUNI BATAVORUM,

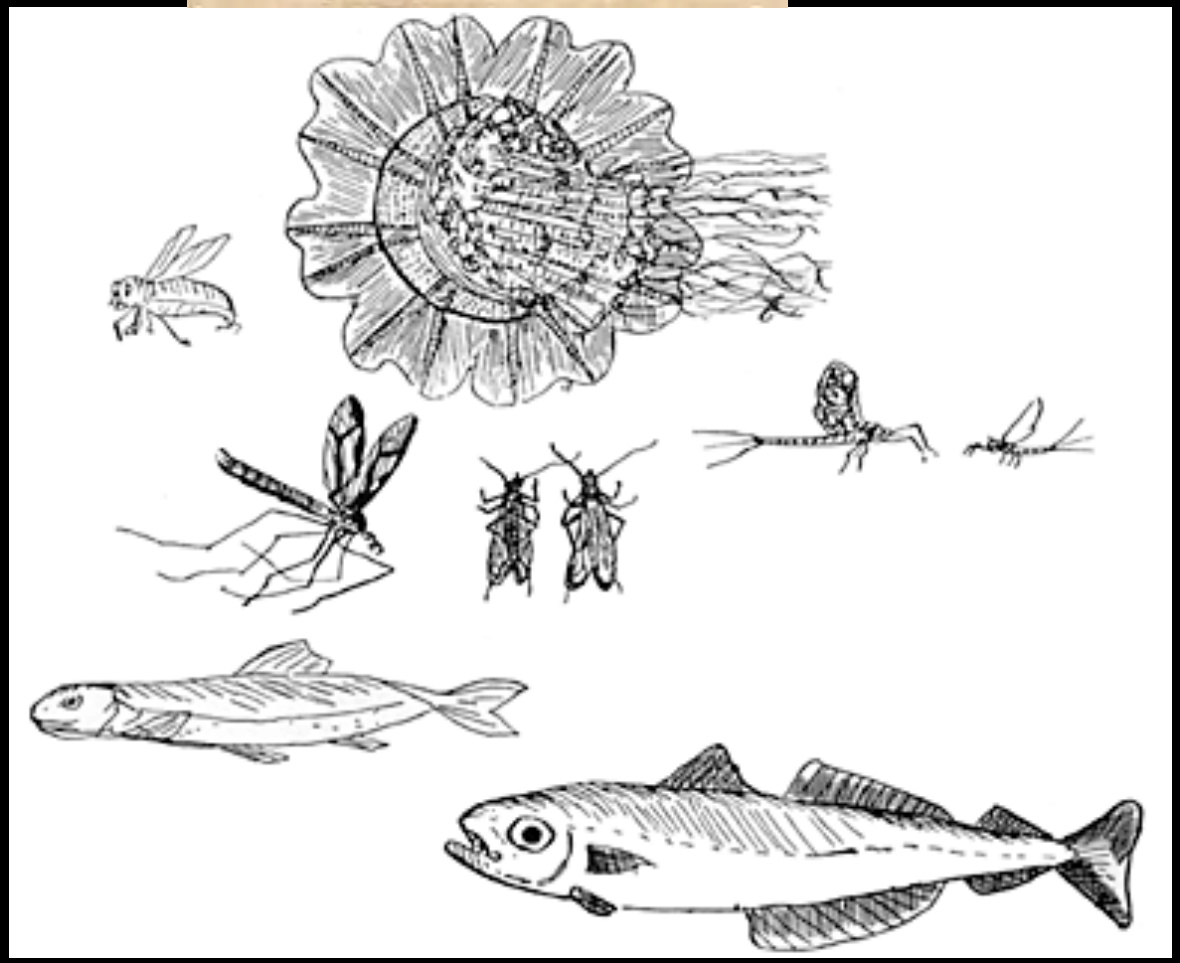
Apud THEODORUM HAAK, MDCCXXXV.

Ex Typographia

JOANNIS WILHELMI DE GROOT.

