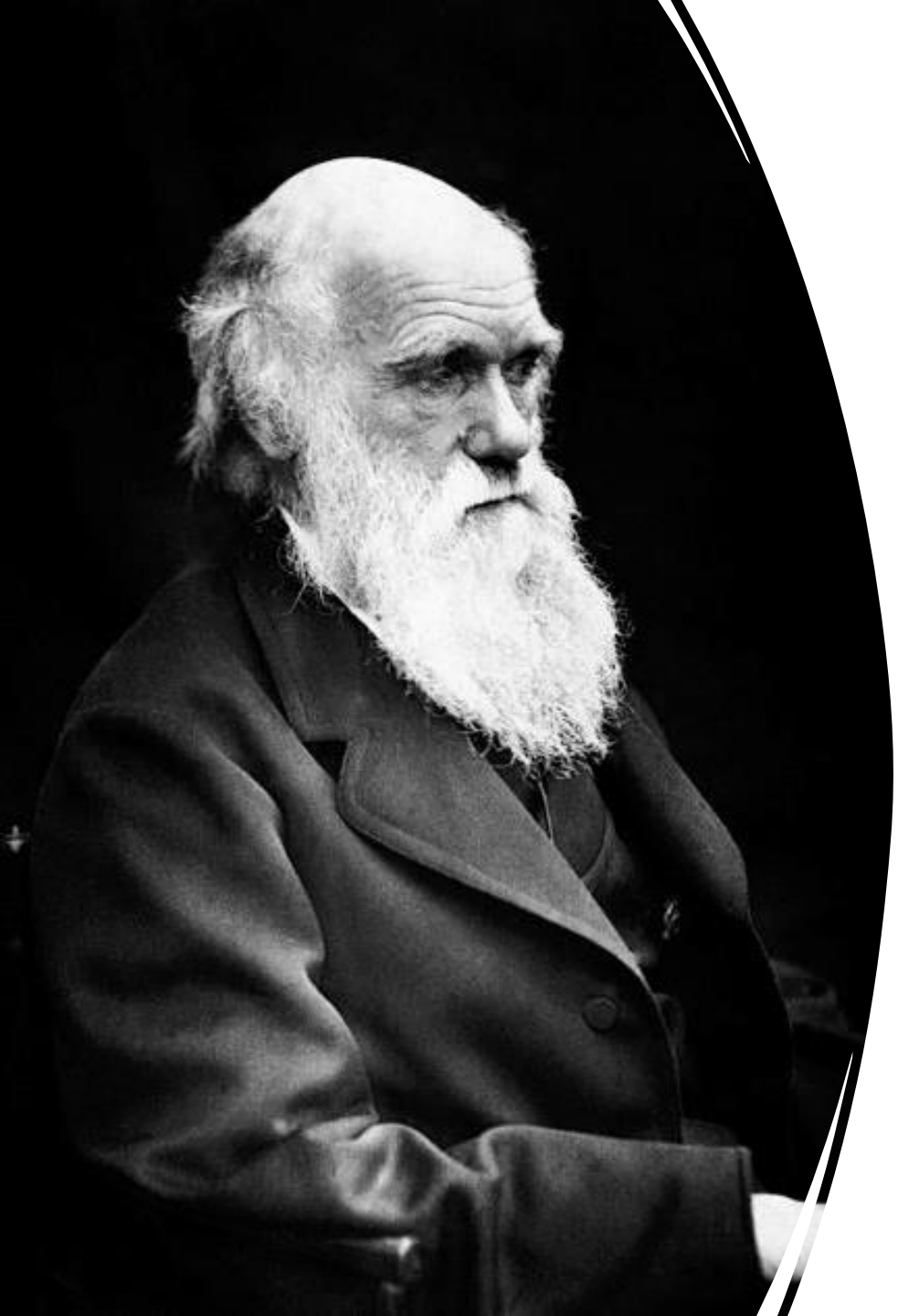


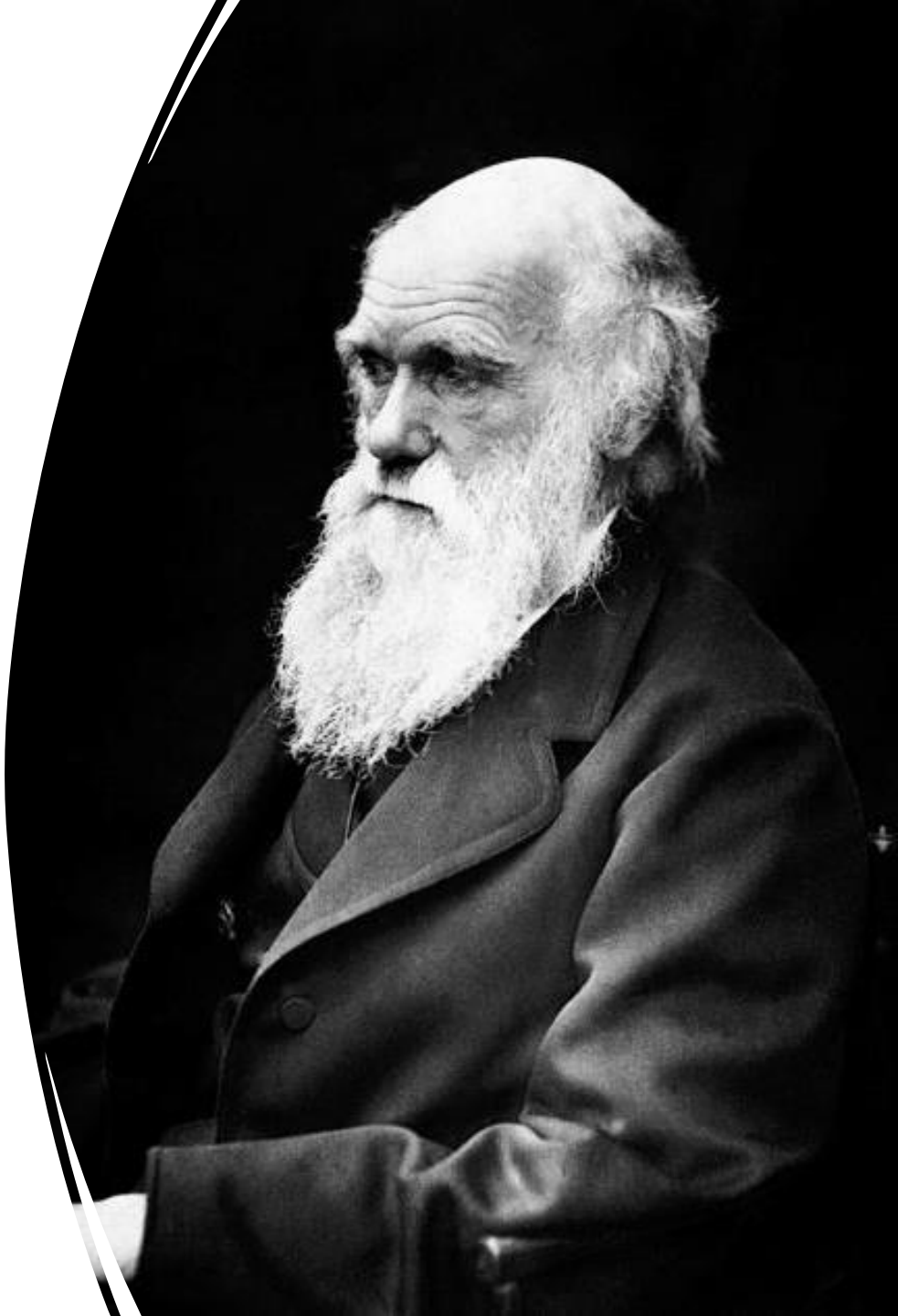
Darwin's "long argument" for the origin of species and why it fails

Rômulo Carleial, PhD

Darwin’s two goals in the Origin

"I had two distinct objects in view; firstly, to show that **species had not been separately created**, and secondly, that **natural selection had been the chief agent of change**, though largely aided by the inherited effects of habit, and slightly by the direct action of the surrounding conditions."

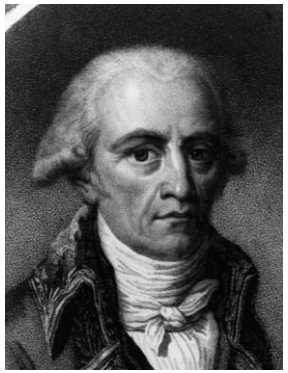
(The Descent of Man, Chapter III)



Background: Evolutionists before Darwin

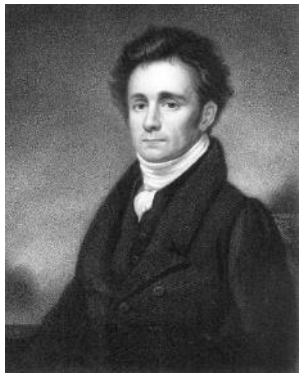
Benoît de Maillet (1656-1738)

Comte de Buffon (1707 – 1788)

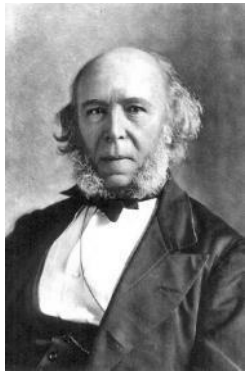


J.B. Lamarck (1744 – 1829)

Robert Grant (1793 – 1874)



Robert Jameson (1774 – 1854)



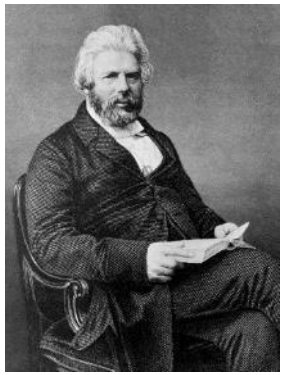
Herbert Spencer (1820 – 1903)

Pierre Maupertuis (1698 – 1759)

Saint-Hilaire (1772 –1844)

Denis Diderot (1713 – 1784)

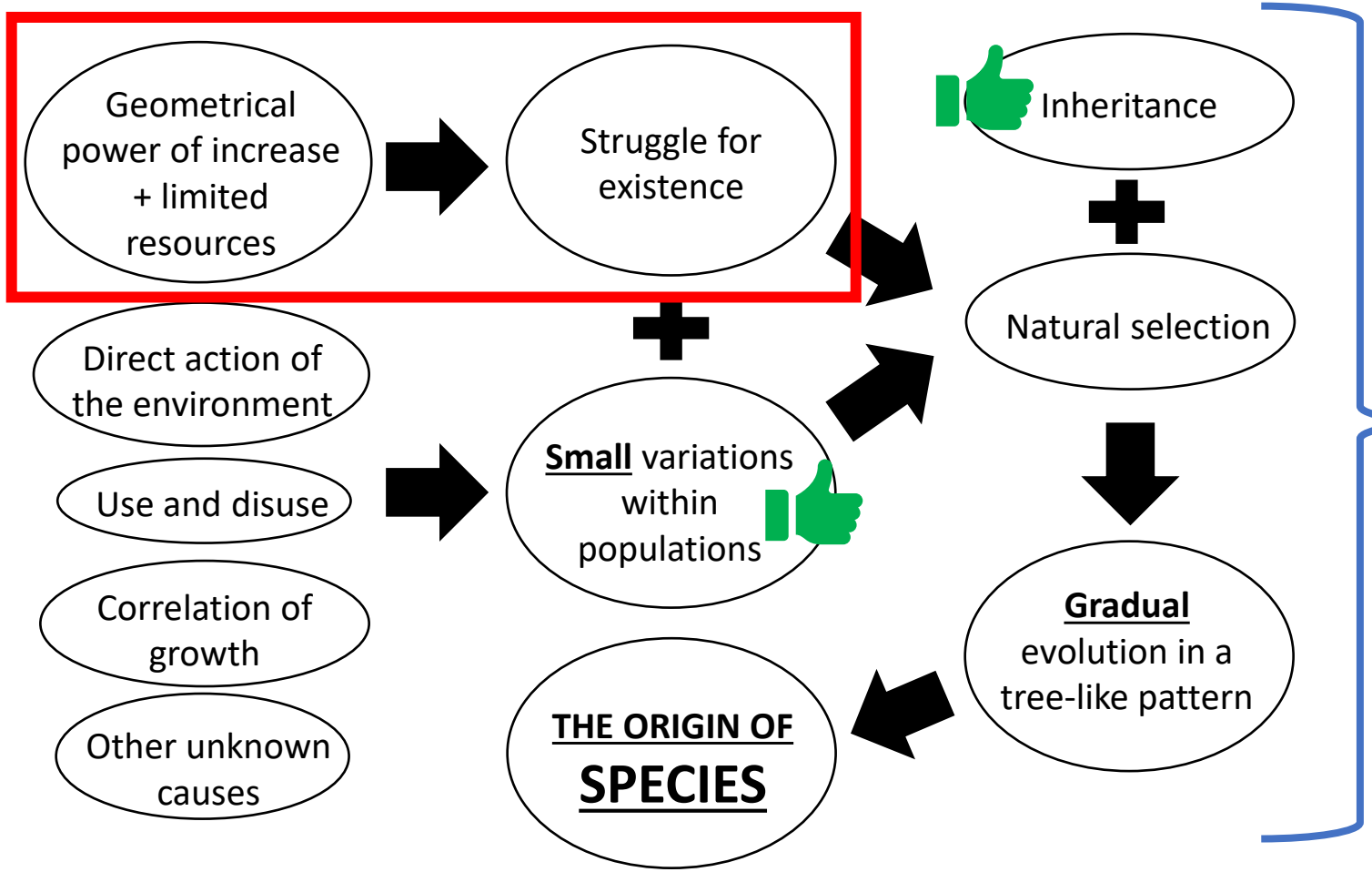
Robert Knox (1791 – 1862)



Robert Chambers (1802 –1871)

Erasmus Darwin (1731 – 1802)

Darwin's long argument



Lines of evidence:

Homology

Rudiments

Embryology

Gradations

Biogeography

Darwin's rhetoric and imagination

Malthusian thinking

- "**Darwin learned a lot from Malthus**. Malthus's great contribution was to emphasize the theme of limitation: populations will inevitably grow to their maximum limits, and if resources are finite, the competition for survival will be intense." (Gould, 1992, p. 80)

- "Darwin's grand metaphor of natural selection came from the theories of economics and the debate over the necessity for competition in markets." (Gould, 2002, p. 43)

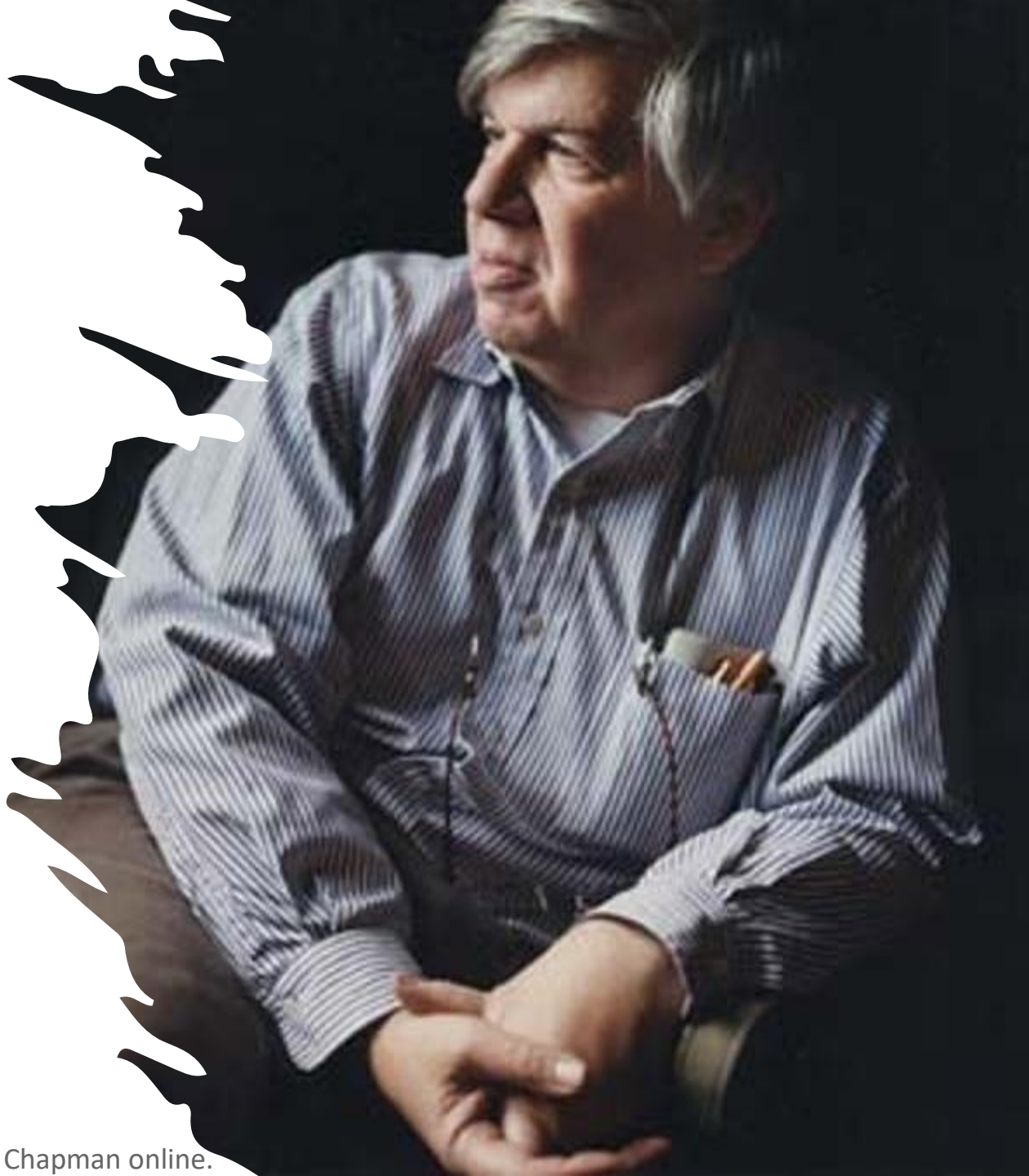


Photo: Kathy Chapman online.

