

Week 5 Tuesday Morning Session

- Topics in evolution and language
- Break
- Video on Evolution of Language
- Discussion

William Paley (1802) <u>Natural Theology</u>	Jean Baptiste de Lamarck (1809) <u>Zoological Philosophy</u>	Charles Darwin (1859) <u>Origin of Species</u>
Existence of current species since the beginning of earth history	Evolution of more complex forms from less complex forms over earth history	Common descent with modification)
Special creation by a wise, benevolent, omniscient, omnipotent diety	Use and disuse Inheritance of acquired characters + ? Progressive Force	Natural Selection

Evolution: Some Distinctions

Evolutionary Phenomena (to be explained)

Evolutionary Theory (Mechanism or Process that does the explaining)

Additional Topics to be covered

Microevolution

Macroevolution

Gradualism, non-gradualism

Adaptionist non adaptationism (exaptionist)

Evolution and development (evo devo)

John Herschel: Newton's Analogical Reasoning

**Known Cause:
Centripetal force
exerted by hand**



**Known Phenomenon:
Orbit of rock in sling
around hand**

**Unknown Cause:
Centripetal force
of universal gravitation**



**Known Phenomenon:
Orbit of Moon
around Earth**

Charles Darwin's Analogical Reasoning

**Known Cause:
Artificial Selection**



**Known Phenomenon:
Diverse Forms of
Domesticated Plants
and Animals**

**Unknown Cause:
Natural Selection**



**Known Phenomenon:
Diverse Forms of
Plants and Animals
in Nature**

William Whewell: Newton's Consilience

Lunar Motion

Planetary Motion

Universal Gravitation

Motion of Projectiles

Motion of the Tides

Charles Darwin's Consilience

Biogeography

Fossil Record

Common Descent

Embryology

Vestigial Organs

Darwin's Original 1859

New Synthesis circa 1947

Modified Darwinian accounts

Punctuated Equilibrium 70s

Evo Devo Theories 90's

The Synthesis

Phase 1: Darwin and Mendel

(resulted in population genetics

“small selection pressures acting on minor genetic differences can produce evolutionary change”)

Phase 2: Linked Phase 1 to traditional areas of biology

January 2-4 1947 international symposium in Princeton NJ.

Representatives of most diverse schools (except hardline Lamarckians)

“there was universal and unanimous agreement with conclusion of the synthesis. All representatives endorsed the gradualness of evolution, the preeminent importance of natural selection, and the populational aspects of the origin of diversity.”

Ernst Mayr, *The Growth of Biological Thought: Diversity, Evolution and Inheritance*, 1982

Gould on the “hardening” of the new synthesis

All phenotypic traits are adaptive

Emphasis on gradualism

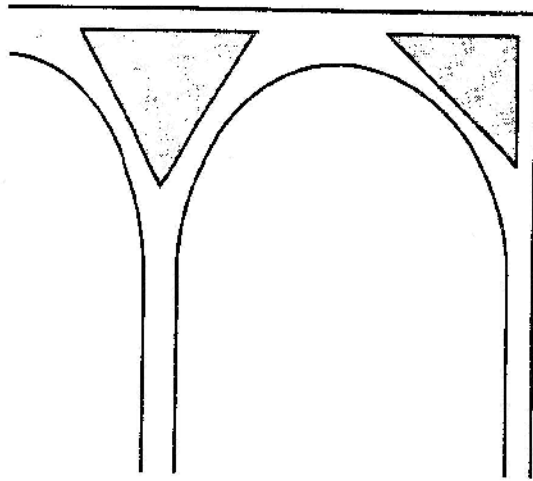
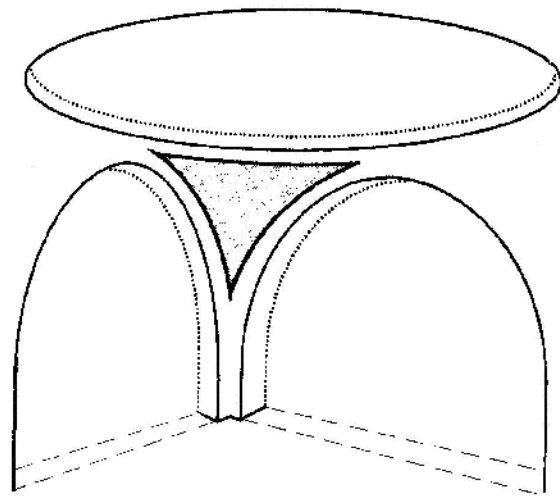
Vrba and Gould -- exaptation

Exaptations: features co-opted for current utility following an origin for a different function (or for no function at all)

Adaptations: features directly crafted for their current utility.

Spandrels: Spaces Left Over





11-9. A three-dimensional spandrel, or pendentive, contrasted with a more conventional two dimensional spandrel between arches in a linear row (below). From Gould, 1997e.

Spandrels

It is some times argued that exapted utility imposed (on a non-adaption) must make subsequent use marginal—but not true of spandrels

I suspect that many puzzling features of human mentality would be better resolved if we conceptualized them as historical constraints derived from distant adaptational origins: tendency to treat natural variety into pairs opposed and dichotomous categories—male and female, night and day, culture vs nature, good vs bad, us vs them.

Sociobiology, evolutionary psychology—environment of evolutionary adaption, in common ancestral population, but as in the case of spandrels they need not be

Gould also presented a non-gradualist version of evolutionary theory—punctuated equilibrium

This version of saltational evolutionary theory (*saltational—dance around*) is reinforced by the contemporary new interdisciplinary approach known as evolution and development –evo devo

This approach grew out of an understanding of the role of regulatory genes in development, and the recognition that in some areas big (macroevolutionary) change) can result from “small” mutation of these regulatory genes

Issues in HCF Hauser, Chomsky, Fitch, *The language Faculty: What is it, Who has it, and How did it Evolve*

Evolution of language—

Shared vs. unique --Even if unique it could be gradual extension of the pre existing communication system

Gradual adaptation vs Saltational—Even if gradual, important aspects of language might have been exapted from their previous adaptive function.

Continuity vs. exaptation

That's All Folks