Carl Linneaus [c. 1707-1778]

- Swedish botanist, physician, zoologist
- Modern biological naming
- Binomial nomenclature
- Taxonomy
- Modern ecology
- *Systema Naturae* [1738]



Drawings by Linnaeus

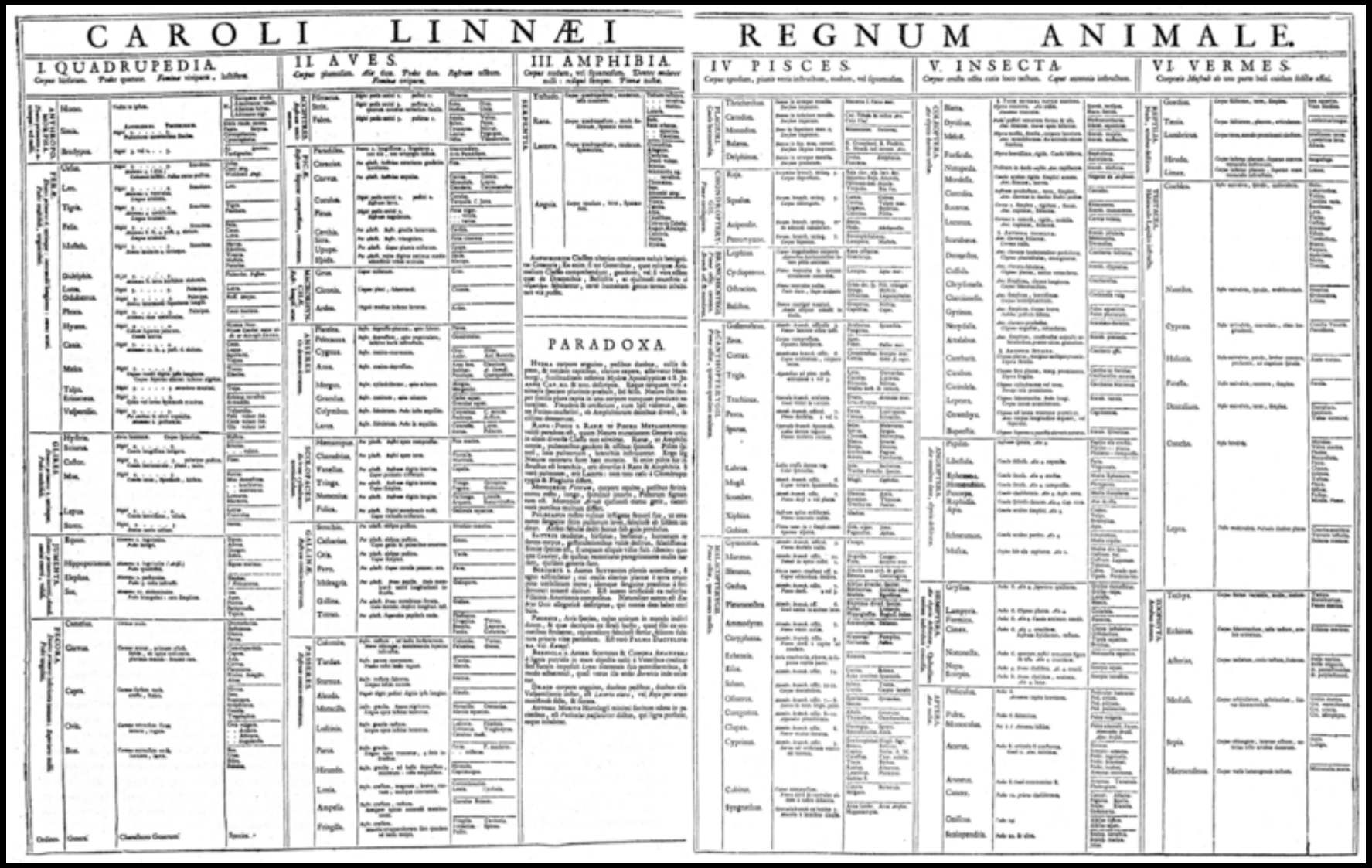


Table of the Animal Kingdom (Regnum Animale) from Carolus Linnaeus's first edition (1735) of *Systema Naturae*