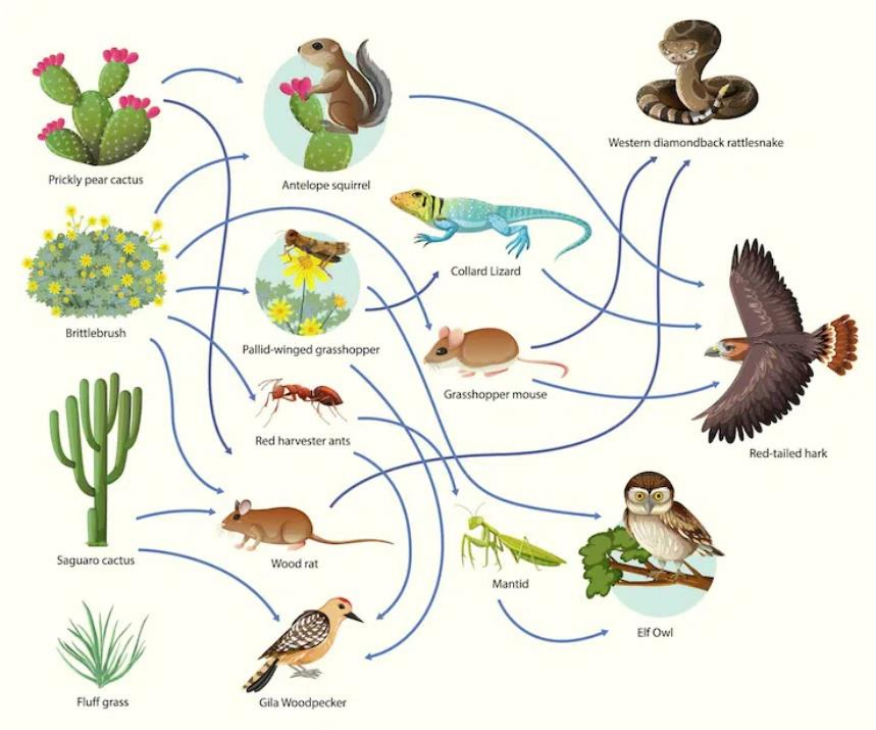
Consequences

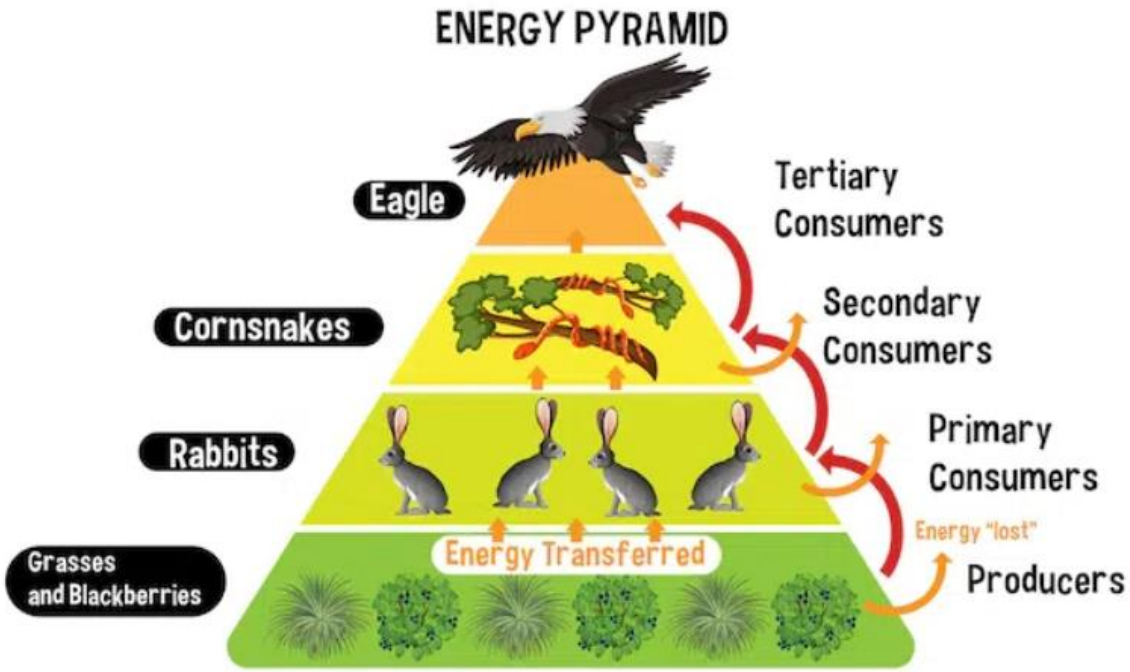
- For Darwin (and Darwinists), nature is in permanent conflict
- Ex. Conflict of interest between parents and offspring, parents vs parents, and offspring vs offspring


Credit Donald Smith

Malthusianism contradicts reality

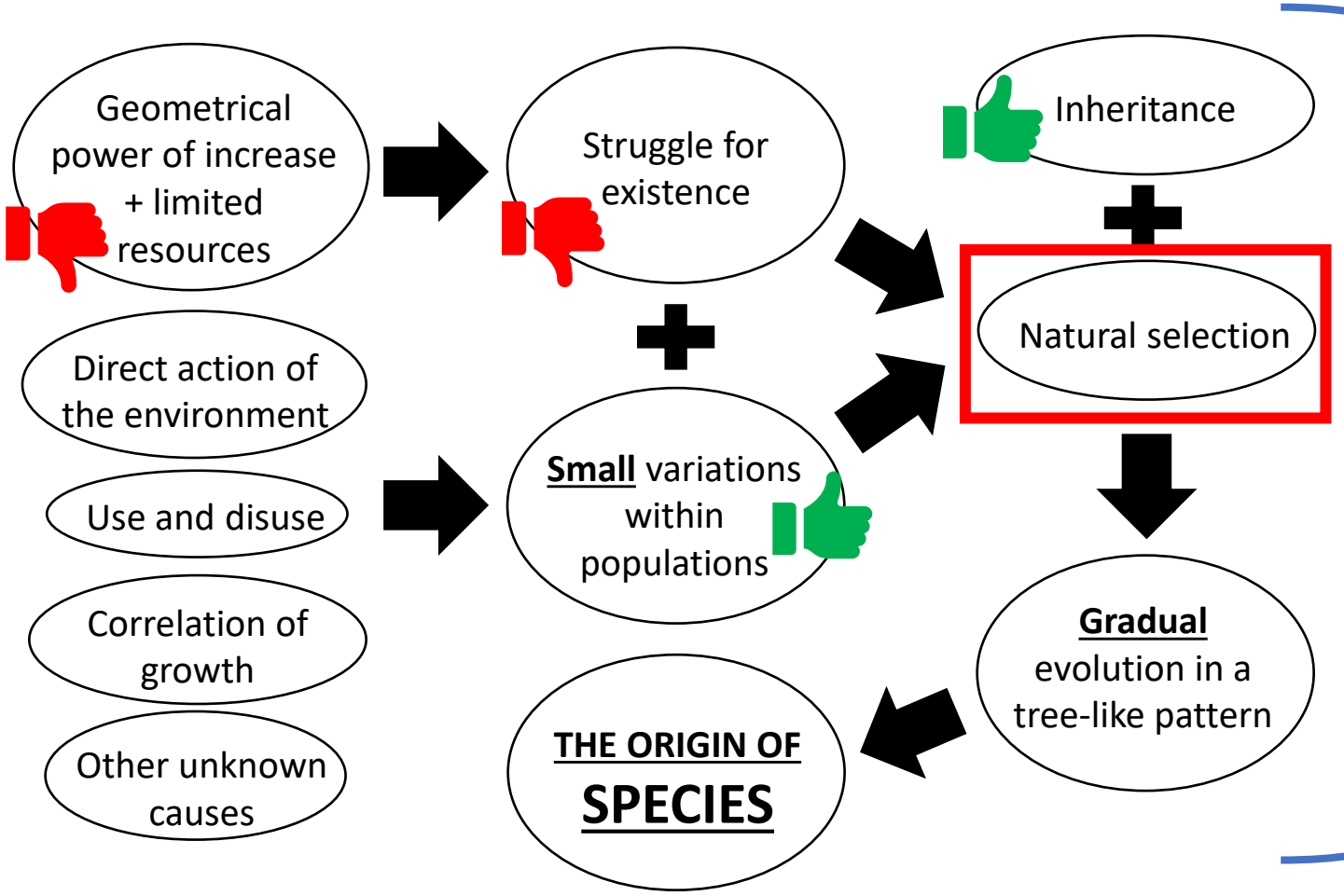
- There is an interdependency among organisms in natural ecosystems
- Although competition may occur at lower-levels, there is an overarching order in the universe





Credit: https://www.geeksforgeeks.org/food-chains-and-food-webs/

Darwin's long argument



Lines of evidence:

Homology

Rudiments

Embryology

Gradations

Biogeography

Darwin's rhetoric and imagination

Natural and artificial selection

- Effects of the struggle for existence and of stockbreeders are of the same kind
- Natural selection is stronger than artificial selection
- Natural selection can therefore produce novel species rather than just varieties

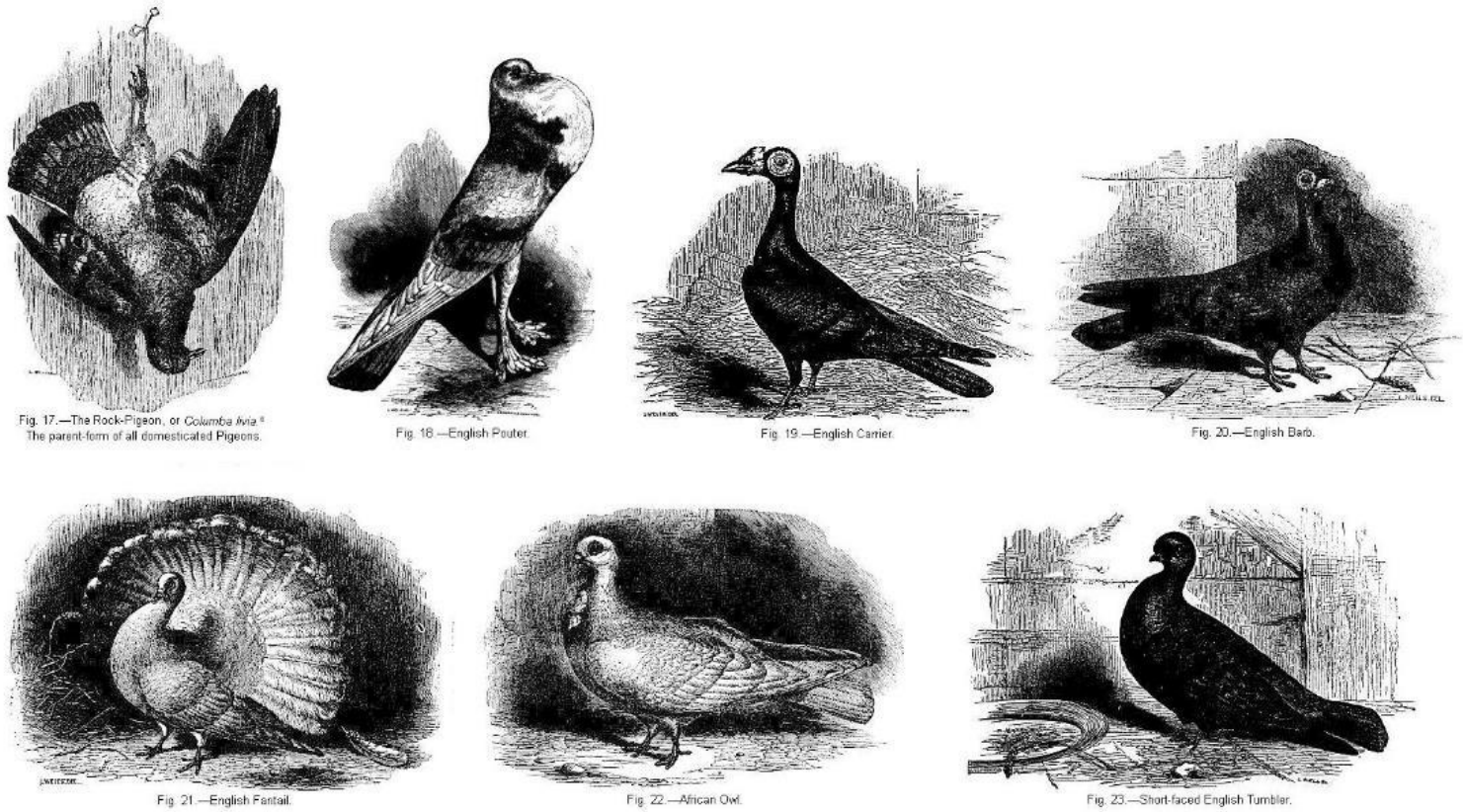


Fig. 17.—The Rock-Pigeon, or *Columba livia*.
The parent-form of all domesticated Pigeons.
Fig. 18.—English Pouter.
Fig. 19.—English Carrier.
Fig. 20.—English Barb.
Fig. 21.—English Fantail.
Fig. 22.—African Owl.
Fig. 23.—Short-faced English Tumbler.

On the origin of pigeons
(Steven M. Carr)

Natural and artificial selection

Artificial selection

- Intelligent
- Goal-directed (teleology)
- Controlled environment
- New genetic variation is deliberately introduced to increase heritability

Natural selection

- Blind
- Purposeless
- Stochastic environmental change
- New genetic variation dependent on random mutations or migration

BY CALLING IT “SELECTION”, DARWIN IS ATTRIBUTING INTENTIONALITY TO NATURE

Natural selection – **cause** or effect?

"It may be said that **natural selection is daily and hourly scrutinizing**, throughout the world, every variation, even the slightest; rejecting that which is bad preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers."

"…in nearly the same way as two man have sometimes hit on the very same invention, **so natural selection..has sometimes modified** in very nearly the same manner two parts in two organic beings, which own but little of their structure in common to inherence from the same ancestor…"

(Darwin, 1859, my emphasis)

Natural selection – cause or **effect**?

“Variations, however, which are of no service to the organism, will not be preserved or selected. Hence we may conclude that **natural selection is not a power or principle, but a result**; and it is the result of the struggle between the varying organisms under changing conditions of life..”

“The term 'natural selection' is in some respects a bad one, as **it seems to imply conscious choice**; but this will be disregarded after a little familiarity.”

