

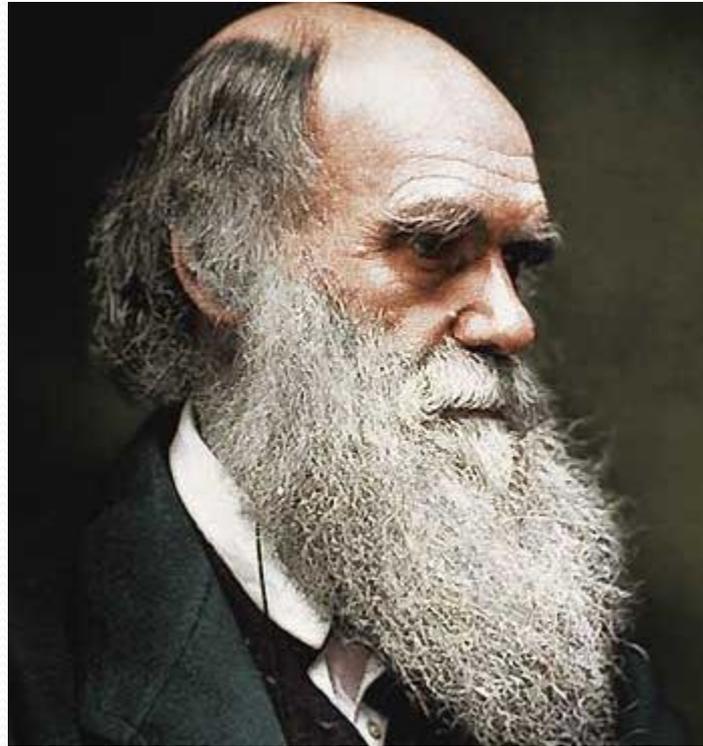
# Warning:

- This lecture contains material on evolution. Evolution by natural selection is more than a mere fact, it is a robust scientific theory which offers the best possible explanation for the complexity of biological systems. Engaging this theory will promote critical awareness and a greater comprehension of one's place in the complexity of nature. **Be Forewarned!**

# The Mystery of Mysteries Darwin's Search for the Origin of Species

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# Charles Darwin (1809-1882)



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- “There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.”

- (Charles Darwin, 1859)

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- “Nothing in biology makes sense except in the light of evolution.”
    - (Theodosius Dobzhansky, 1973)

# Charles Darwin: The Formative Years



# William Paley's Natural Theology: The Anglican Compromise.



# Crucial Points of Paley's Natural Theology

- 1. Embraces St. Thomas of Aquinas' Design Argument.
- 2. Formulates argument as Inductive Inference.
- 3. Proposes the study of God's work in addition to the study of God's words with a religious rationale for the study of natural history
- 4. Defines the study of biology as the pursuit of the intricate relationship between structure and purpose.
- 5. Establishes purpose as the teleological explanation for biological structures.

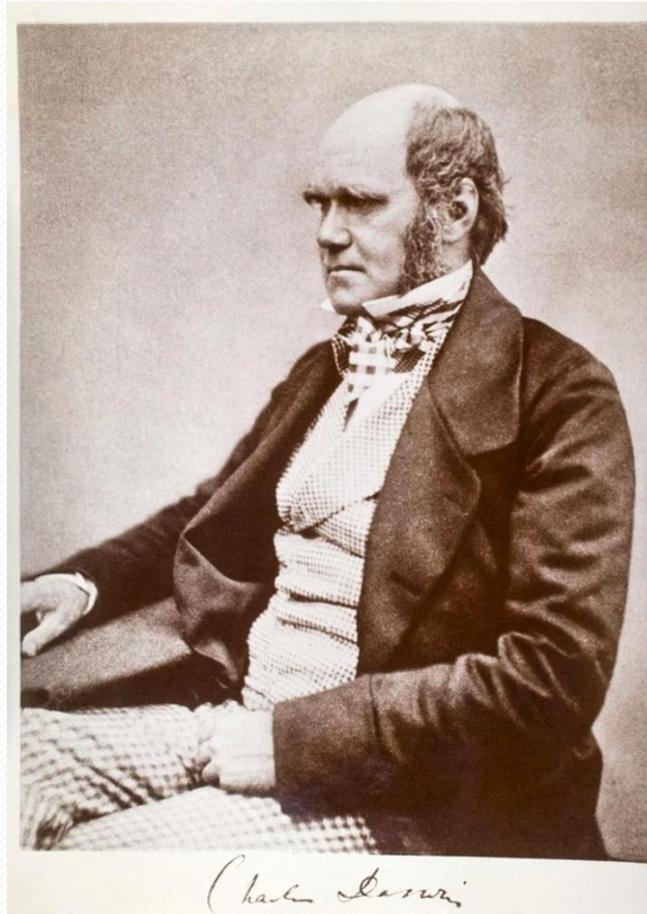
# St. Thomas Aquinas' Design Argument

- 1. Wherever complex design exists, there must be a designer.
- 2. Nature is complex.
- 3. Therefore, Nature must have had an intelligent designer.

