Deleuze and Biology

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Plan of the lectures

- Lecture 1: Construction of the standard view
- Lecture 2: Contemporary issues and positions
- Lecture 3: Deleuze’s contribution

Lecture 1
Construction of the Standard View

- Introduction
- Natural History
- Darwin's "Copernican Revolution"
- The Modern Synthesis
- The Molecular Revolution
- Evo-devo

Introduction
The great questions of biology

- repetition and difference in biological processes occurring on different temporal and spatial organizational scales

Spatial / organizational scales

Molecular	cellular	organ	organic systems	organisms	groups	ecologies
DNA RNA protein Enzymes etc	Membranes Cytoplasm Mitochondria Ribosomes etc	Heart Liver etc	Nervous Endocrine, Digestive etc	Bacteria Cats Dogs Humans etc	Colonies Demes* Packs Societies etc	Local Regional Planetary

*Demes = reproductive communities

Temporal / processual scales

	Developmental	Organismic	Reproductive	Evolutionary
	Diachronic (months)	Synchronic (seconds, days, months)	Diachronic (generations)	Diachronic (geological)
	Embryology	Physiology	Heredity	Evolution
Repetition	Regular patterns of development	Systematic function as restoration of set points: homeostasis	Children resemble parents	Conservation of sex, body plans, species
Difference	Developmental plasticity	Multiple norms of "health"	Children differ from parents	novelty / disparity*

*Gould: diversity = number of species;
disparity = difference in basic organization.

Some basic terminology

- *Biological disciplines*
  - History-centered: classification can be called “taxonomy,” but now, after Darwin, it's also known as “*cladistics*," that is, classification with regard to evolution; *paleontology*; *genetics*.
  - Organism-centered: *embryology*, *physiology*, *anatomy*, *ethology*, *ecology*. (These can be done with a gene-centered focus, but not necessarily.)
- *Ontogeny* = development (developmental and organismic scales). Embryonic development, followed by “growth,” then “transformation” at puberty, etc.
- *Phylogeny* = descent and branching (reproductive and evolutionary scales).
- *Speciation* = appearance of new species (evolutionary scale).
- *Genome* = set of genes for a species.
- *Genotype* = set of genes in any one individual.
- *Phenotype* = concrete features of the individual: anatomy, physiology, behavior.

Natural history
Foucault in *The Order of Things*

- The classification of natural beings by the identity and difference of their properties
- "It is … impossible for *natural history* to conceive of *the history of nature*" (OT: 157)
- “Biology did not exist before the 19th century, because life itself did not exist; all that existed were living beings" (OT: 127-128).

Table of natural history *Cyclopaedia* (1728)

http://commons.wikimedia.org/wiki/Image:Table_of_Natural_History%2C_Cyclopaedia%2C_Volume_2.jpg