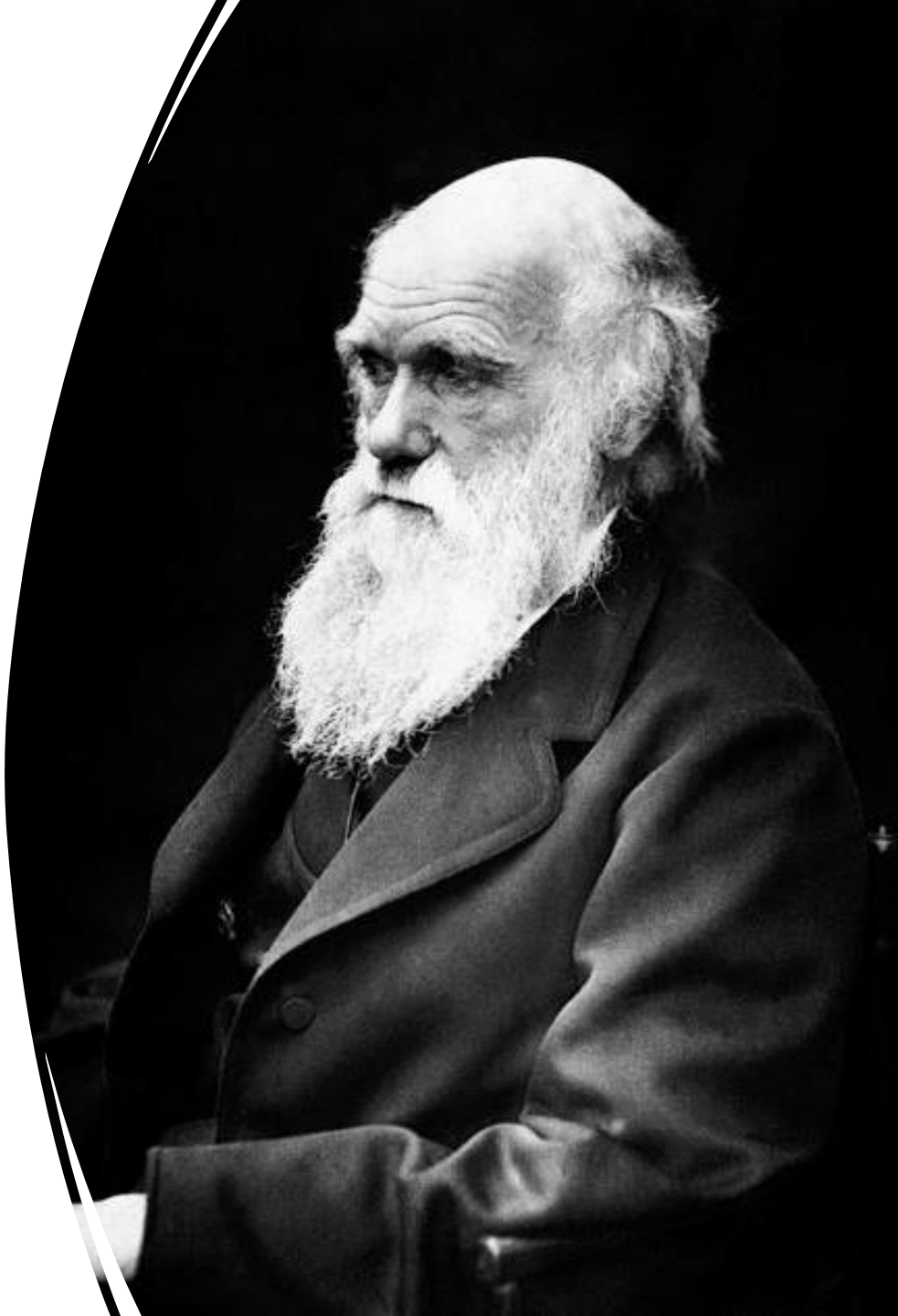
"Natural selection **is not a conscious power**, but **acts** solely by and **for the good** of each being."

(Darwin, 1859, my emphasis)

Natural selection – cause or effect?

"Several writers have misapprehended or objected to the term Natural Selection. Some have even imagined that natural selection induces variability, whereas it implies only the preservation of such variations as arise and are beneficial to the being under the conditions of life."

The Origin of Species 6th ed (Darwin 1872 , p. 63)



Natural selection – cause or effect?

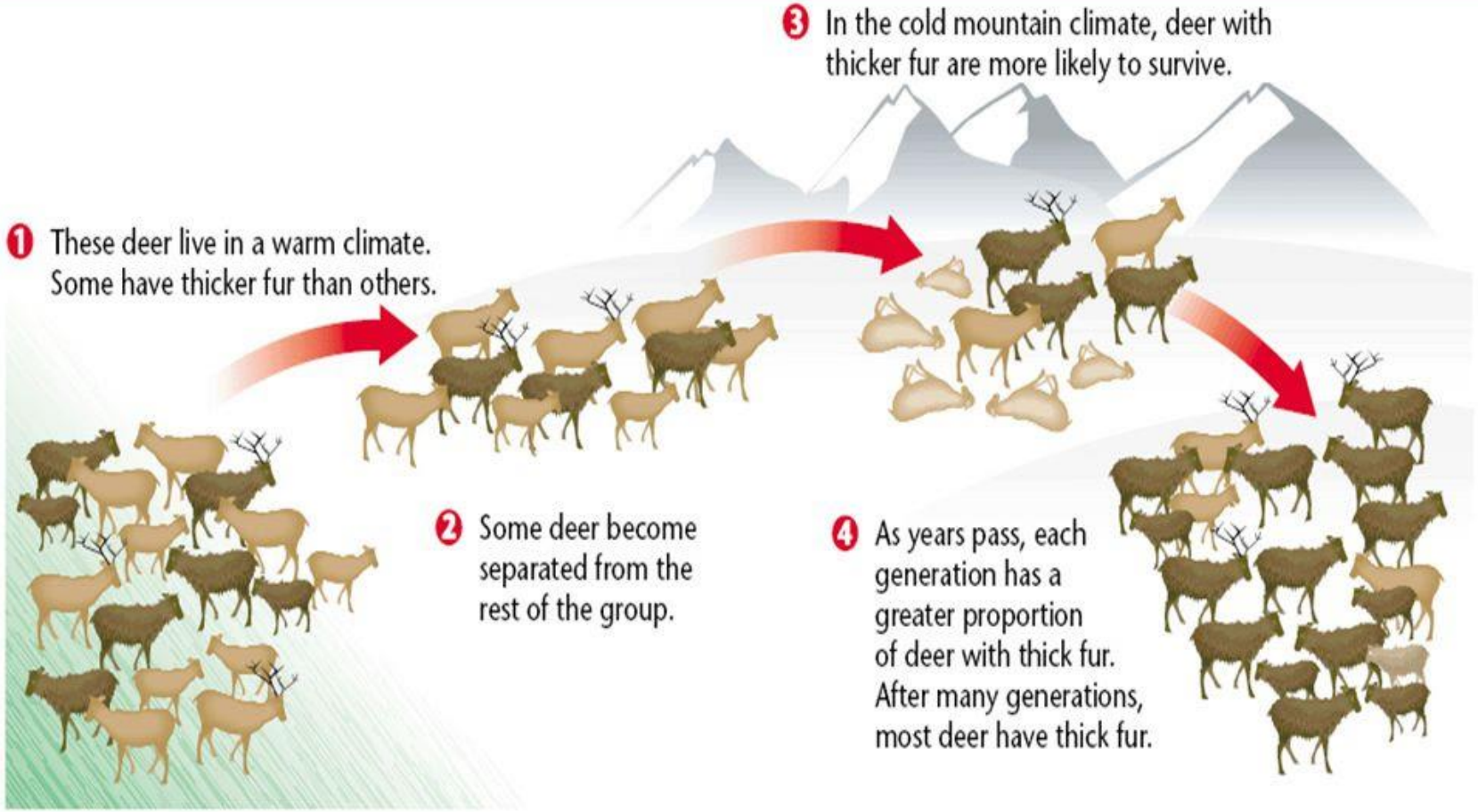
"Selection is not only a **central force in nature** but it is also a dynamic one. For instance, selection can vary in strength (e.g. strong or weak), direction (e.g. positive or negative), form (e.g. linear or nonlinear), space and time."

Sapielski et al. 2009 (refs omitted)

"When **natural selection acts**, step by step, to improve such a complex system as the genotype, it does not operate as a purely negative force . . . It acts as a **positive force** that pays a premium for any contribution toward an improvement, however small. For this reason profound thinkers about evolution, such as Theodosius Dobzhansky, Julian Huxley, and G.G. Simpson, have called selection '**creative**'."

Mayr 1976: 45–46 (my emphasis)

Nature Selects



- Natural selection = differential reproduction (an effect, not a cause)
- Reduces variation
- “Natural selection may explain the survival of the fittest, but it cannot explain the arrival of the fittest.” (de Vries 1912 , p. 827).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Phil. Trans. R. Soc. B (2010) **365**, 87–97
doi:10.1098/rstb.2009.0150

Review

Fluctuating selection: the perpetual renewal of adaptation in variable environments

Graham Bell*

Department of Biology, McGill University, 1205 Avenue Docteur Penfield, Montreal, Quebec H3A 1B1, Canada

Unpredictable Evolution in a 30-Year Study of Darwin's Finches

Peter R. Grant and B. Rosemary Grant

Genetica **112–113:** 127–144, 2001.

Rates of evolution on the time scale of the evolutionary process

Philip D. Gingerich
Departments of Geological Sciences, Biology, Anthropology, Museum of Paleontology, The University of Michigan, Ann Arbor, MI 49109-1079, USA

The million-year wait for macroevolutionary bursts

Josef C. Uyeda[a,1], Thomas F. Hansen[b], Stevan J. Arnold[a], and Jason Pienaar[c]

[a]Department of Zoology, Oregon State University, Corvallis, OR 97331; [b]Department of Biology, Centre for Ecological and Evolutionary Synthesis, University of Oslo, 0316 Oslo, Norway; and [c]Department of Genetics, University of Pretoria, Pretoria, South Africa 0002

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ECOLOGY LETTERS

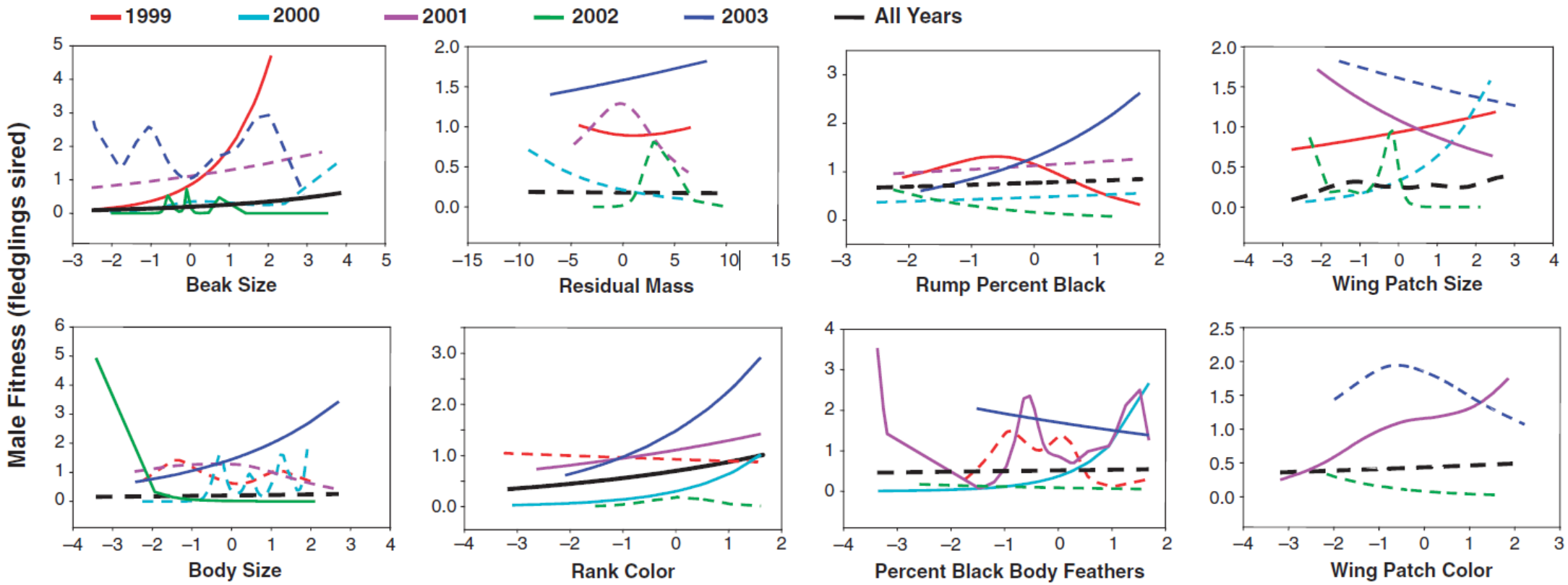
Ecology Letters, (2009) **12**: 1261–1276 doi: 10.1111/j.1461-0248.2009.01381.x

REVIEW AND SYNTHESIS

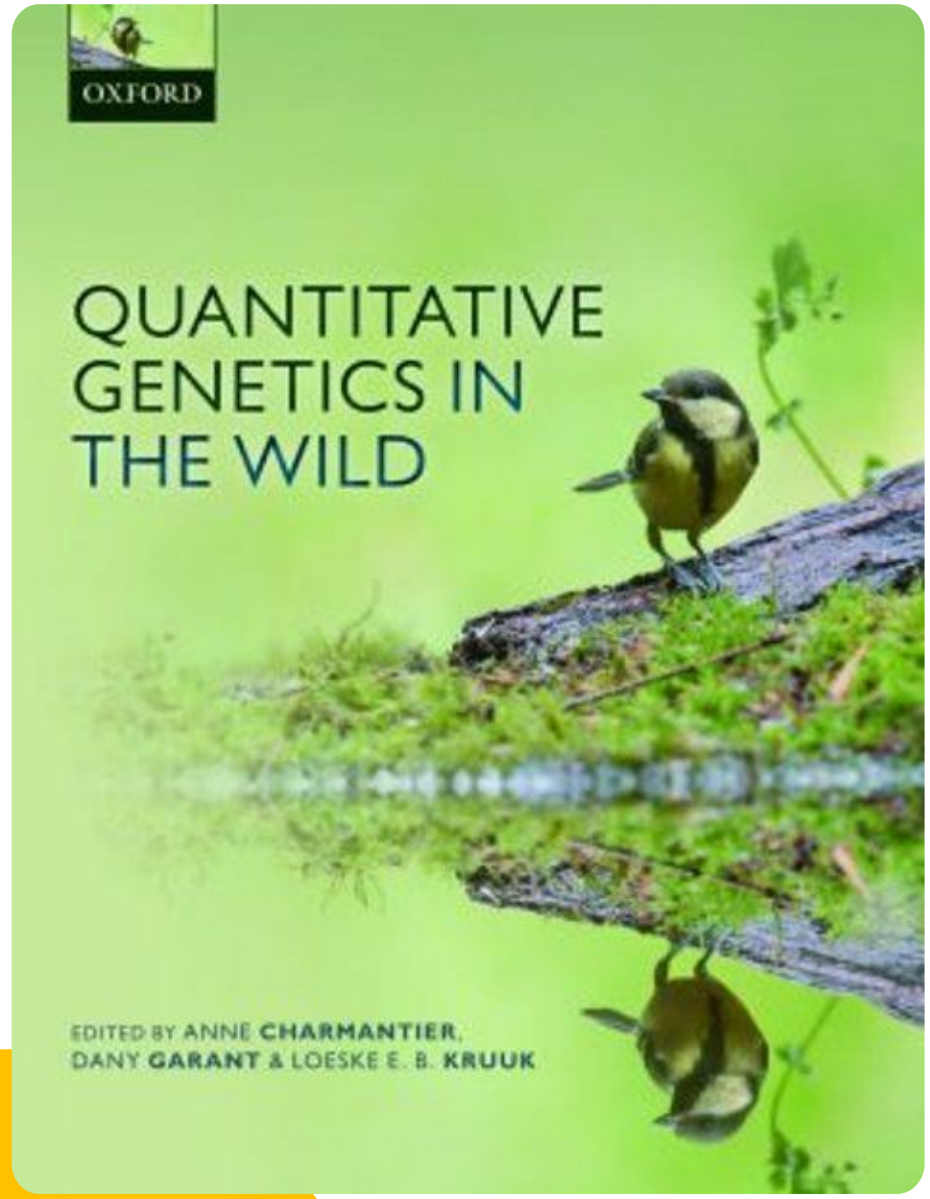
It's about time: the temporal dynamics of phenotypic selection in the wild

Is natural selection actually stronger? Stasis in natural populations

Is natural selection actually stronger?