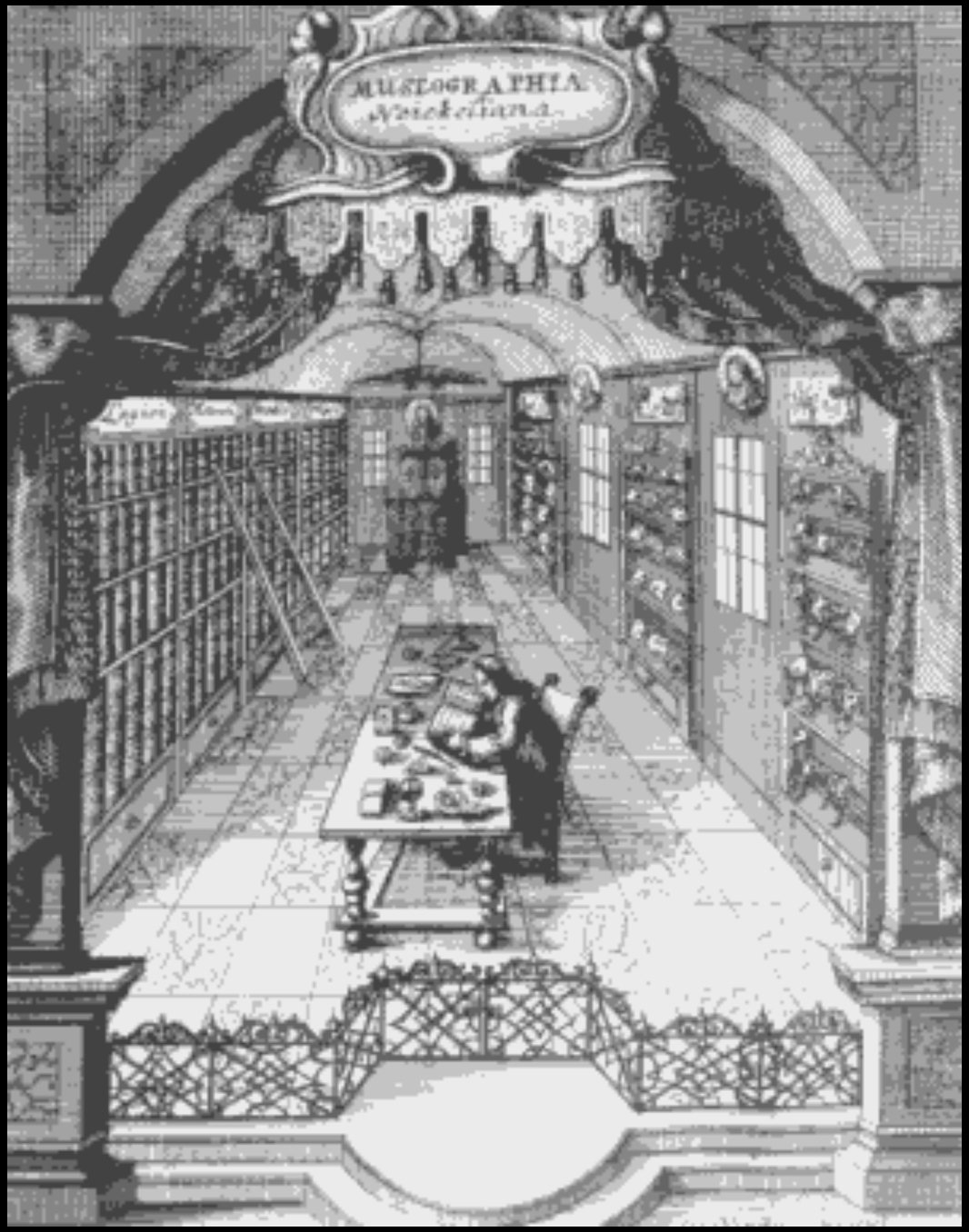
David Teniers the Younger, The Art Collection of Archduke Leopold Wilhelm in Brussels, 1650-52

The Philadelphia Museum, later known as Peale's American Museum. This museum is considered the first. It housed a diverse collection of botanical, biological, and archaeological specimens. Most notably, the museum contained a large variety of birds which Peale himself acquired, and in many instances mounted, having taught himself taxidermy.

Charles Willson Peale, The Artist in His Museum, 1822

Wunderkammer/Kunstkammer, 15-16th centuries, "Musei Wormiani Historia", the frontispiece from the *Museum Wormianum* depicting Ole Worm's cabinet of curiosities