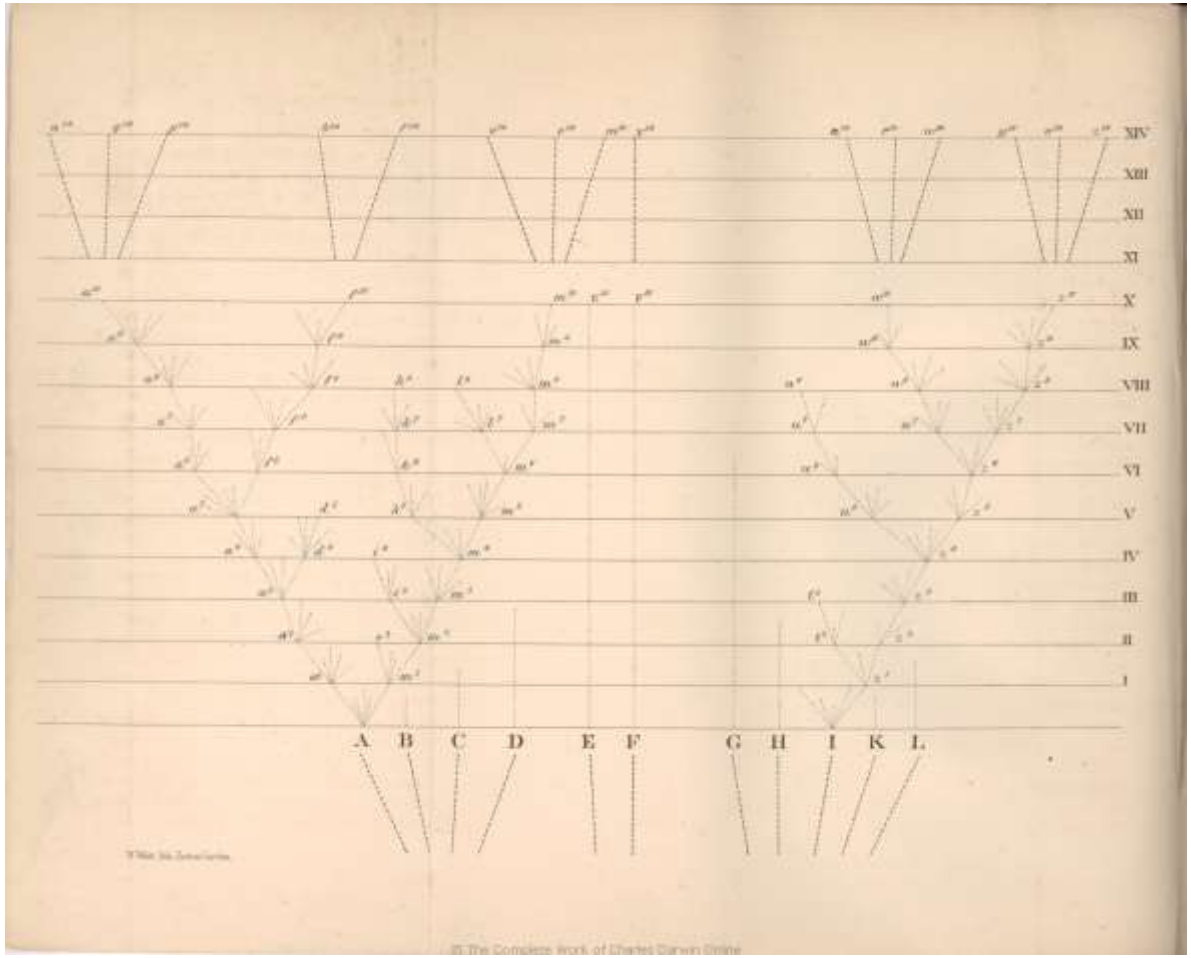
Darwin's "Copernican Revolution"

- Natural selection as mechanism of evolution
- Variation
  - Source = accidental mutation
  - Random and prevalent
  - Some will be adaptive (increase fitness)
- Heritability
- Selection
  - Population pressures
  - Applying Malthus to nature

Consequences of Darwin

- Dynamicism of life
- Differenciation of species
- Multiple temporal scales
- Irreality of species
- Population thinking

Darwin's diagram



http://darwin-online.org.uk/

Darwin's unanswered questions

- (correct) mechanism for heredity
- mechanism for development

The modern synthesis

- Rediscovery of Mendel's laws
- Population genetics
- Modern synthesis = population genetics plus Darwin's theory of evolution by natural selection
- Evolution is / is measured by:
  - Change in distribution of genes in a population
- NB: organism perspective absent