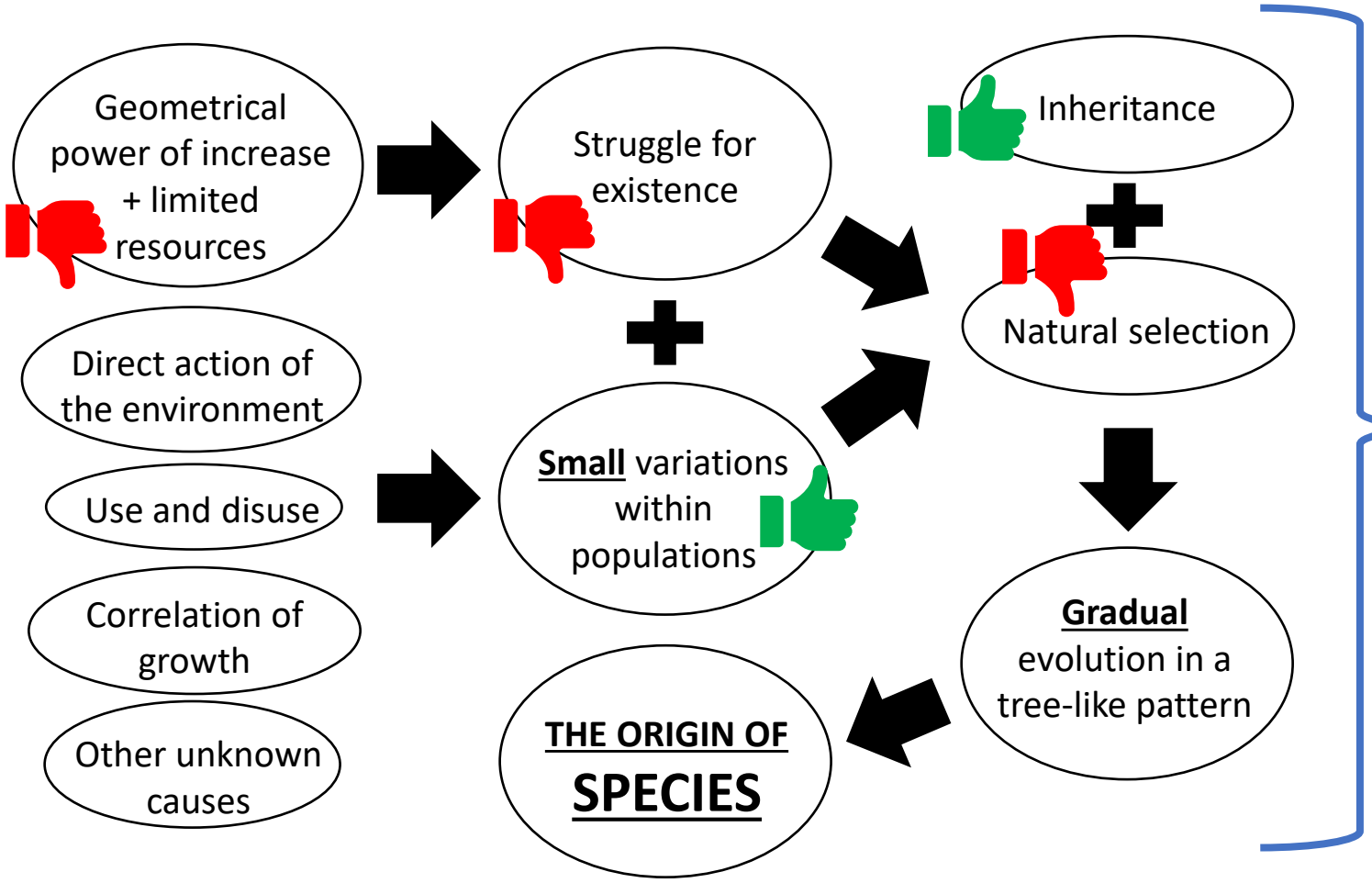
Chaine, A.S. and Lyon, B.E., 2008. Adaptive plasticity in female mate choice dampens sexual selection on male ornaments in the lark bunting. science, 319(5862), pp.459-462.



Is natural selection actually stronger?

- Trait heritability in natural populations tend to be low:
  - -Morphological traits (mean ± SE: 0.56 ± 0.035)
  - -Behavioural traits (0.52 ± 0.058)
  - -Physiological traits (0.49 ± 0.072)
  - -Life history traits (0.33 ± 0.038)
- For comparison, human height has ~0.8 heritability

Darwin's long argument



Lines of evidence:

Homology

Rudiments

Embryology

Gradations

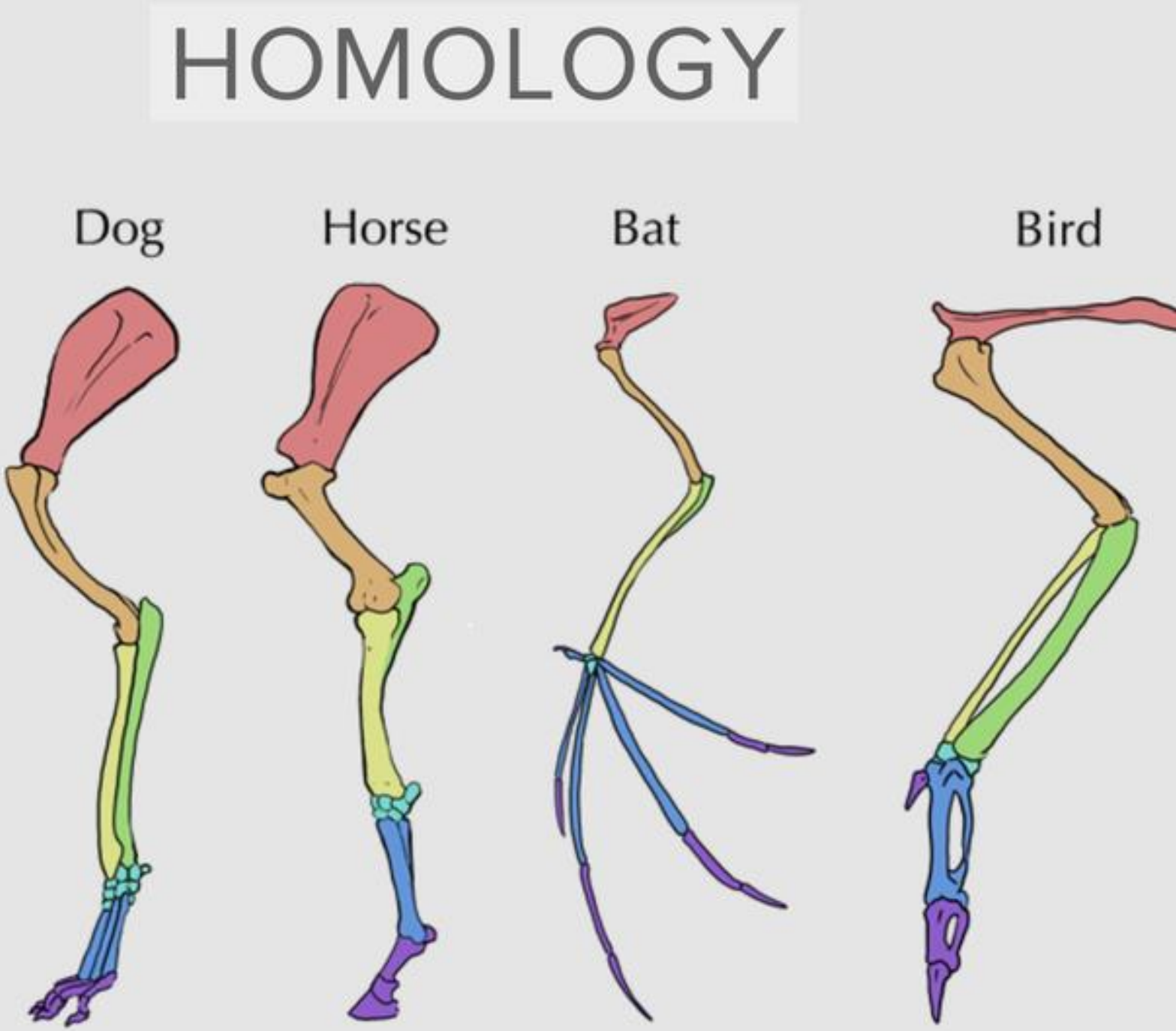
Biogeography

Darwin's rhetoric and imagination

Evidence for evolution: homology

"What can be more curious than that the hand of a man, formed for grasping, that of a mole for digging, the leg of the horse, the paddle of the porpoise, and the wing of the bat, should all be constructed on the same pattern, and should include the same bones, in the same relative positions?"

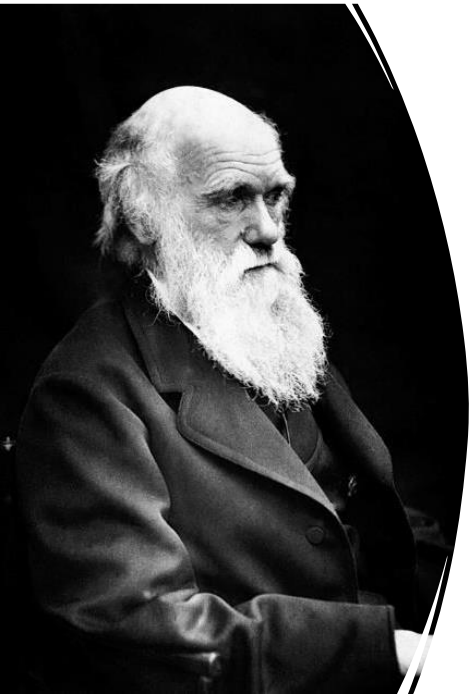
(On the Origin of Species)



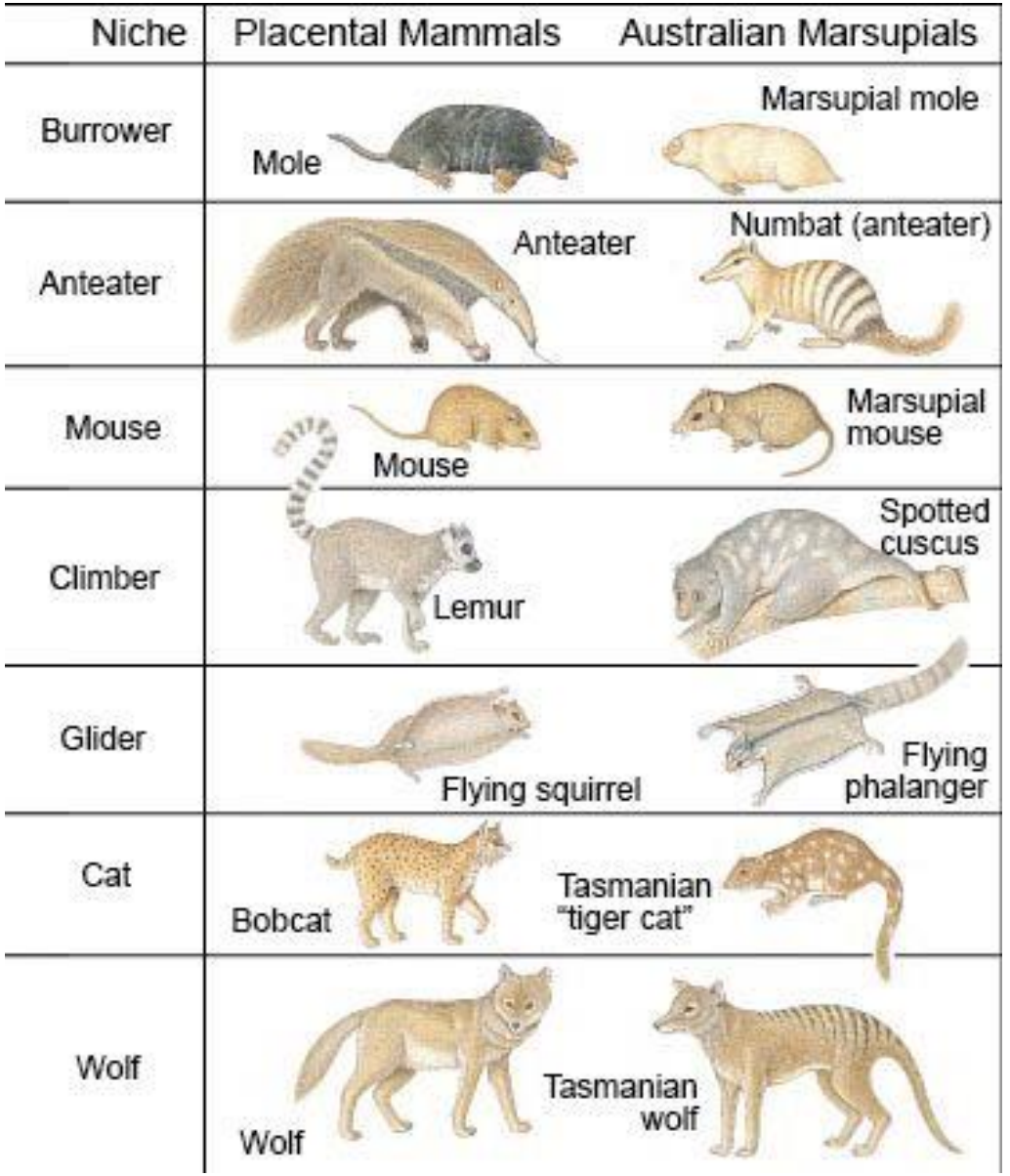
UNIVERSAL COMMON DESCENT

HOMOLOGY (SIMILARITY DUE TO COMMON DESCENT DESCENT)

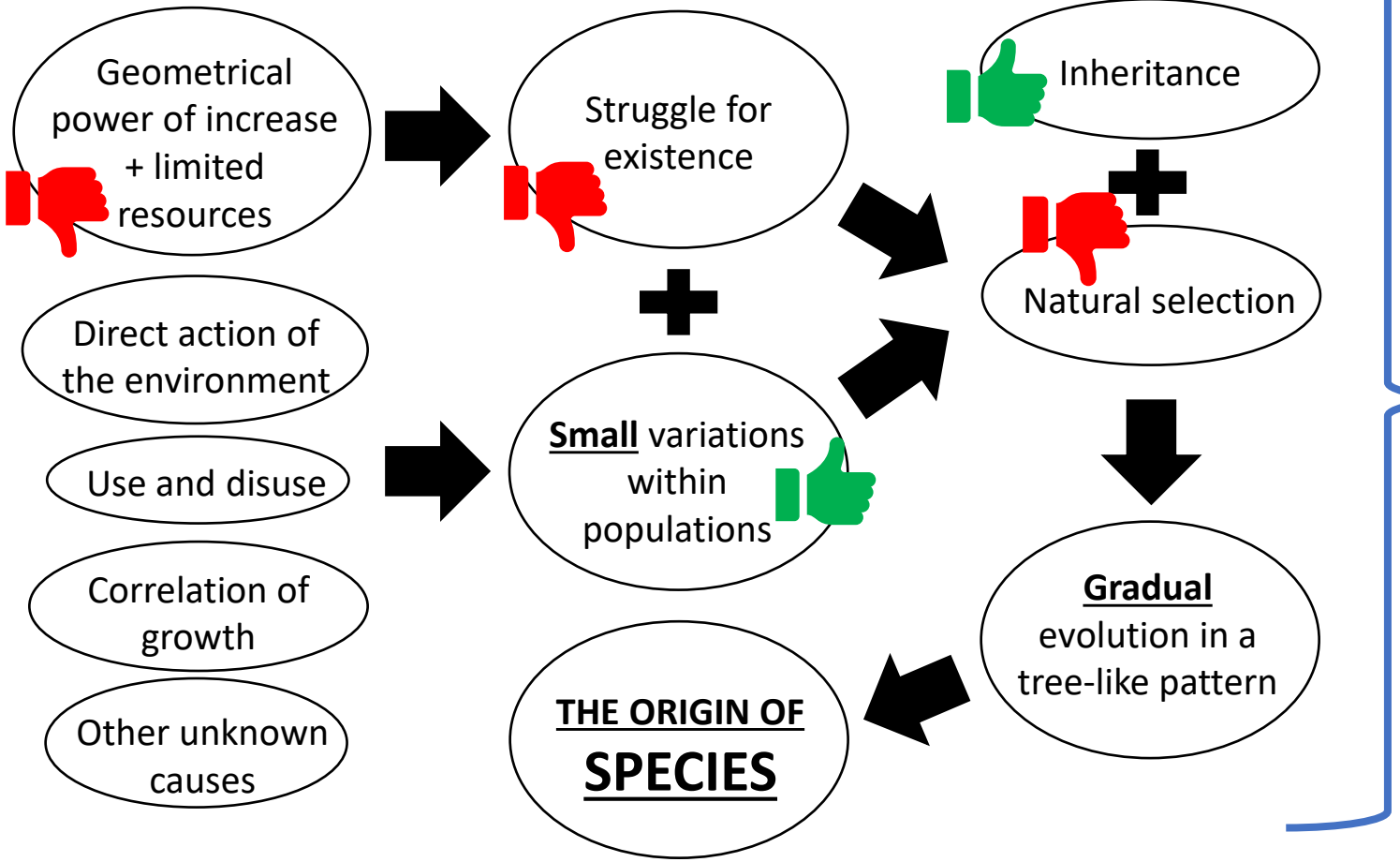
EXCEPT WHEN IT ISN'T. THEN IT BECOMES CONVERGENCE



"… cases of instincts almost identically the same in animals so remote in the scale of nature, that we cannot account for their similarity by inheritance from a common parent, and must therefore believe that **they have been acquired by independent acts of natural selection**."