Frans Francken, A Collector’s Cabinet, 1625

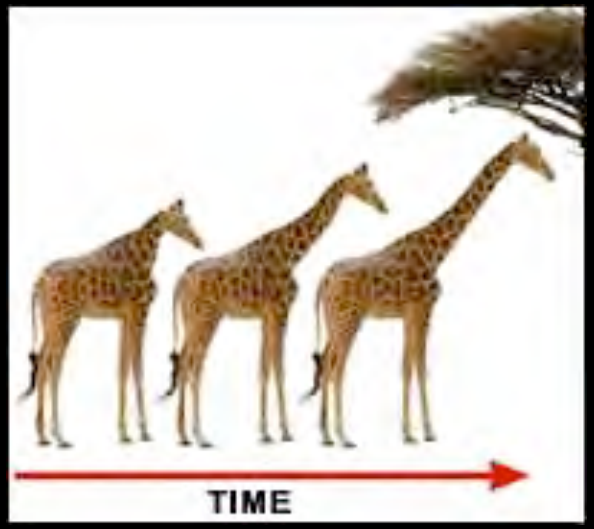


Frontispiz der Museographia, aus: Neickels Museographia, 1727

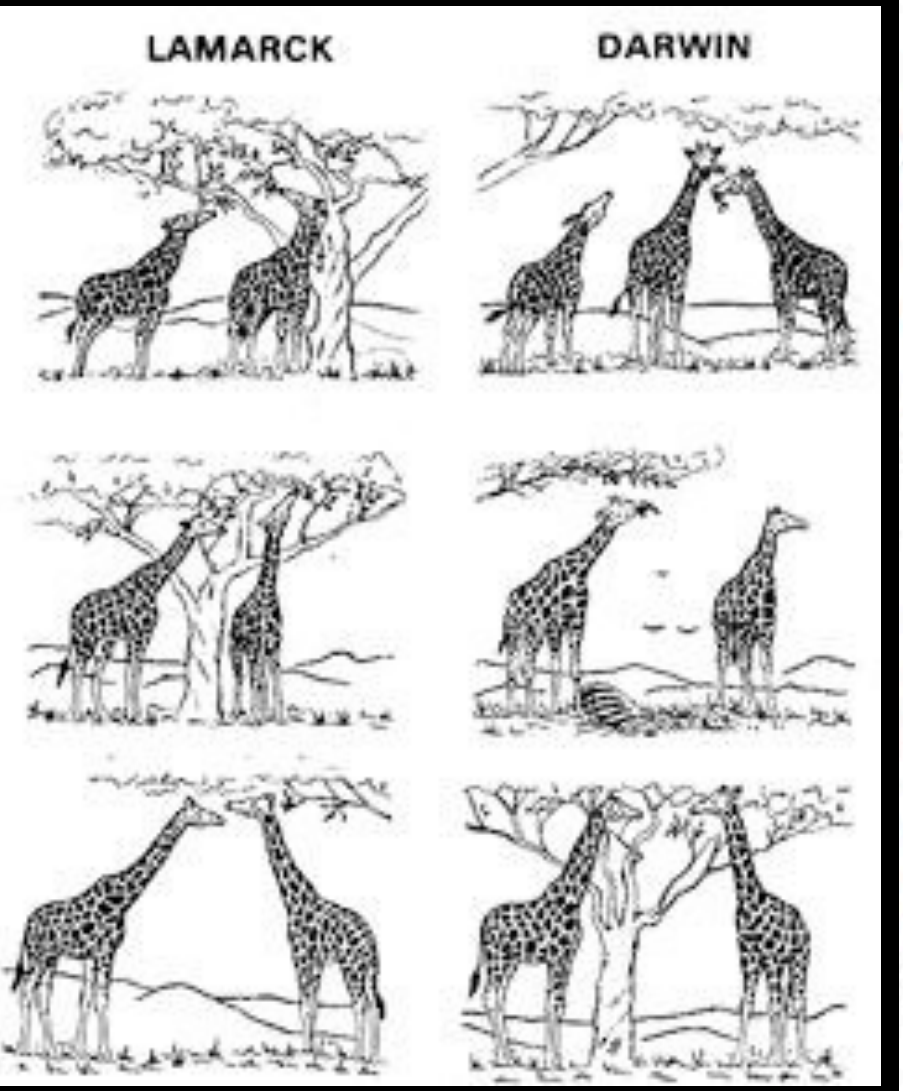
Jean-Baptiste Lamarck [1744-1829]

