Discussion Questions for August 29, 2013

Each author lays out a view of the major questions in evo-devo (and where the field should head). What are these views? To what extent are they compatible? To what extent incompatible?

Wray attributes the rise of evo-devo to a combination of technical developments and empirical discoveries:
What were the key empirical discoveries that laid the groundwork for modern evo-devo?
What were the key technical advances?
Are there theoretical/conceptual drivers, too?

Shifting phylogenetic focus:
How was the original (phylum-level/broad) phylogenetic focus related to the available tools/empirical questions in development? What's behind the shift to a focus on trait differences between closely related organisms? Do you expect that results will be similar or different at these two scales? What about the shift down to a true population-genetic perspective? Can we extrapolate from results at the population/species level to longer time scales?

Wray takes a gene-centric approach to developmental biology: what we are after is explanations at the level of genes.

How would you (or he) defend this gene-centric view?

What other level(s) of explanation might be informative? When would these be more informative than gene-level explanations?

On what basis does he argue that regulatory mutations will be the most important?

What would Moczek say to Wray? How opposed are their views?

A recent article (Travisano and Shaw, 2013. Evolution 67:305-314) presents arguments similar to Moczek's about the importance of the environment. But they go even further in rejecting gene-centered approaches: "deciphering the relationship between genotype and phenotype is likely to yield little explanatory insight." "In efforts to explain evolution of phenotypes, focus on particular alleles at particular loci is misplaced". If we're really interested in phenotypic evolution, should we forget about genes?

Are Moczek's components of a theory of developmental evolution necessary? Are they sufficient? How important is the aim of having a predictive theory?

Moczek argues that several phenomena (facilitated variation, genetic accommodation, niche construction) involving an interaction between genes and the environment give a framework for understanding/predicting the evolution of development. What can we learn by investigating each of these phenomena? What's the effect of having genes vs. environment as our starting point?

Wray and Moczek focuses on what development has done for evolution. What about the reverse? What about contributions of evolution to the study of development?

Müller outlines four different research programs within evo-devo:

Can you give examples of work that would fall into each?

What is the value of the programs less focused on genes?

Which of these would Wray recognize? What about Moczek?