

Developmental Biology

Molecular genetics and the new development

Molecular Genetics and Development

“One of the most important questions for embryology relating to the activity of the genes cannot be answered at present. Whether all genes are active all the time, or whether some of them are more active at certain stages of development than others, are questions of profound interest.”

TH Morgan, 1927

“...those who desire to make genetics the basis of physiology of development will have to explain how an unchanging complex can direct the course of an ordered developmental stream.”

Frank Lillie, 1927

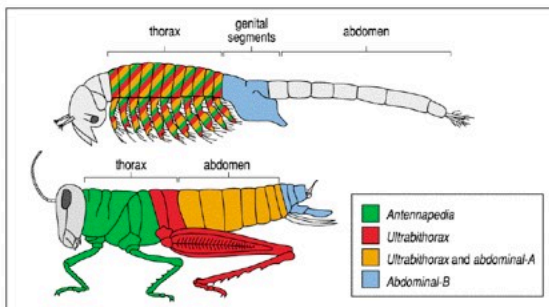
Once upon a time, there was a great Synthesis, and all the paleontologists and taxonomists and biogeographers and population geneticists were invited, but the developmental biologists were all snubbed, and had to spend 40 years wandering in the wilderness of *Entwicklungsmechanik*, unappreciated and left out of evolution altogether.

And then Lewis puzzled out BX-C and Nüsslein-Volhard and Wieschaus discovered *bcd* and *nos* and *hb*, and Gehring found Hox, and now finally we get to teach those evolutionists a thing or two.

The Evo Devo 'Revolution'

"The comparison of developmental genes between species became a new discipline at the interface of embryology and evolutionary biology — evolutionary developmental biology, or 'Evo Devo' for short."

Sean B. Carroll, 2005

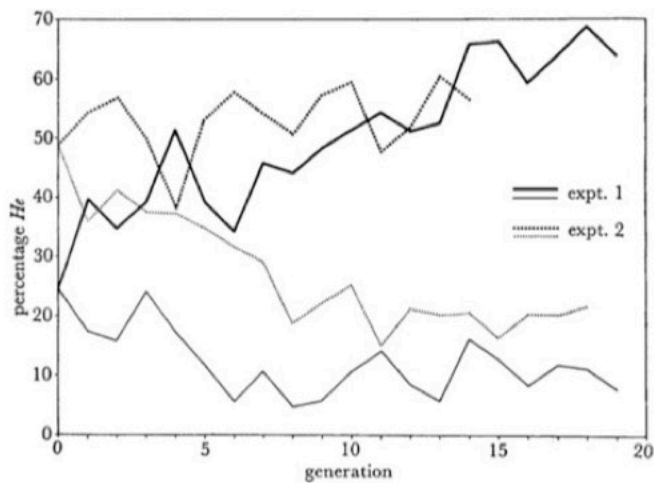


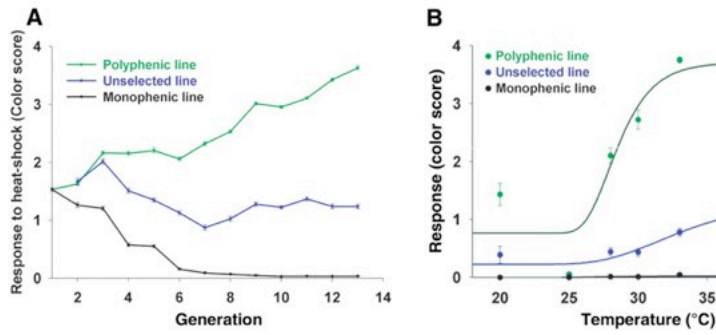
Differences between evolutionary and developmental biologists

Quality	Evolutionary Biologists	Developmental Biologists
Causality	Selection	Proximate mechanisms
Genes	Source of variation	Directors of function
Target	<i>Trans</i> elements (coding sequence)	<i>Cis</i> elements (regulatory)
Variation	Diversity & change	Universality & constancy
History	Phylogeny	Cell lineage
Time Scale	10 ¹ -10 ⁹ years	10 ⁻¹ -10 ⁻⁷ years

Evolution proceeds by mutation and selection. A novel mutation occurs in a gene that gives the individual inheriting it an advantage, and that person passes it on to their children who also gets the advantage and do better than their peers, and leave more offspring. Given time, the advantageous mutation spreads through the population so the entire species has it.

Populations
Networks
Plasticity
Environment





(Suzuki and Nijhout, 2006)

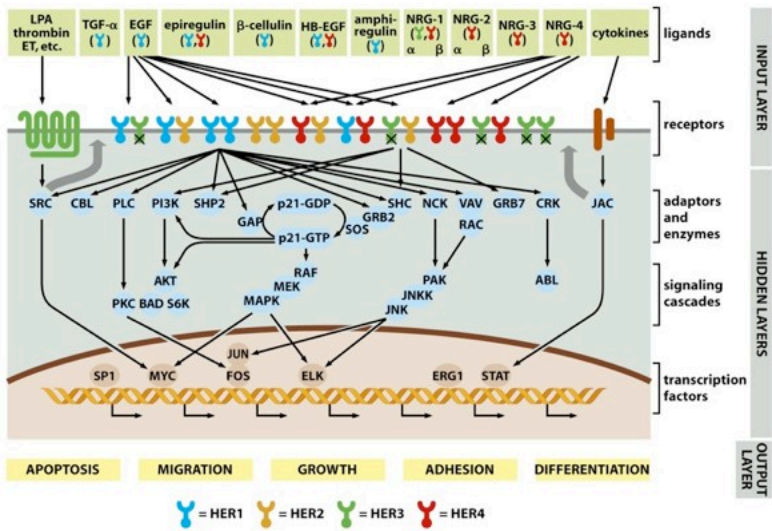


Figure 5.1 The Biology of Cancer (© Garland Science 2007)