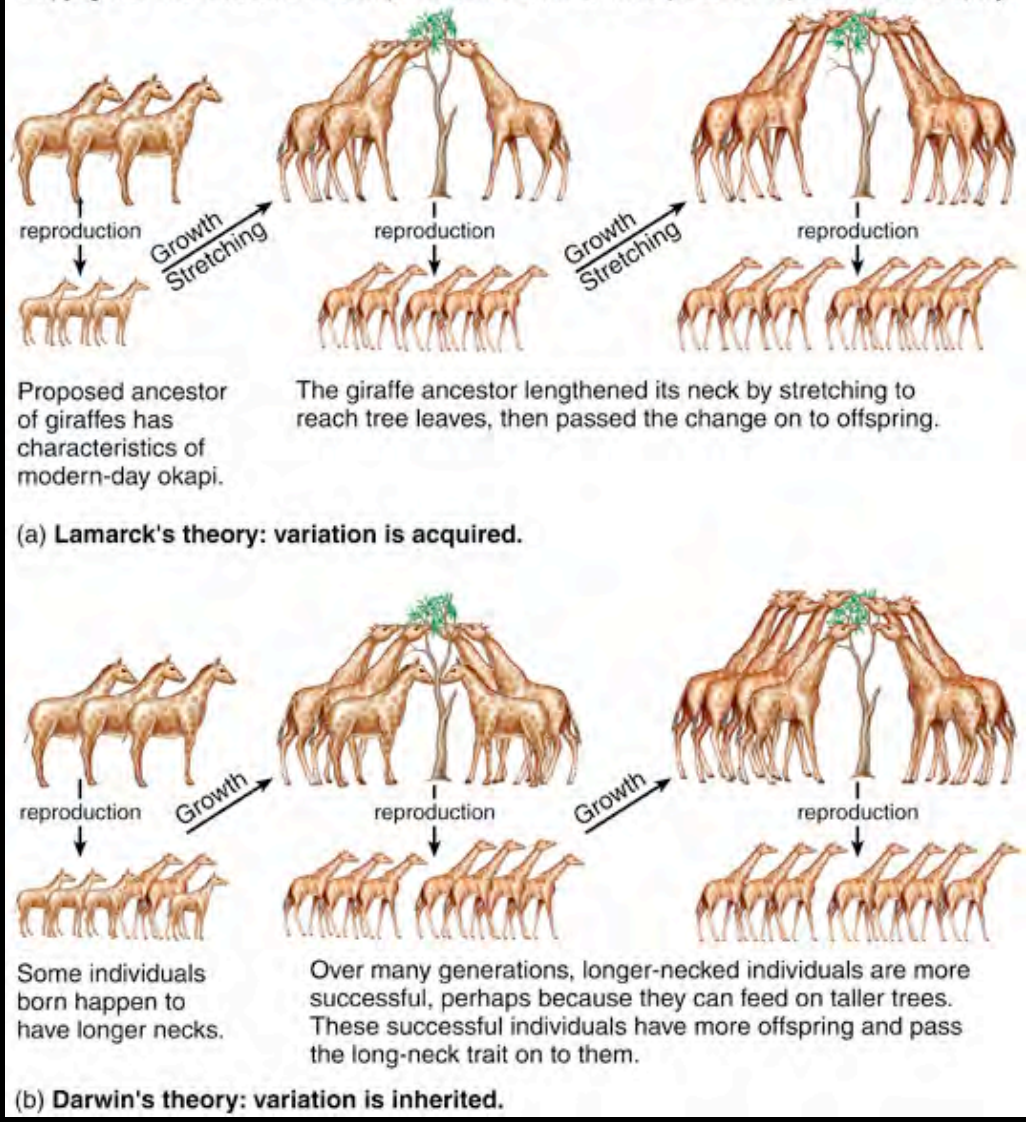
- French naturalist
- Biologist
- The first to develop a truly coherent evolutionary theoryThe environment gives rise to changes in animals.
- Inheritance of acquired characteristics
  - aka soft inheritance
  - aka Lamarckism use/disuse theory

1. The force that perpetually tends to make order.
2. The adaptation of organisms to their environment.



Lamarck believed that the long necks of giraffes evolved as generations of giraffes reached for ever higher leaves.





COMPARISON OF EVOLUTION MECHANISMS: SUMMARY

Lamarck's Hypothesis: The Inheritance of Acquired Characteristics

1. A **changing environment** creates a need for certain features to be developed in order to survive.*
2. **"Acquired Characteristics"**: Through use and/or non-use, those features needed for survival are developed in each individual.
3. **Inheritance**: Those characteristics developed ("acquired") by individuals are somehow passed on to their offspring, who can continue that development...
4. **New Species**: Eventually, over many generations, enough differences have developed that we can say we have a new species.

