

Historical context

1. **a.** Long before the advent of molecular biology, observations of developmental series of embryos across taxa by Meckel, Serres, von Baer, and Haeckel, led to recapitulation theory, in its various flavors, becoming the first intellectual theme of Evo-Devo (Wray 2010). How have highly computational “-omics” techniques informed our understanding of embryogenesis as an evolutionary model?
- b.** As with taxonomy, those who study developmental biology tend to split into those who favor morphological versus molecular approaches. Considering the recent, rapid advances in “next-gen” sequencing technologies and the emergence of bioinformatics, is it finally time to put away the calipers, or are all the gains in knowledge at the molecular level still merely “sub-phenotype”?

Key terms & concepts – If any of these terms needs clarification, we can define them in class.

phylotypic stage	transcriptome	phylostratigraphy
pharyngula	gene ontology	BLASTP
modularity	developmental burden	TAI / TDI

Discussing the papers

2. Can you summarize the findings of each of today’s readings in a sentence?

Irie et al. (2011) –

Quint et al. (2012) –

Tian et al. (2013) –

3. Table 2 in Tian et al. (2013) best summarizes the alternative models of evolutionary conservation during development. What mechanisms would give rise to each of these patterns?

4. How did Irie et al. (2011) analyze transcriptome similarity across model vertebrates (Figs. 2, 3)?

5. What makes the similarity in plant and animal embryogenesis so doggone interesting (see Fig. 4 in Quint et al. 2012)?

6. All three papers compare sequence conservation of expressed genes, but Quint et al. (2012) also compared the evolutionary *ages* of these transcripts. Was this necessary? How did their two indices (TDI & TAI) differ?

7. Are you surprised that *Dictyostelium* doesn’t fit the developmental hourglass “mold” (Tian 2013)? Explain how modularity affects patterning during embryogenesis.

8. Tian et al. (2013) are quick to draw a distinction between the various *patterns* of conserved developmental processes and the spatial constraints *model*, which can be recast to produce different patterns. What do you make of these semantics?