Darwinism summarised



Lines of evidence:

Homology

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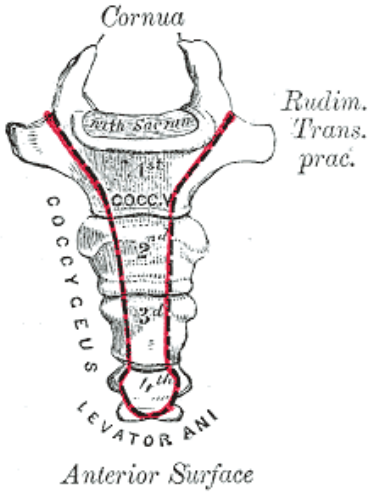
Darwin's rhetoric and imagination

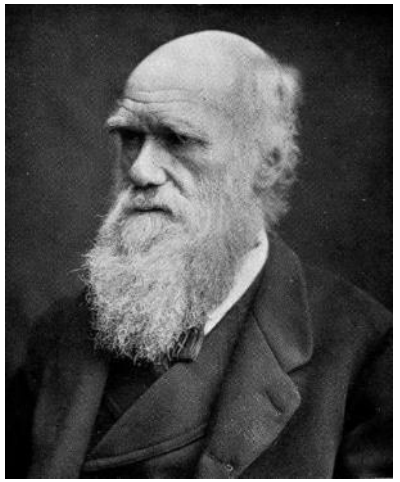
Vestigial organs

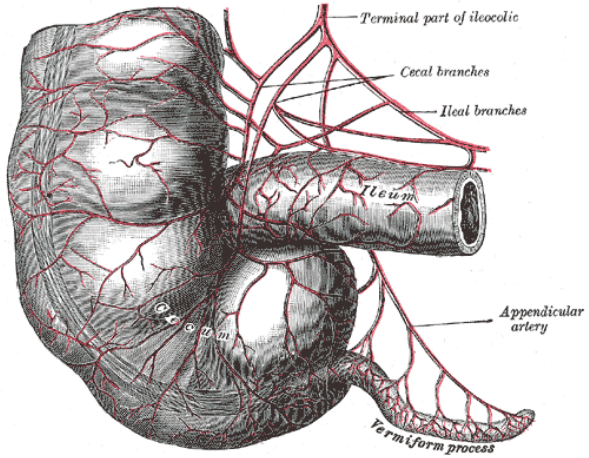


Anterior Surface

"On the view of each organism with all its separate parts having been specially created, how utterly inexplicable is it that organs bearing the plain stamp of inutility … should so frequently occur."

(The origin of species)

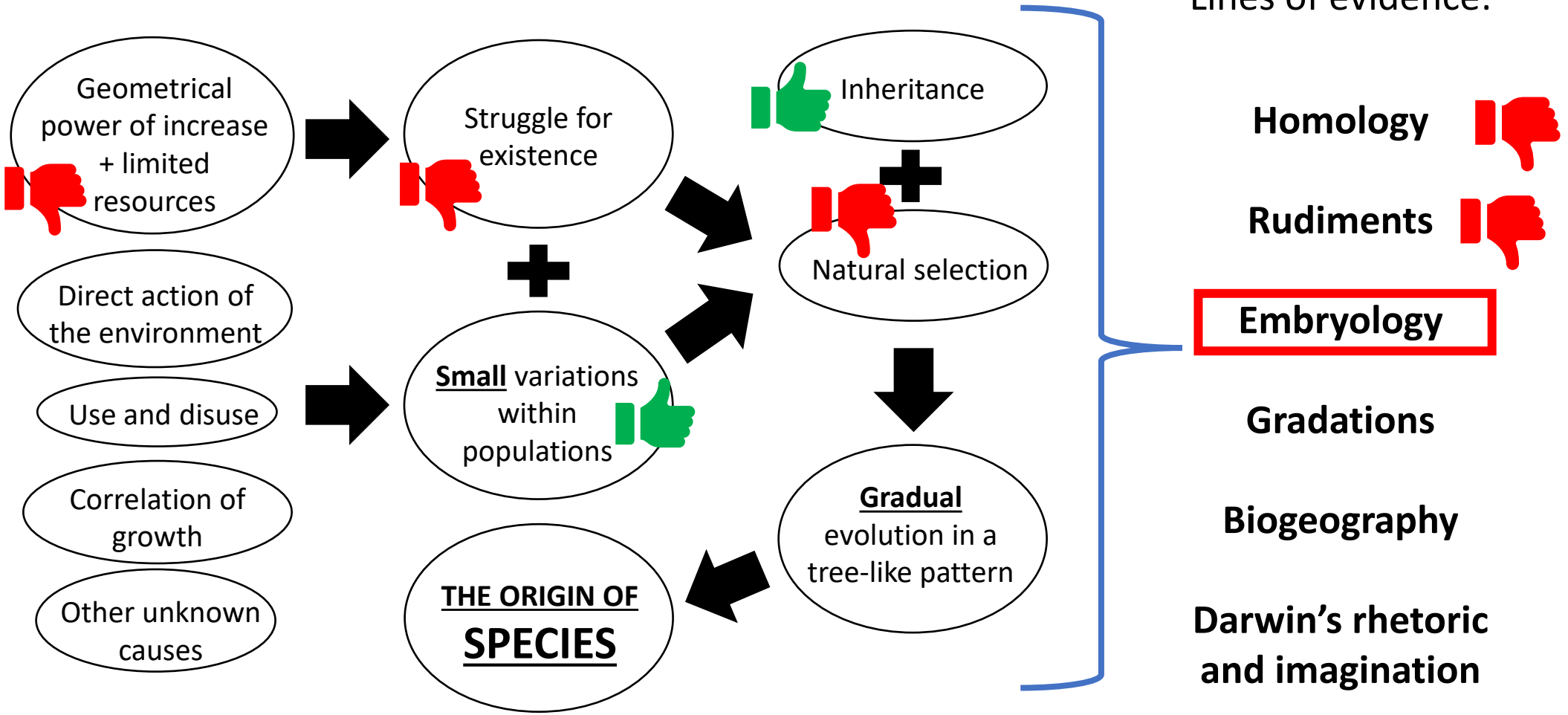




Problems:

1. Appeal to ignorance: function is usually identified later
2. Theological, rather than biological, argument
3. If true, would prove degeneration, not evolution

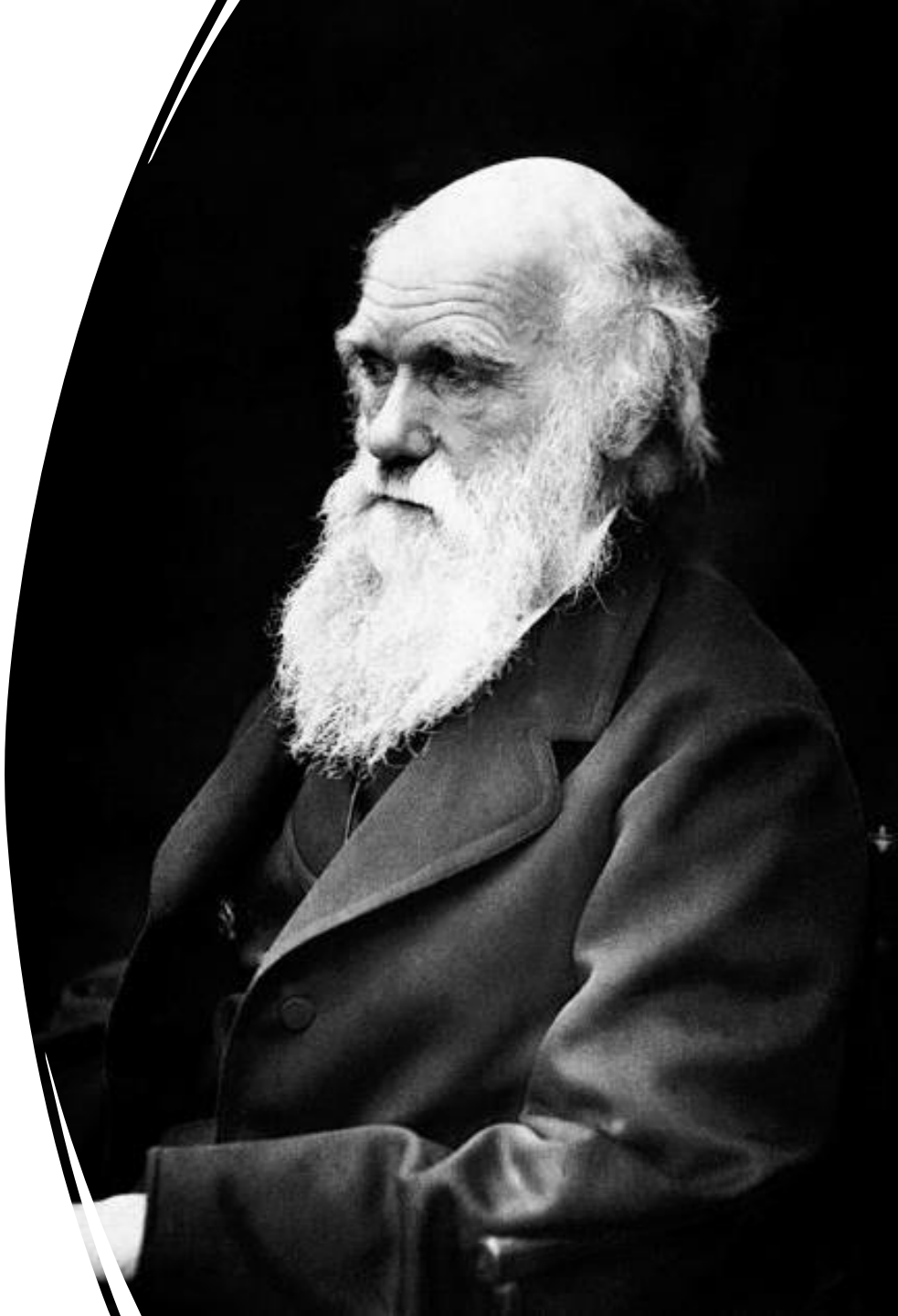
Darwinism summarised

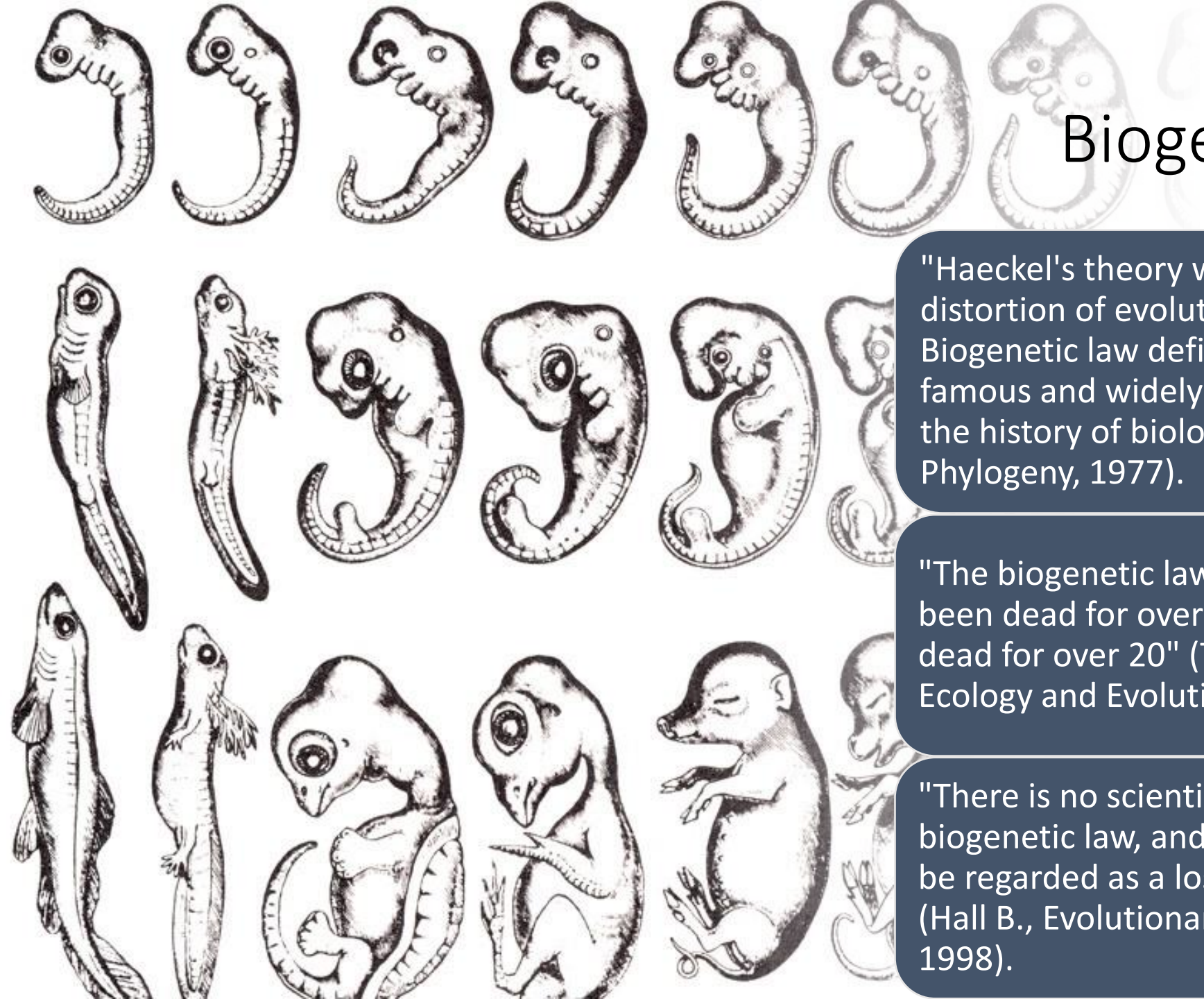


Evidence for evolution: embryology

"The resemblance of embryos of different classes to each other and to the adult form of the same species, **supports the doctrine of evolution**…"

(On the Origin of Species, Chapter 13)