Darwin's Hypothesis: Natural Selection

1. **Overproduction**: More offspring produced than will ultimately survive and reproduce
2. **Variation**: Inheritable features vary from individual to individual.
3. **Change in environment**: Changes in climate, topography, food supply, predators, etc.
4. **"Struggle for existence":** Mainly competition within the species, for food, habitat, survival from being eaten
5. **"Survival of the fit"** (not necessarily the strongest): Those with more adaptive traits tend to survive longer and/or produce the most offspring; these are the "naturally selected".
6. **Inheritance of "selected" features**: Traits involved are already inheritable, but may involve new combinations.
7. **New Species,** better adapted to the new environment: When the collective traits of the population differ significantly from the earlier population, and can no longer reproduce with the earlier population.

QUICK COMPARISON

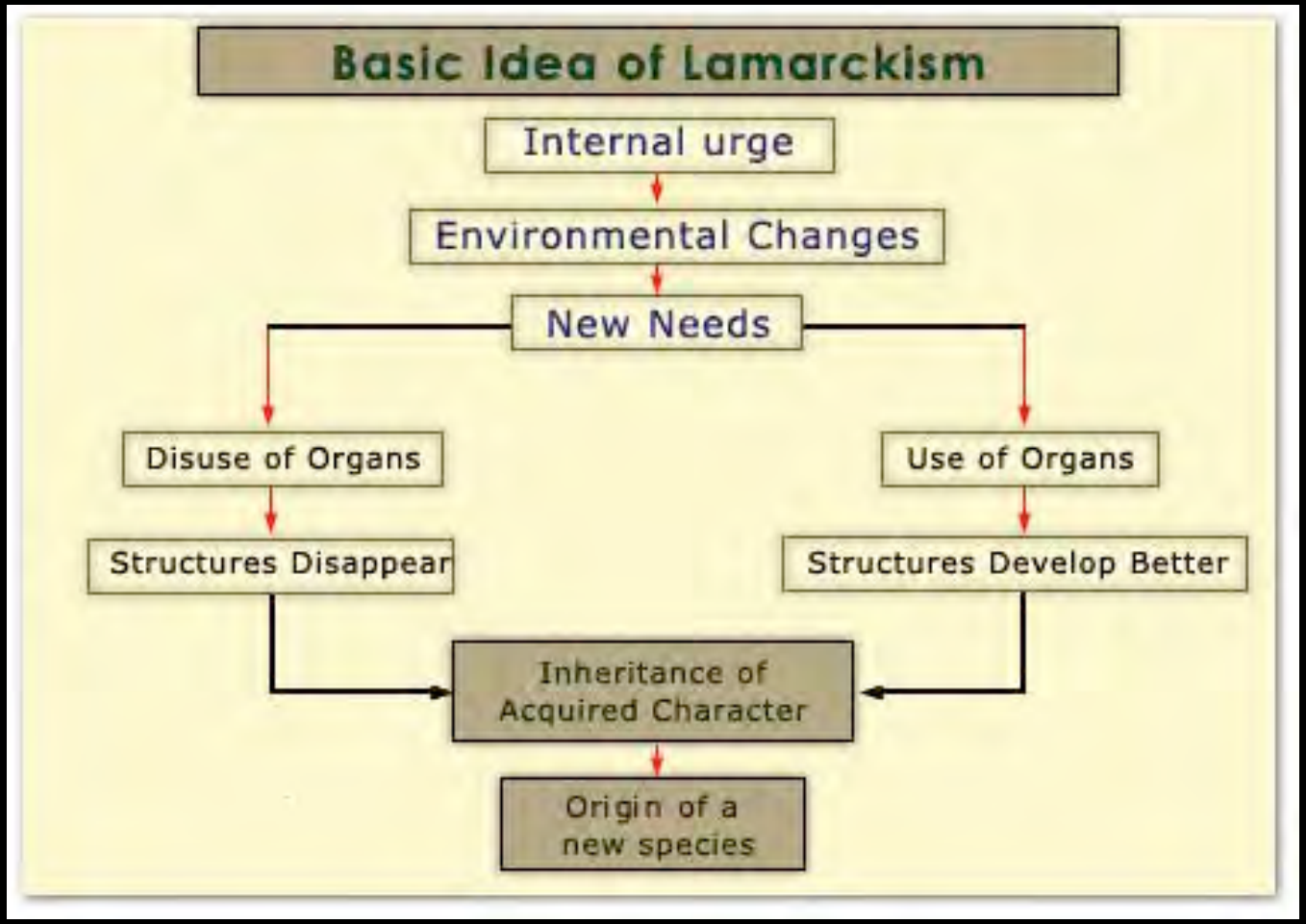
LAMARCK	DARWIN
1. Environment changes, creating a "need" to change	1. Variations of inheritable features which already normally are present
2. New features develop, "in order to survive" or "so that it can survive"	2. The environment selects features that will help the organism survive and others get eliminated
3. Traits gotten from parents are somehow passes down to the offspring	3. traits which help an organism to survive get passed on to offspring who inherit those traits