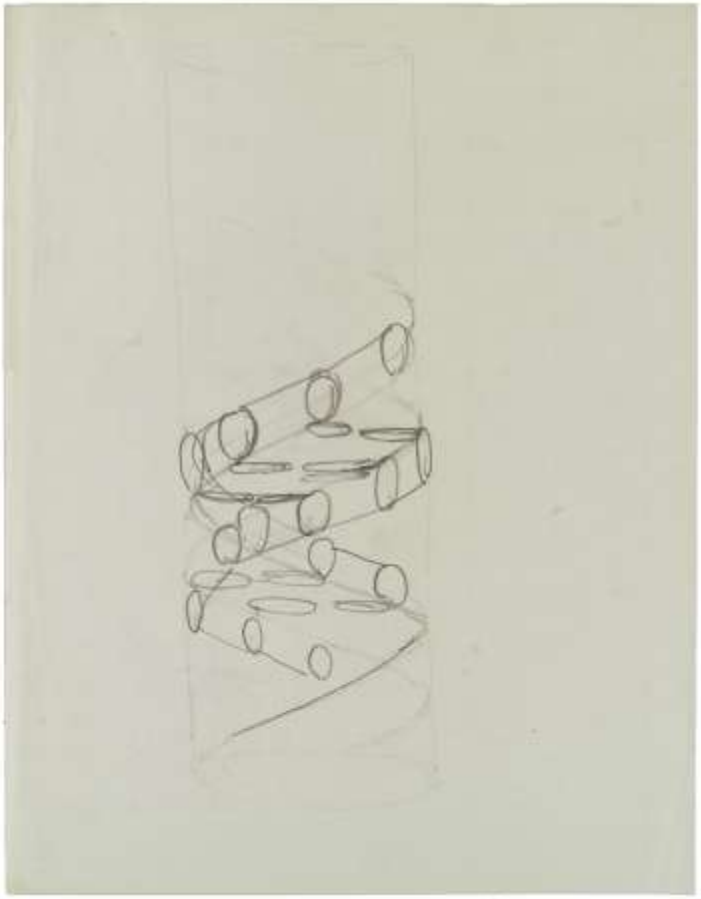
Genes at the time of the modern synthesis

- Abstract hereditary units accounting for traits.
- No sense of:
- Physical structure
- Means of transmission
- Conservation of structure during transmission
- Role in development

The molecular revolution

- Watson and Crick did not “discover” DNA
- Structure controls function
- Transcription and translation
- The “central dogma”
- Development: the final frontier
- Jacob and Monod
  - Structural vs regulatory genes
  - the “genetic program”

Crick's drawing of double helix (c. 1953)



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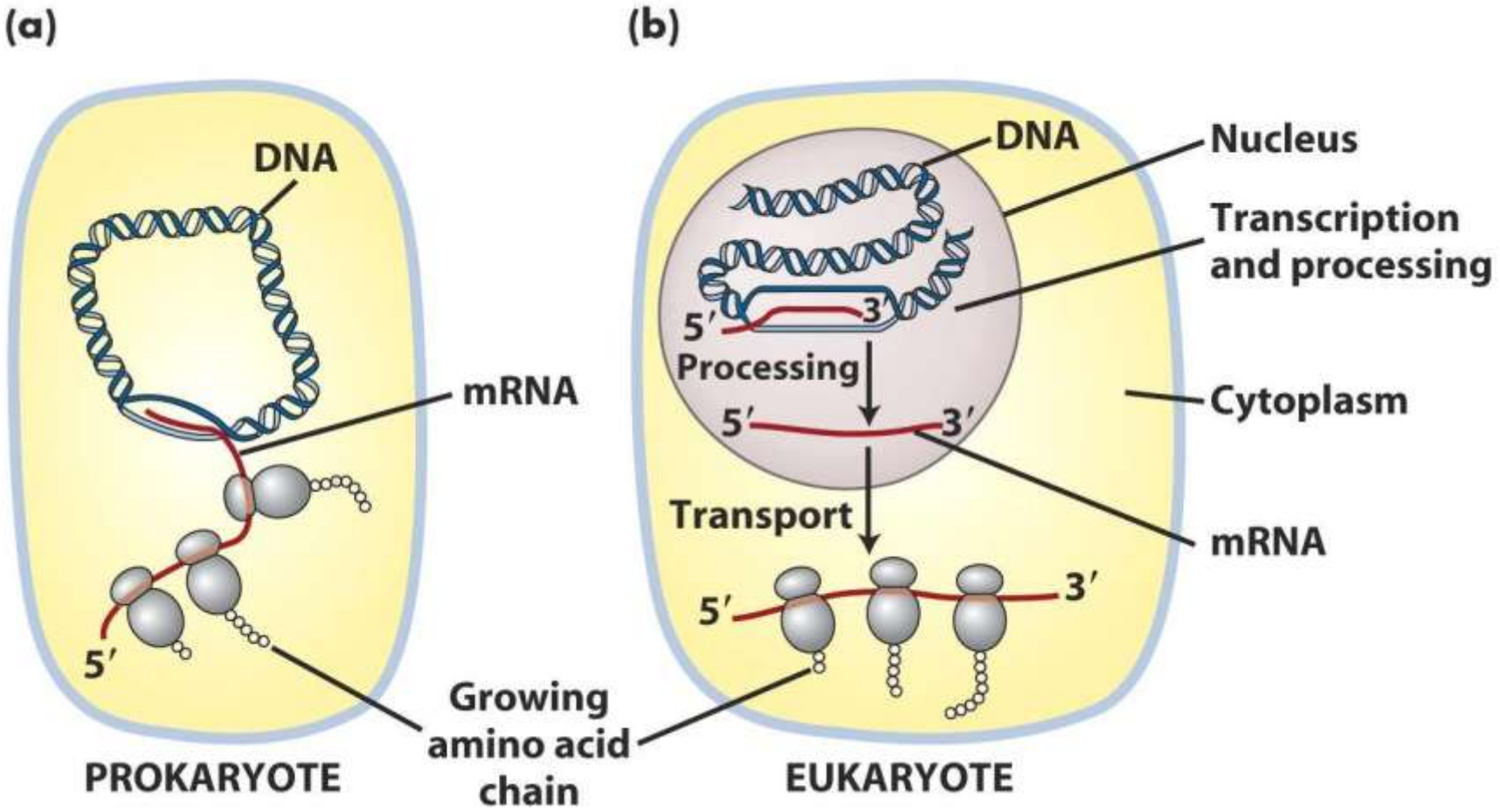
Transcription and translation (simplified)