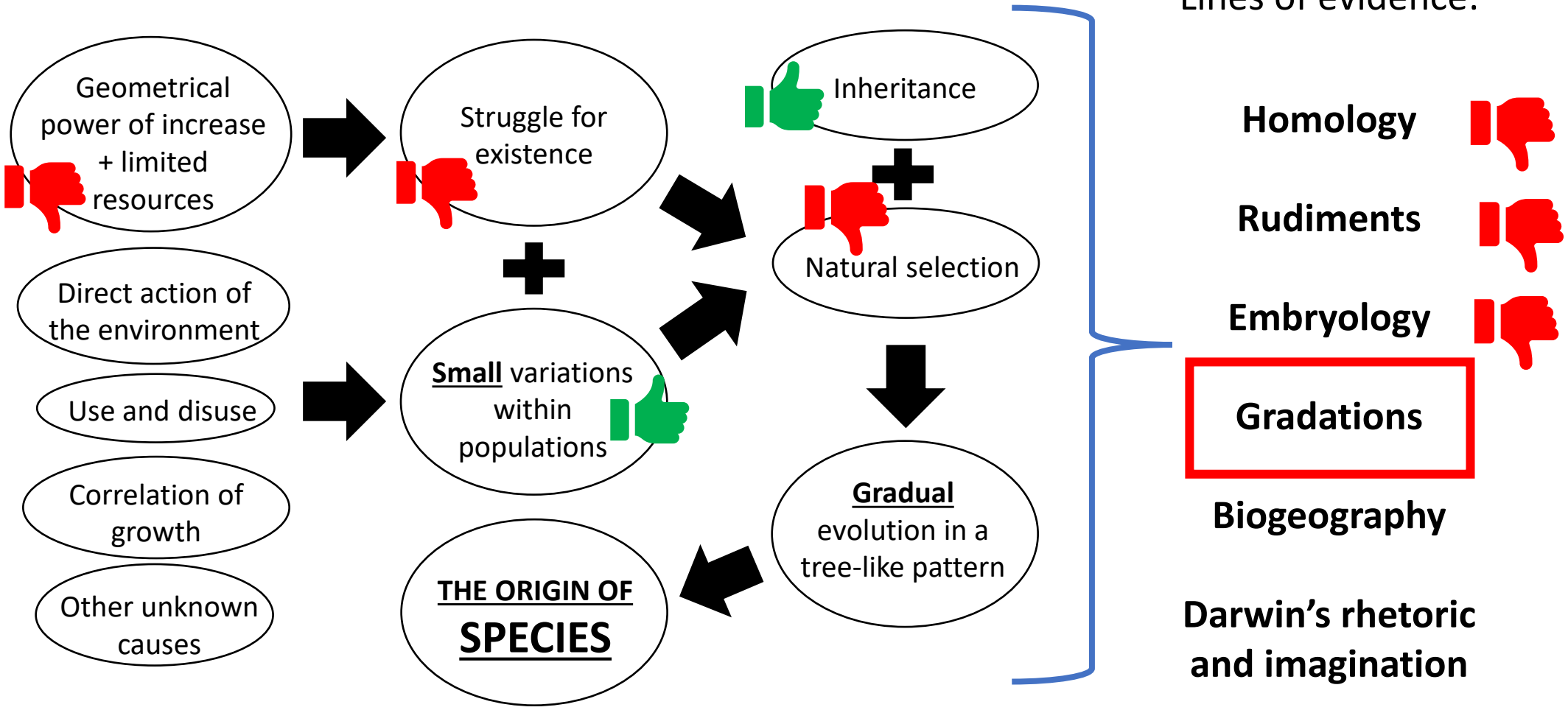
Biogenetic law

"Haeckel's theory was in fact an egregious distortion of evolutionary theory and embryology. Biogenetic law defined, and still defines, the most famous and widely held case of misconception in the history of biology" (Gould, S.J., Ontogeny and Phylogeny, 1977).

"The biogenetic law as a general proposition has been dead for over 50 years and unequivocally dead for over 20" (Thomson, K. S., Trends in Ecology and Evolution, 1994).

"There is no scientific justification for the biogenetic law, and its abandonment should not be regarded as a loss to science, but as a gain" (Hall B., Evolutionary Developmental Biology, 1998).

Darwin's long argument

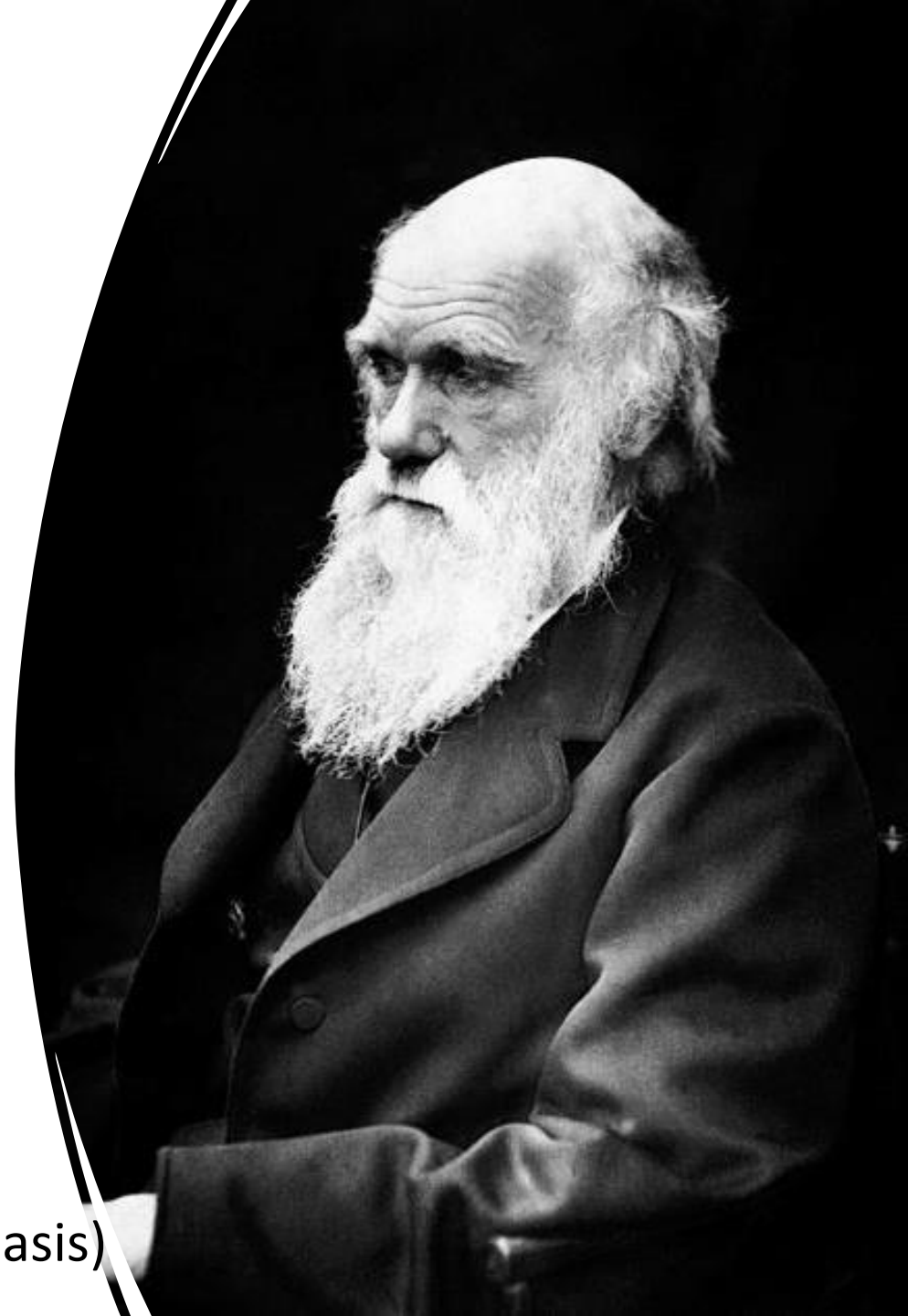


Natura non facit saltum

“As natural selection acts solely by accumulating slight, successive, favorable variations, **it can produce no great or sudden modification**; it can act only by very short and slow steps. Hence the canon of *“Natura non facit saltum*,” which every fresh addition to our knowledge tends to make more strictly correct, is on this theory simply intelligible.”

"If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, **my theory would absolutely break down**."

(The origin of species, my emphasis)



Gradations

- Darwin requires gradualism for two reasons:
  (1) To make the origin of complex structures more believable
  (2) Because his main argument relies on actual gradations found in nature
- Darwin's approach is ahistorical: he compares living species

Gradations

- Why the ahistorical approach?
- Darwin knows evolutionary gradualism necessitates an infinitude of intermediate forms
- Lack of living intermediates is blamed on extinction due to competition
- However, the fossil record is also discontinuous

Fossil record: many explosions

Prospects & Overviews

Problems & Paradigms

The odontode explosion: The origin of tooth-like structures in vertebrates

Gareth J. Fraser[1)], Robert Cerny[2)], Vladimir Soukup[2)], Marianne Bronner-Fraser[3)] and J. Todd Streelman[4)*]*

The Avalon Explosion: Evolution of Ediacara Morphospace

Bing Shen, Lin Dong, Shuhai Xiao,* Michał Kowalewski

Ediacara fossils [575 to 542 million years ago (Ma)] represent Earth's oldest known complex macroscopic life forms, but their morphological history is poorly understood. A comprehensive quantitative analysis of these fossils indicates that the oldest Ediacara assemblage—the Avalon assemblage (575 to 565 Ma)—already encompassed the full range of Ediacara morphospace. A comparable morphospace range was occupied by the subsequent White Sea (560 to 550 Ma) and Nama (550 to 542 Ma) assemblages, although it was populated differently. In contrast, taxonomic richness increased in the White Sea assemblage and declined in the Nama assemblage. These diversity changes, occurring while morphospace range remained relatively constant, led to inverse shifts in morphological variance. The Avalon morphospace expansion mirrors the Cambrian explosion, and both events may reflect similar underlying mechanisms.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Phil. Trans. R. Soc. B (2006) **361**, 1069–1083
doi:10.1098/rstb.2006.1846
Published online 3 May 2006

Darwin's dilemma: the realities of the Cambrian 'explosion'

Simon Conway Morris*

Department of Earth Sciences, University of Cambridge, Downing Street, Cambridge CB2 3EQ, UK

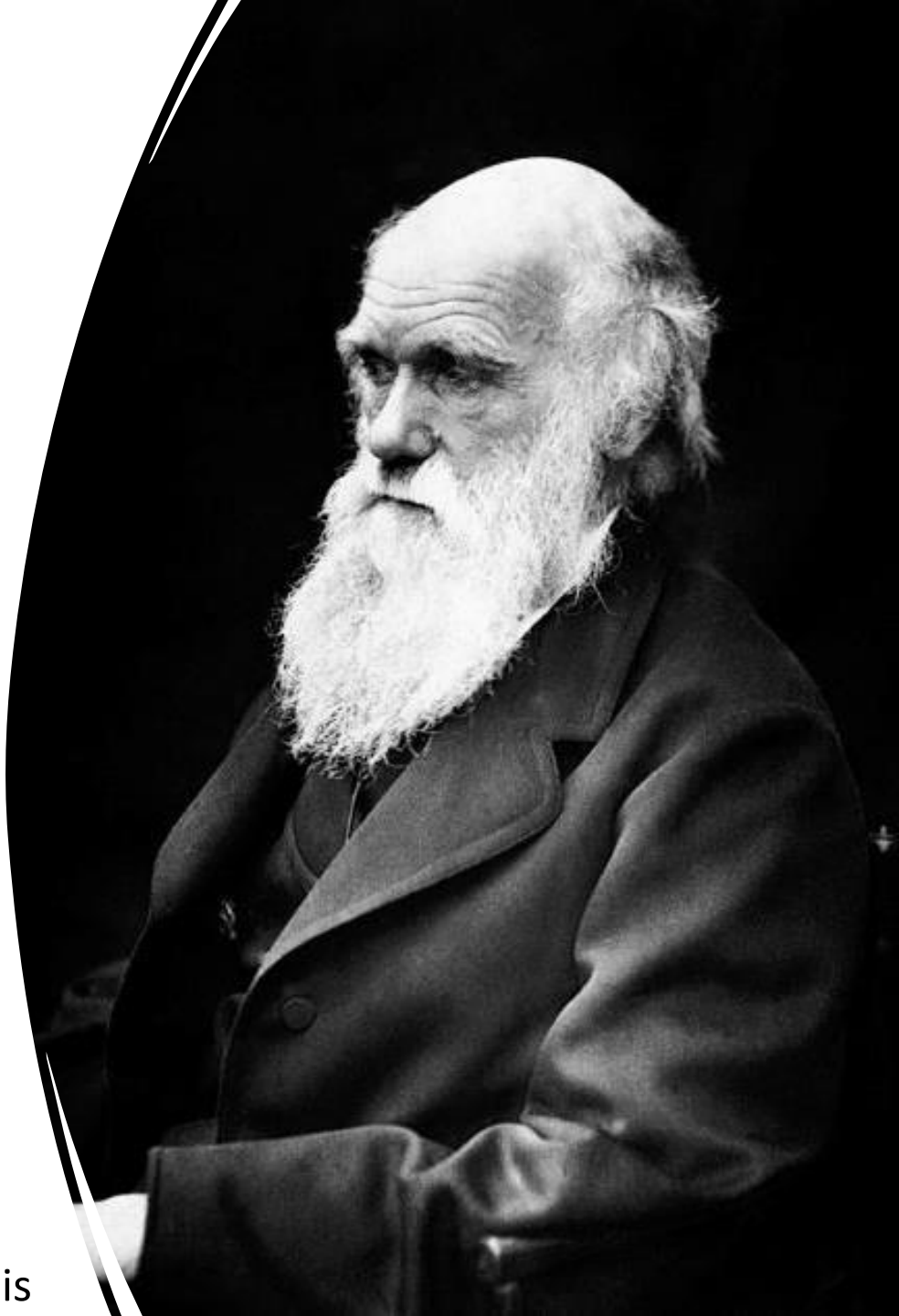
Lack of gradations in the fossil record

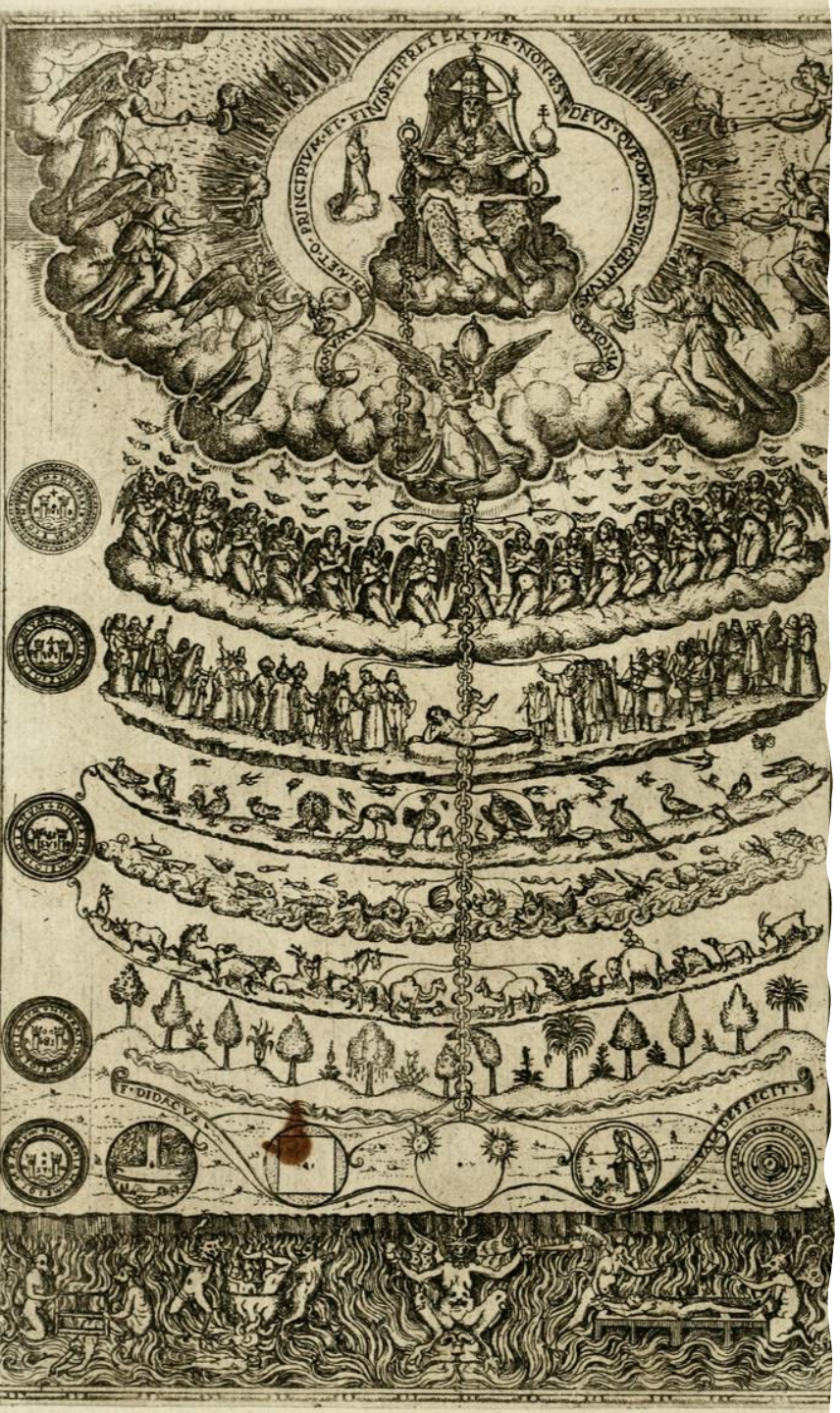
“If numerous species, belonging to the same genera or families, **have really started into life all at once**, the fact would be fatal to the theory of descent with slow modification through natural selection”

“The **geological record is extremely imperfect** and this fact will to a large extent explain why we do not find interminable varieties, connecting together all the extinct and existing forms of life by the finest graduated steps.”