* Note the Anthropomorphic wording here ("something non-human having human motivations or attributes"). This could also be referred to as the "Mickey Mouse" syndrome. Be sure to avoid this kind of wording or implication in any explanations of Natural Selection.

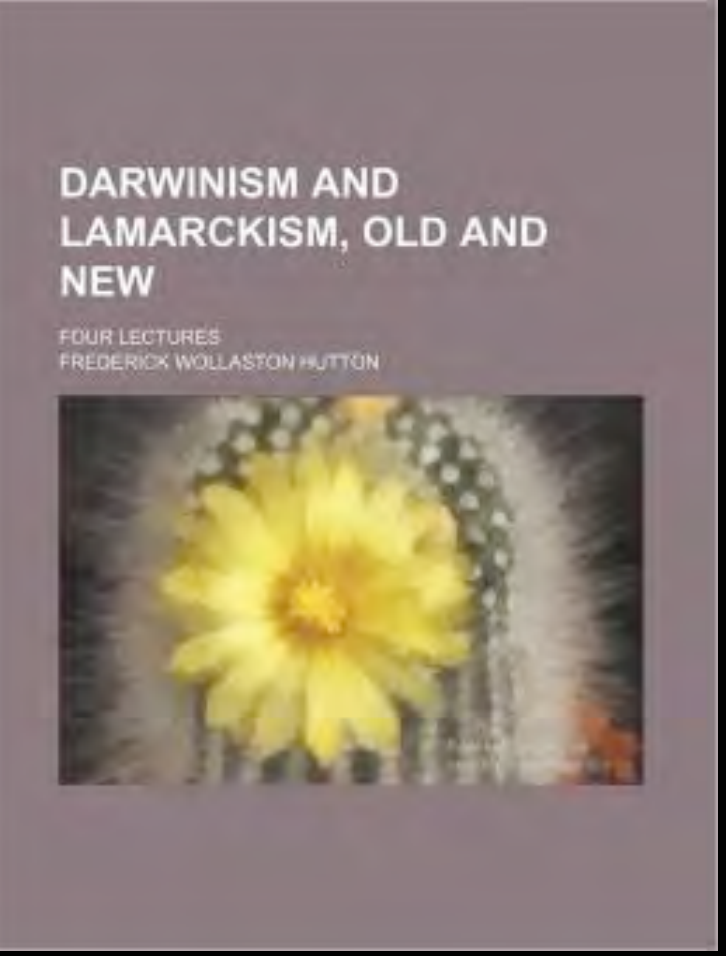
========== COMMON MISCONCEPTIONS TO AVOID

1. Only groups of organisms can evolve (populations or species); individuals never evolve.
2. Adaptations, in the evolutionary sense, as properly used in class and text, can only "develop" as characteristics of a species, generally over a long period of time, involving many generations; these must not be confused with the "adjustments" an individual might make, consciously or otherwise, enabling it to survive better (such as "developing resistance to a disease" or "adapting to higher altitudes", etc.).

Lamarckism or Neo-Lamarckianism



- **Lamarckism** (or **Lamarckian inheritance**) is the idea that an organism can pass on characteristics that it acquired during its lifetime to its offspring (also known as heritability of acquired characteristics or soft inheritance).
- 1880-present



Frederick Wollaston Hutton [1836-1905]

- English scientist who applied the theory of natural selection to explain the origins and nature of the natural history of New Zealand.
- He was an early and avid supporter of Darwinian selection principles, and used these to help explain the biogeographical and evolutionary origins of elements of the New Zealand biota.

Epigenesis, Epigenetics, and Autopoesis

In biology, and specifically genetics, **epigenetics** is the study of heritable changes in gene activity that are *not* caused by changes in the DNA sequence.

