

Origination of Organismal Forms, Muller and Newman, editors,  
MIT Press, 2003

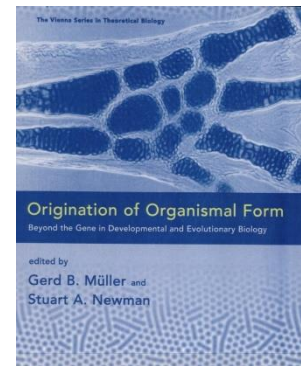


Table 1.1 p.5

Open questions concerning morphological evolution

1. Burgess shale effect Why did metazoan body plans arise in a burst?
2. Homoplasy Why do similar morphologies arise independently and repeatedly?
3. Convergence Why do distantly related lineages produce similar designs?
4. Homology Why do building elements organize as fixed body plans and organ forms?
5. Novelty How are new elements introduced into existing body plans?
6. Modularity Why are design units reused repeatedly?
7. Constraint Why are not all design options of a phenotype space realized?
8. Atavisms Why do characters long absent in a lineage reappear?
9. Tempo Why are the rates of morphological change unequal?

Table 1.2 p.6

Open questions concerning the genotype-phenotype relationship in development and evolution

10. Jurassic Park scenario Does the genetic code contain the complete information of organismal form?
11. Novelty Do new structural elements arise from mutations?
12. Polyphenism Why can identical genetic content be associated with very different morphological phenotypes?
13. Redundancy and Overdetermination Why are there multiple genetic and biochemical pathways to the realization of biological forms?
14. Discordance Why do morphological and genetic evolution proceed at different paces?
15. Epigenesis How is the genotype-phenotype relationship mediated in development?

Table 1.3 p.7

Open questions concerning epigenesis and its role in morphological evolution

16. Programs Does the developmental generation of organismal form result from deterministic programs?
17. Context How are developmental processes modulated by epigenetic context?
18. Generic Properties What is the role of the physicochemical properties of biological materials?
19. Environment What is the role of the external environment in development?

Table 1.4 p.8

Open questions concerning the theory of morphological evolution

20. Origination What generative mechanisms are responsible for the origin and innovation of phenotypic characters?
21. Plasticity Are developmental response capacities specifically evolved, or is plasticity a primitive property?
22. Epigenesis Do the rules of developmental transformation shape evolution?
23. Evolvability Is the evolutionary potential of a lineage associated with the capacity of its developmental system to respond to the environment?
24. Assimilation What is the role of genetic co-optation and assimilation in the evolution of organismal form?