"He who rejects these views on the nature of the geological record, **will rightly reject my whole theory**."

On the Origin of Species, my emphasis





Do gradations in nature suggest evolution?

- Darwin suggests gradations in trait complexity show evolution from the simplicity to complexity is possible
- However, all he provides are imaginary steps for how these transitions could have happened
- Some of his successive gradations (e.g. eyes) are now considered convergent evolution
- Knowledge of gradations in nature is nothing new (e.g. the great chain of being)

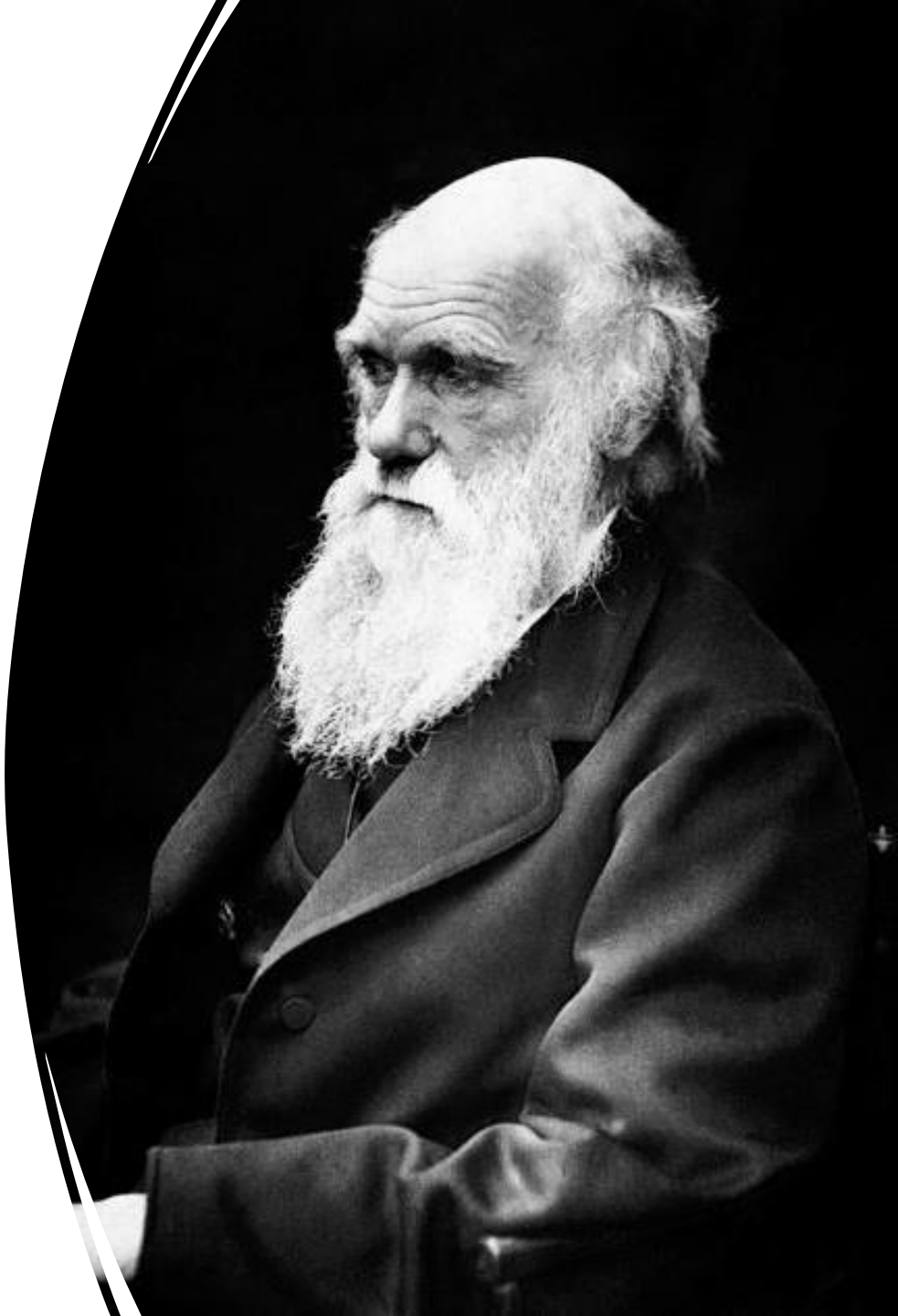
Another problem with gradualism

- If populations gradually evolve into others, then species are constructs of our mind
- Back to Heraclitus: only change exists (no permanence, no identity)
- How can Darwin write about the origin of species, without acknowledging they exist?
- Today we have more than 30 concepts of species

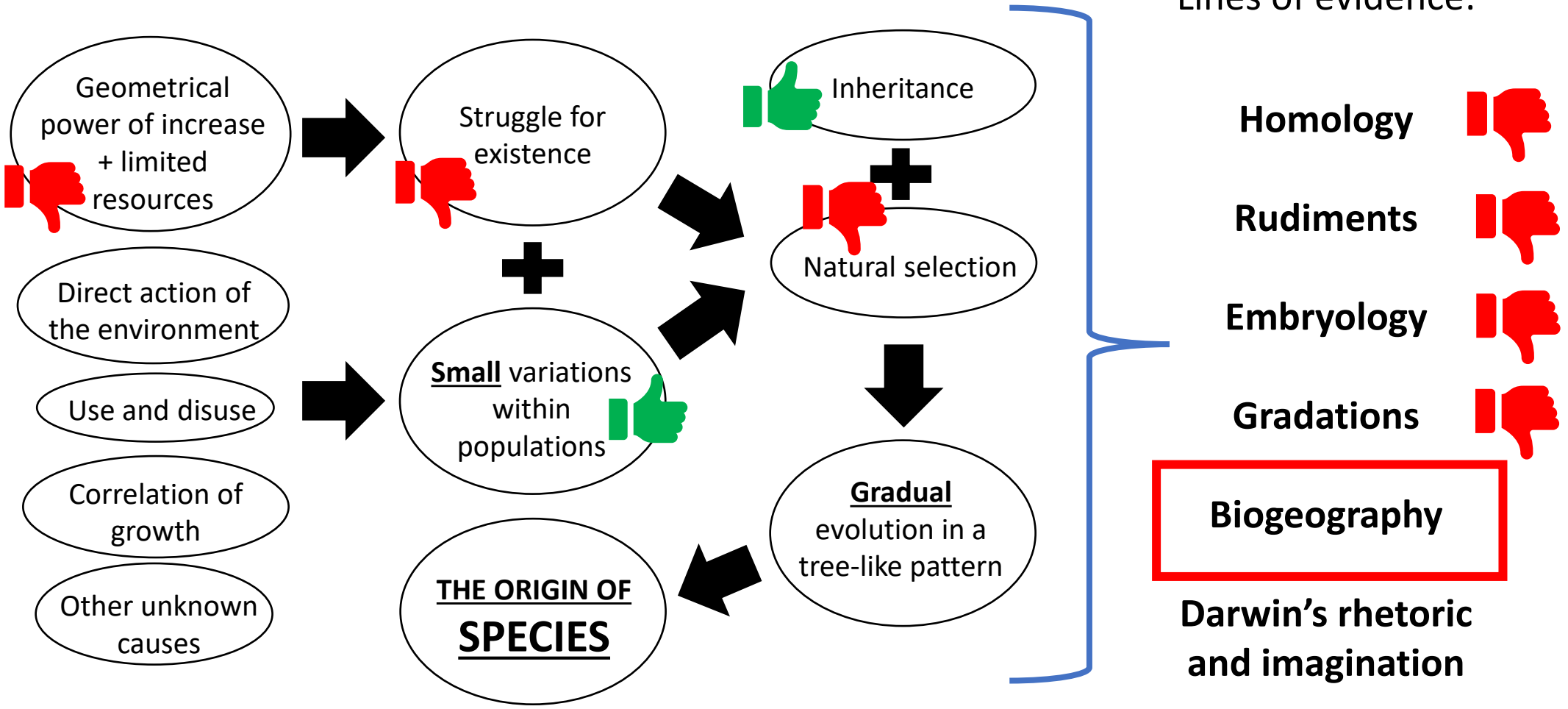
The Origin of what, exactly?

"**I look at the term species as one arbitrarily given**, for the sake of convenience, to a set of individuals closely resembling each other, and that it does not essentially differ from the term variety, which is given to less distinct and more fluctuating forms. **The term variety**, again, in comparison with mere individual differences, **is also applied arbitrarily**, for convenience's sake."

The Origin of Species, my emphasis

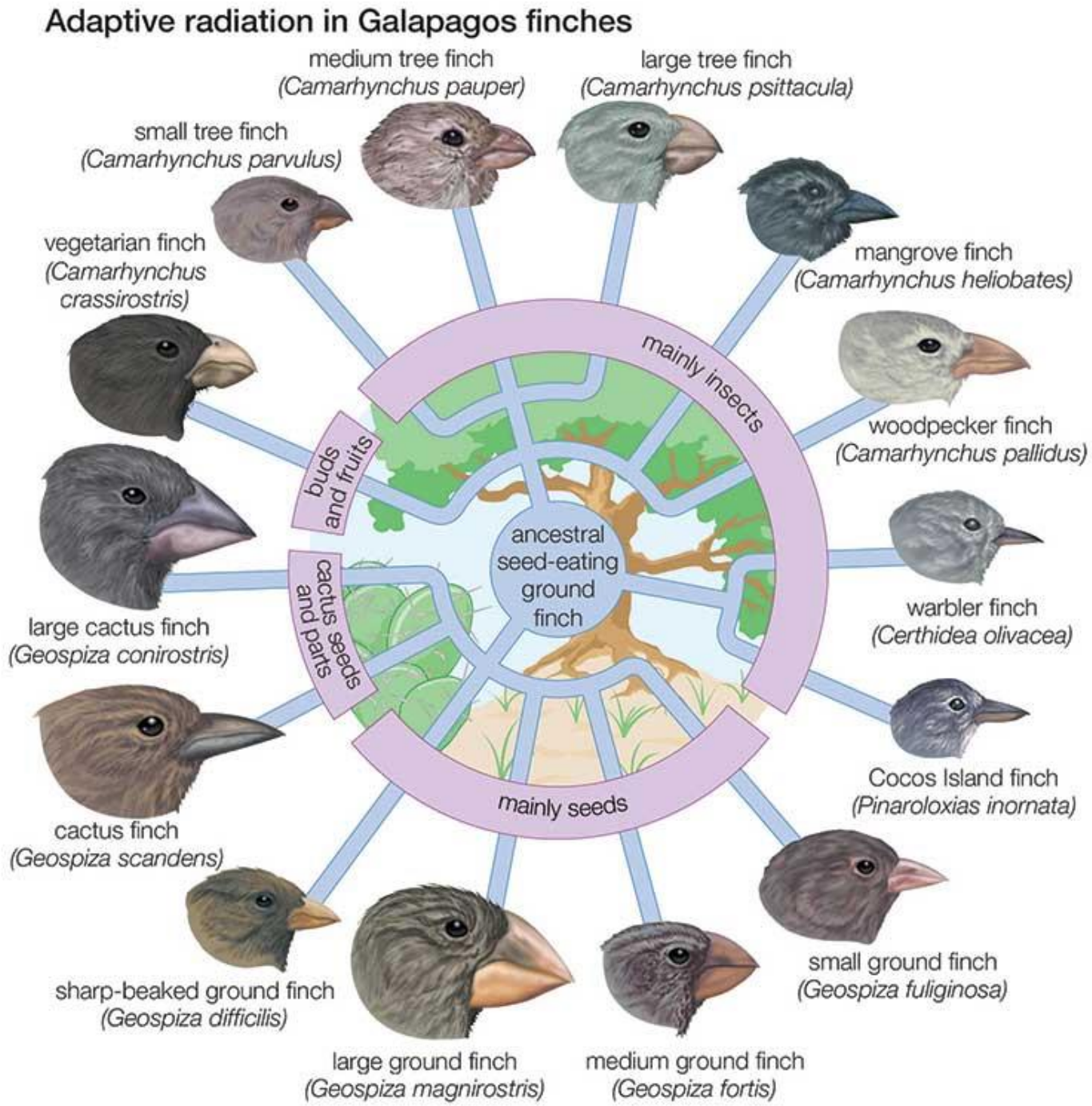


Darwin's long argument



Biogeography

- Among other things, Darwin states that species inhabiting islands bear affinities to those in the continent
- This suggests they have a common ancestry, rather than independent creations



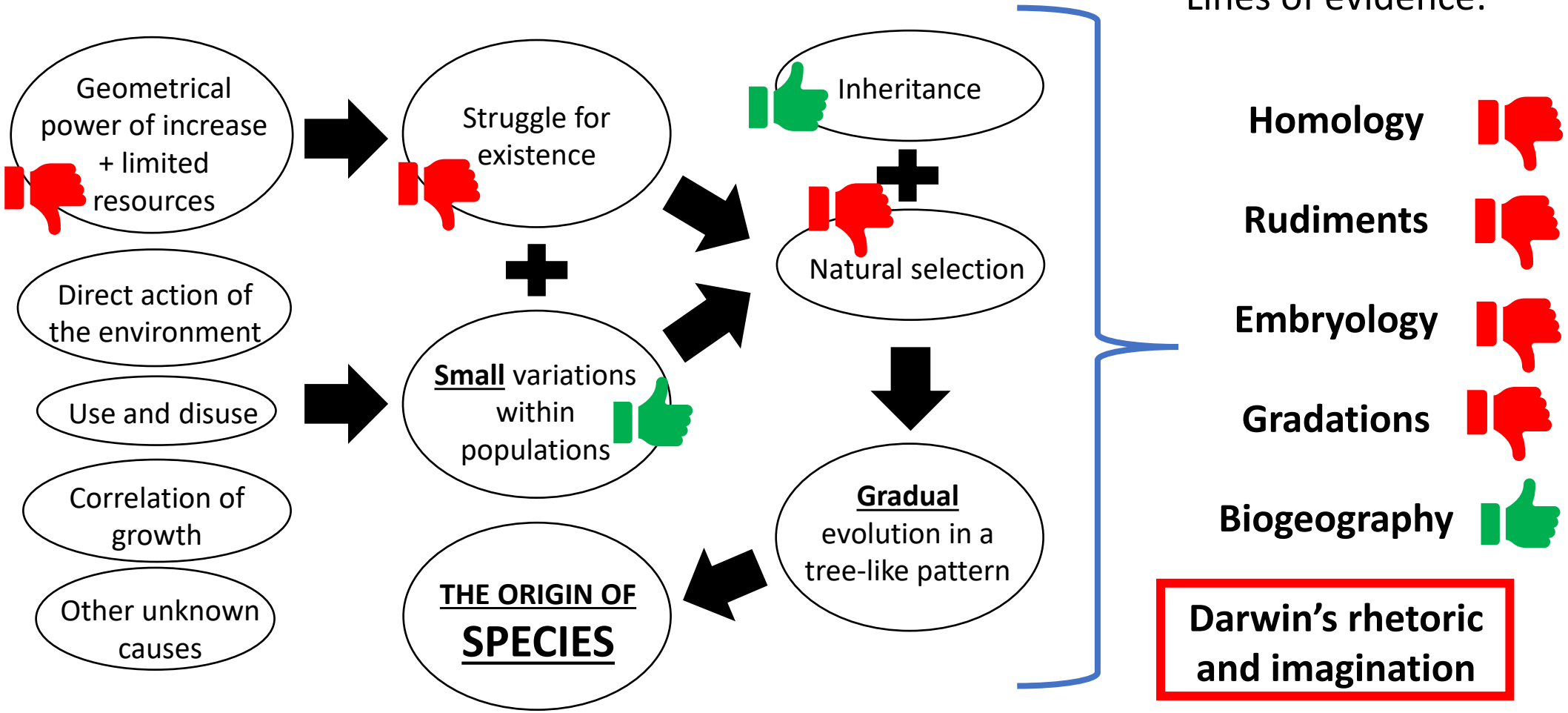
Small changes are compatible with Creation

"**If it is meant**, only that a fertile offspring may be supposed to intimate, **that the two parent plants have branched out from one common stock since the creation of the world**, I am fully disposed to admit the truth of that position"

"A Genus: all the species which have peculiar affinities, distinguishing them from all others; and which, I think, render it probable that they **have branched, since the creation of the world, from one original**."