# Francis Bacon, The Advancement of Learning

- To conclude, therefore, let no man out of a weak conceit of sobriety, or an ill-applied moderation, think or maintain, that a man can search too far or be too well studied in the book of God's word, or in the book of God's works; divinity or philosophy; but rather let men endeavor an endless progress or proficiencie in both. (Quoted in Darwin, 1859)

# Charles Darwin (1860)



# Charles Darwin (1841)



# The Voyage of the Beagle (1831-1836)



# Darwin's Transformation and the Voyage of the Beagle

- 1. Challenged Darwin to apply Lyell's Principles of Geology to explain novel geographical features.
- 2. Challenged Darwin to identify the diversity of species among unfamiliar forms.
- 3. Provided Darwin the opportunity to witness the diversity of life in natural setting.
- 4. Introduced Darwin into the exclusive circle of British naturalists.

# On The Origin of Species

## 1859



# Darwin's "One Long Argument"

- 1. Using domestication as the most immediate evidence for evolution, Darwin makes a fundamental argument for natural selection (Chapters 1-4).
- 2. Darwin addresses the potential impediments and difficulties confronting his theory of evolution (Chapters 5-9).
- 3. Using William Whewell's consilience of inductions, Darwin defends his hypothesis by demonstrating its explanatory power (Chapters 10-14).

# The Argument for Natural Selection

- 1. Domestication as a model for descent with modification.
- 2. The fundamental challenge of the concept of species as the unit of creation.
- 3. The struggle for existence as a constant in nature.
- 4. The magnification of natural selection by a geological scale of time.

# The Lessons of Domestication

- 1. Provides the most immediate evidence that biological species are not immutable.
- 2. Change occurs not in the individual but in the line of descent in which there are generational improvements.
- 3. Varieties occur by forming new lines of descent.
- 4. Humans do not create variation but select from the variations given by the forces of heredity.
- 5. Those that are selected establish the breeding stock for the next generation.

# The Challenge of Essentialism

- 1. The distinction between species , subspecies, and variety is subject to great debate and confusion.
- 2. Generally the species has been defined by the “unity of kind” and has been viewed as the object of creation and variety as a community of descent within each species.
- 3. It would be profitable to extend the commonality of descent to the species of the same genus.
- 4. Varieties, therefore, can be viewed as incipient species.

# The Struggle for Existence as a Natural force of Selection.

- 1. The potential for the increase in a population is geometric, but the potential for the increase in resources is arithmetic.
- 2. This mathematical discrepancy in potential growth creates a struggle for existence.
- 3. The struggle for existence establishes for each new generation a natural force of selection.
- 4. Those that meet the challenge of this struggle for existence will be the progenitors of the next generation.

# A Basic Outline of Natural Selection

- P<sub>1</sub>: Organic beings vary over time.
- P<sub>2</sub>: The geometric potential for population growth creates a struggle for existence.
- D<sub>1</sub>: Those that survive the struggle for existence do so because their characteristics are useful in survival.
- P<sub>3</sub>: These features will be inherited by their offspring.
- D<sub>2</sub>: Incrementally over time, each species or variety will become more ideally suited for the conditions of life in which they live.

# Impediments and Difficulties

- 1. A lack of a clear understanding of the generative forces of heredity as a source of continuous variation.
- 2. The absence or rarity of transitional varieties.
- 3. The challenge of organs of perfection and trivial structures.
- 4. The origins of differences in habits and instincts.
- 5. The reproductive incompatibility of some species.
- 6. The imperfections of the geological record.

# The Explanatory Power of Darwin's Hypothesis

- 1. Darwin argues that the appeal to the unique creation offers no explanation but only restates a proposed fact.
- 2. Explains the geological distribution of fossils.
- 3. Explains the geographical distribution of species.
- 4. Explains taxonomic distinctions as genealogical distinctions.
- 5. Explains the commonality of structure and the distinction of function.
- 6. Explains the intricate relationship between an organism and its environment.

# Darwin and Natural Theology

- 1. Darwin attempts to define his project within the frame of natural theology.
- 2. Darwin draws the distinction between primary and secondary causes.
- 3. The principles and laws which define the functions of nature are the product of primary causes and the specific phenomena of nature are product of these principles.
- 4. Thus, Darwin presents a naturalistic explanation for the origin of species as a product of the forces of natural law while allowing room for speculation about ultimate cause.

- “Darwin has, beyond all his contemporaries , given an impulse to the philosophical investigation of the most backward and obscure branch of the Biological Sciences of his day; he has laid the foundations of a great edifice; but he need not be surprised if, in the progress of erection, the superstructure is altered by his successors, like the Duomo of Milan, from the roman to a different style of architecture.”

- (Hugh Falconer, 1862)

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- “To return to your concluding sentence: far from being surprised, I look at it as absolutely certain that very much in the *Origin* will be proved rubbish; but I expect and hope that the framework will stand.”
    - (Letter to Falconer, Charles Darwin, 1862)

# William Whewell: Bridgewater Treatise

- “But with regard to the material world, we can at least go so far as this—we can perceive that events are brought about not by insulated interpositions of Divine powers, exerted in each particular case, but by the establishment of general laws.”
  - (Quoted by Darwin, 1859)