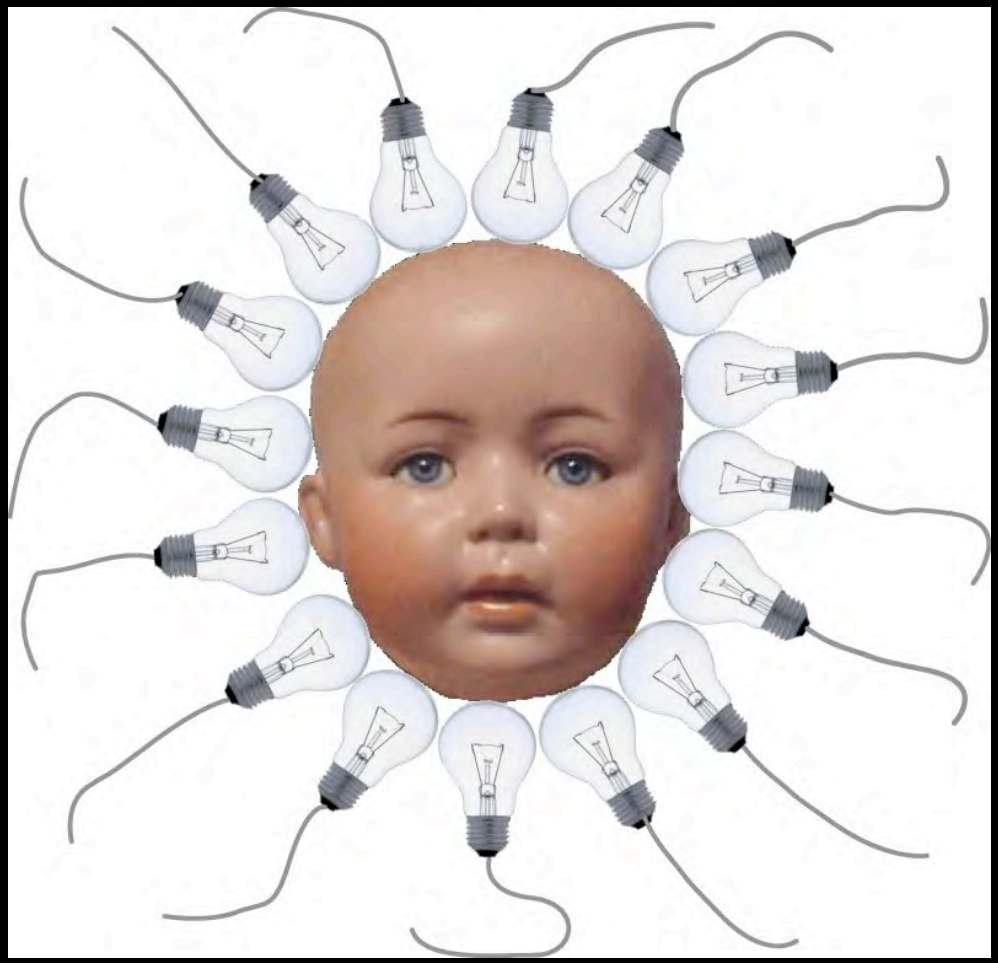
“Once nurture seemed clearly distinct from nature. Now it appears that our diets and lifestyles can change the expression of our genes. How? By influencing a network of chemical switches within our cells collectively known as the epigenome. This new understanding may lead us to potent new medical therapies. Epigenetic cancer therapy, for one, already seems to be yielding promising results.”

Epigenetics, Posted 07.24.07, NOVA scienceNOW, http://www.pbs.org/wgbh/nova/body/epigenetics.html

Autopoeisis - "**Autopoiesis**" (from Greek *auto-*, meaning "self", and *poiesis*, meaning "creation, production") refers to a system capable of reproducing and maintaining itself.

“An autopoietic machine is a machine organized (defined as a unity) as a network of processes of production (transformation and destruction) of components which: (i) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them; and (ii) constitute it (the machine) as a concrete unity in space in which they (the components) exist by specifying the topological domain of its realization as such a network.”

Autopoiesis and Cognition: the Realization of the Living, Humberto Maturana and Francisco Varela



Richard Dawkins [1941-]

- Ethologist
- Evolutionary biologist
- *The Selfish Gene (*1976)

MEMETICS
GENETICS