- DNA in nucleus is *separated* (two strands pull apart).
- *Transcription*: copying a strand of DNA into mRNA
  - mRNA = messenger RNA
- The mRNA is *transported* out of nucleus into cytoplasm
- On the ribosome, the tRNA *binds* to mRNA
  - tRNA = transfer RNA
  - tRNA recognizes triplet codons on the mRNA
- *Translation*: The tRNA adds an amino acid to protein chain
  - each amino acid correlates to each triplet codon
- Completed protein chain *drops off* ribosome

Transcription and translation

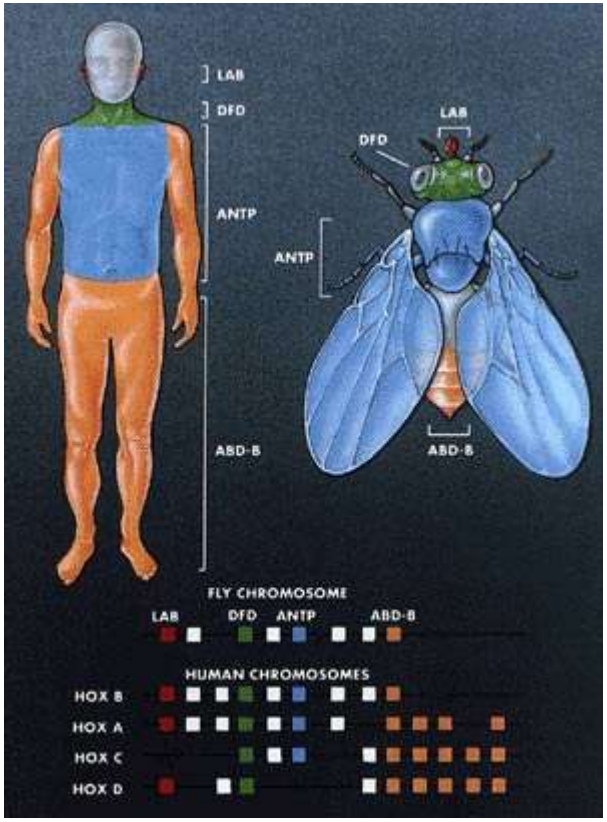


http://cropandsoil.oregonstate.edu/classes/css430/lecture%209-07/figure-08-01.JPG

Evo-devo

- Bringing evolution and development together on the molecular level
- Homeotic genes
- “Eyeless”
- Source of disparity
  - Different regulatory gene networks
  - Even with same “genetic toolkit”
- Evolution: change in regulatory gene networks

Hox genes



http://thebrain.mcgill.ca/flash/capsules/images/outil_rouge05_img01.jpg