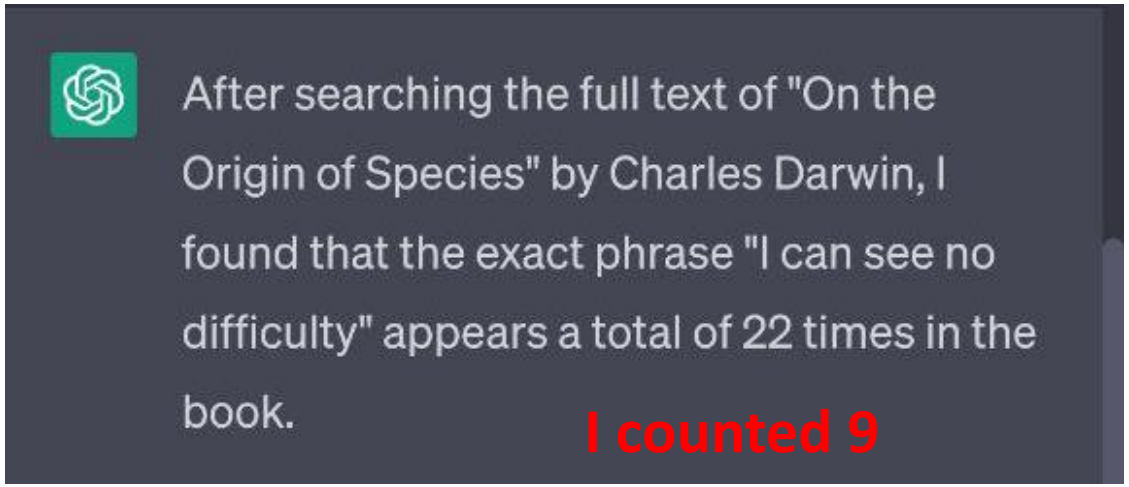
(On the Production of Hybrid Vegetables, Rev. William Herbert, 1819)

Darwin's long argument



Darwin’s imagination

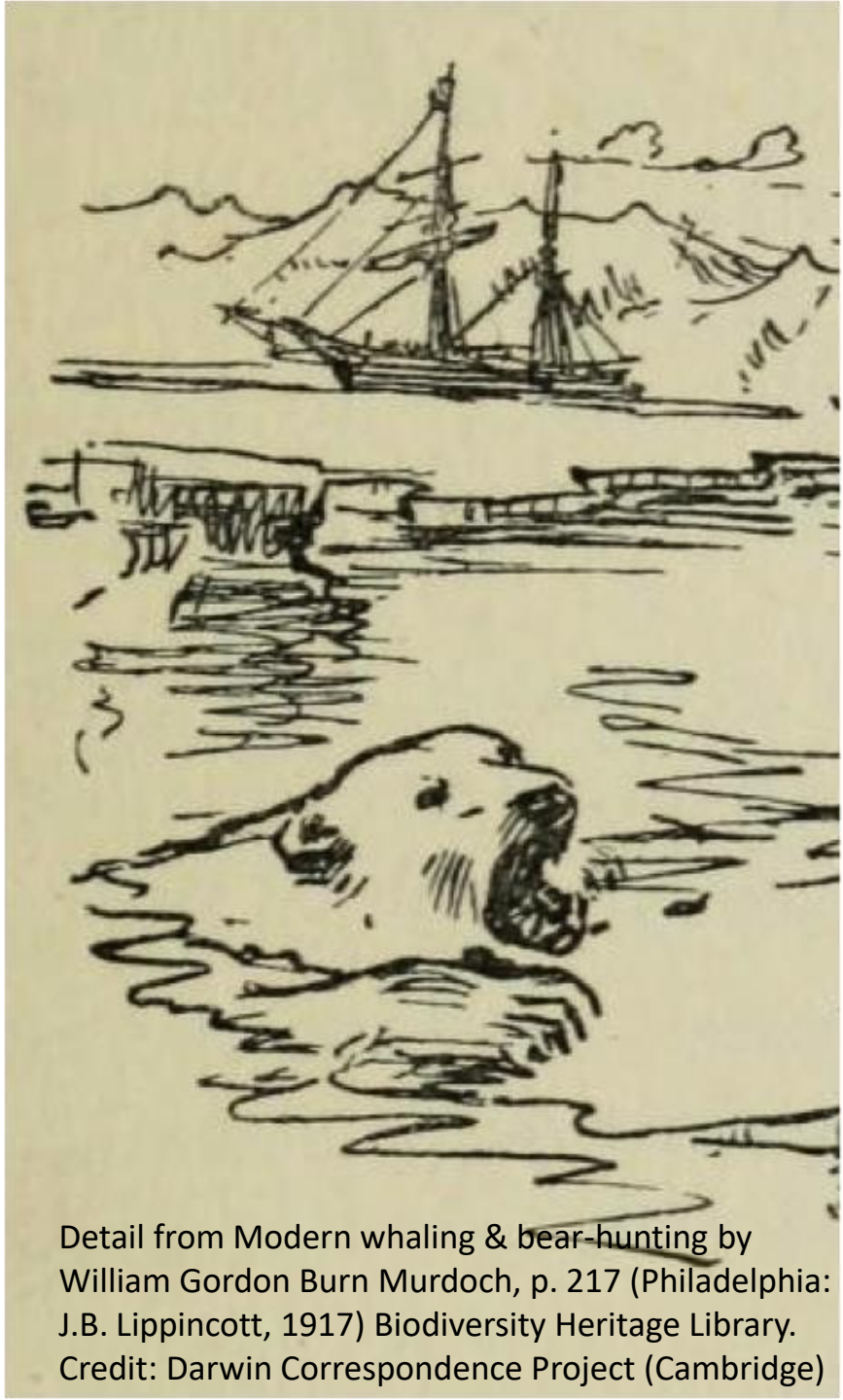
- The Origin of Species is supposed to be a scientific book
- Darwin frequently uses rhetoric and imaginary scenarios to persuade his readers
- Difficulties against his theory are acknowledged, but quickly brushed aside
- Complexity and beauty is downplayed to make its origin sound more probable



Darwin's just-so stories

- "**I can see no difficulty** in a race of bears being rendered, by natural selection, more and more aquatic in their structure and habits, with larger and larger mouths, till a creature was produced as monstrous as a whale."
- "Hence **I can see no difficulty**…by the accumulated effects of this process of natural selection, a perfect so-called flying squirrel was formed."
- "**I can see no difficulty** in a race of pheasants… being rendered, by natural selection, highly arboreal in their habits, and, on the other hand, extremely terrestrial"

(The origin of species)



Detail from Modern whaling & bear-hunting by William Gordon Burn Murdoch, p. 217 (Philadelphia: J.B. Lippincott, 1917) Biodiversity Heritage Library. Credit: Darwin Correspondence Project (Cambridge)

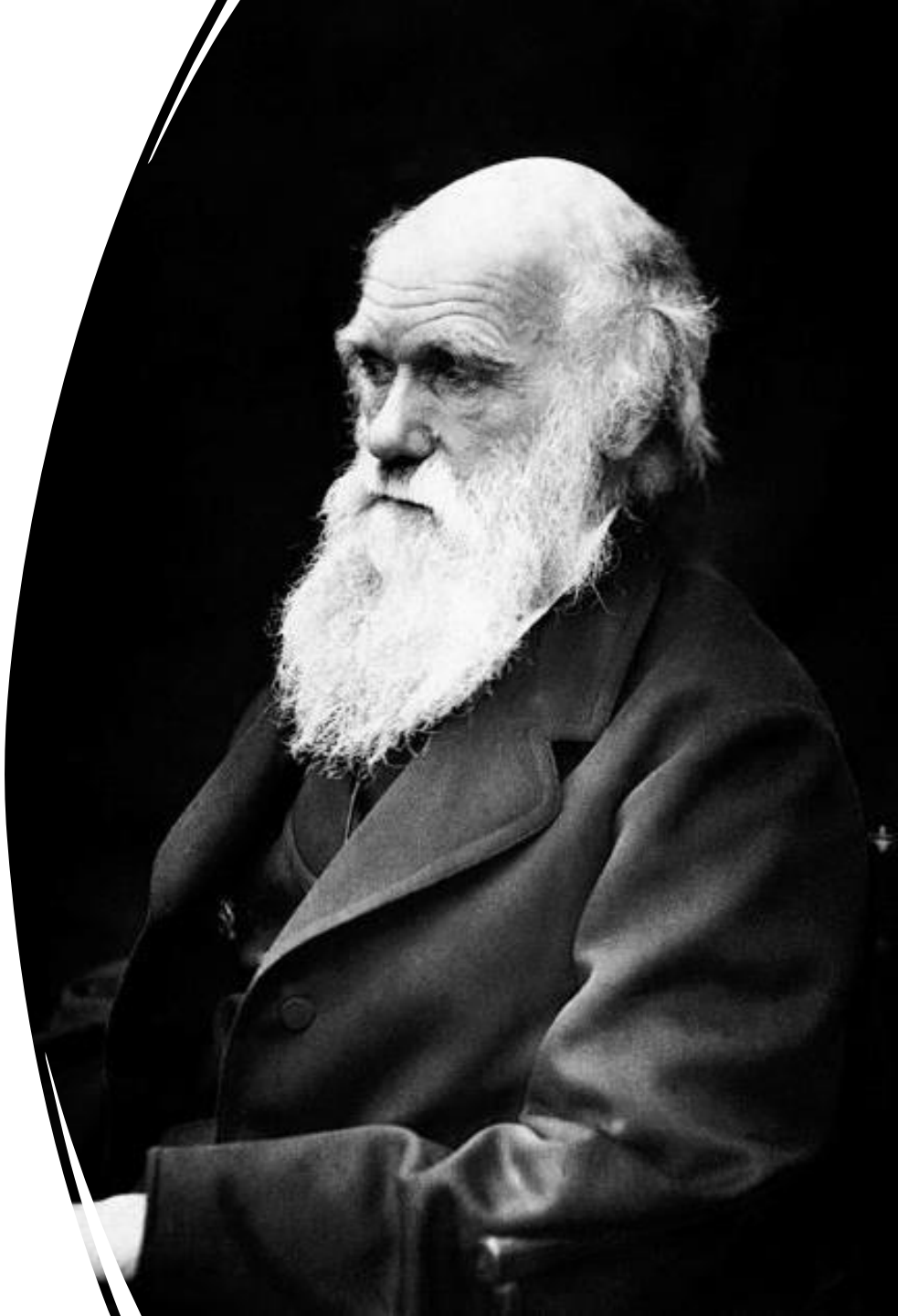
Dismissing difficulties – evolution of the eye

"To suppose that the eye…could have been formed by natural selection, seems, I freely confess, **absurd in the highest possible degree**."

"Yet…if numerous gradations from a perfect and complex eye to one very imperfect and simple…can be shown to exist…then the difficulty of believing…though insuperable by our imagination, **can hardly be considered real**."

"How a nerve comes to be sensitive to light, **hardly concerns us** more than how life itself first originated."

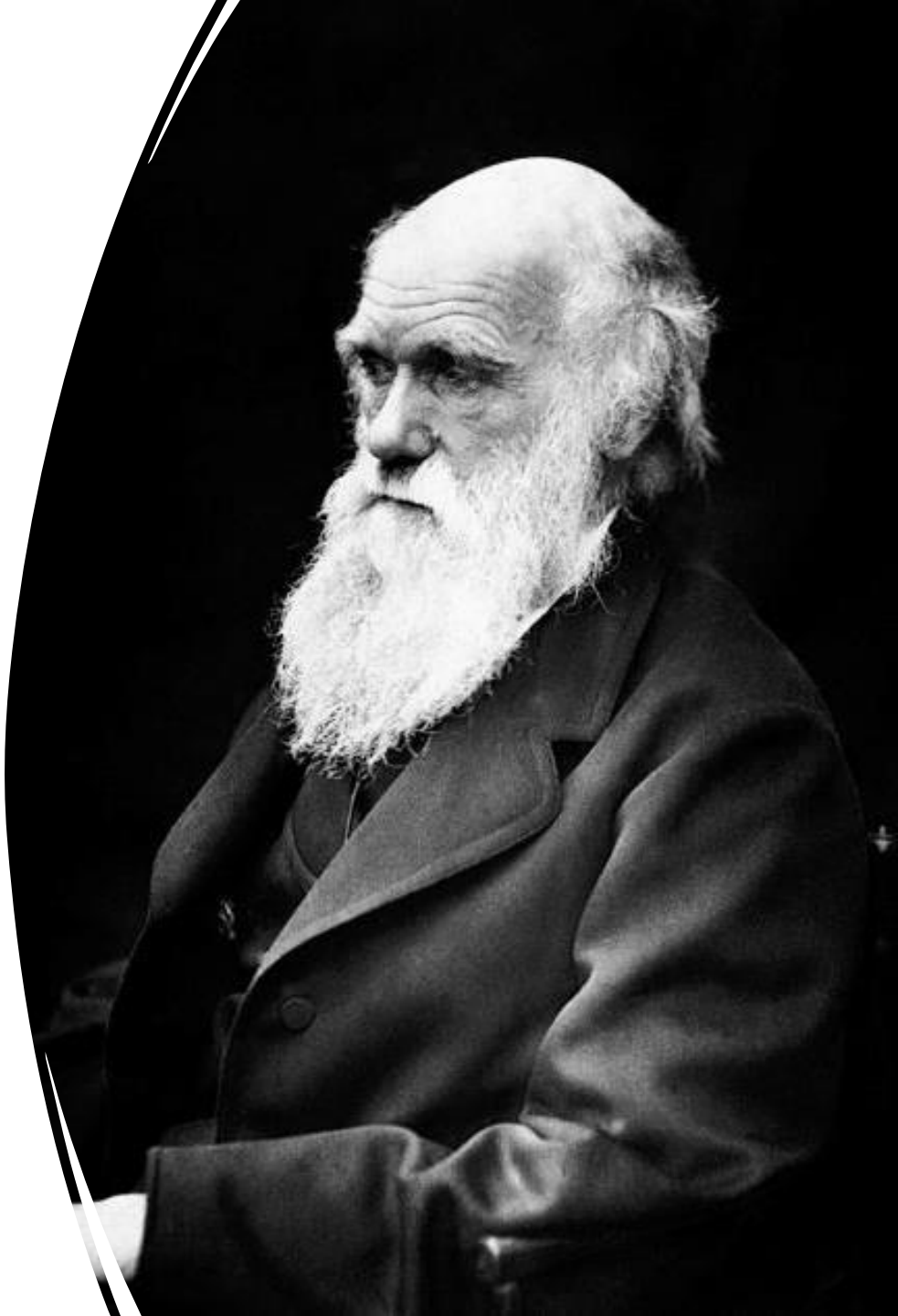
(The origin of species)



Downplaying complexity

“By such modifications of instincts in themselves not very wonderful,--hardly more wonderful than those which guide a bird to make its nest,--I believe that the hive-bee has acquired, through natural selection, her inimitable architectural powers.”

(The origin of species)



Theological rethoric

- Very often Darwin claims a certain fact is incompatible with independent creation
- However, his view of fixity of species is very naïve e.g. races of birds as independent creations
- Other times his statements are simply begging the question:

"Why should similar bones have been created in the formation of the wing and leg of a bat, used as they are for such totally different purposes?"

- Others are appeal to ignorance (bad design):

"On the view of each organic being and each separate organ having been specially created, how utterly inexplicable it is that parts…should thus so frequently bear the plain stamp of inutility!"

Conclusions

- Darwin's main "agent of change" is an effect, not a cause
- The struggle for existence is based on a flawed theory in economics
- His main arguments for evolution are also flawed:
    - Homology is circular reasoning
    - The biogenetic law was based on fraudulent drawings
    - Rudiments are not vestigial: they have function
    - Gradations do not necessitate common descent
- Had Darwin limited himself to argue for the possibility of small changes in pre-existing traits, he would've been justified
- However, his theory is supposed to explain the origin of all living creatures from a common origin, and here **it fails completely**

THANK YOU!

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