"Endless Forms Most Beautiful" – Discussion Questions

Chapter 1 – Animal Architecture: Modern Forms, Ancient Designs

- 1) What are some examples of modular and serially repeating body parts?
- 2) What examples show the same body part changed in different ways (homologs)?
- 3) What examples show the body part as part of a series (serial homologs)?

Chapter 2 – Monsters, Mutants, and Master Genes

- 1) What caused a lamb to be cyclopic?
- 2) What is the "organizer"?
- 3) What experiments were done to newt embryos, chicken embryos and butterflies that showed the existence of "organizers"?
- 4) Organizers produce morphogens. What effect do morphogens have?
- 5) What effect does a morphogen concentration gradient have?

Chapter 3 – From E. Coli to Elephants

- 1) What is a homeotic or hox gene?
- 2) What is a homeobox?
- 3) What is a homeodomain?
- 4) Many animals had homeoboxes very similar to each other, even if the animals were not closely related. What does this suggest?
- 5) What happened when the eyeless gene was turned on in the wing and legs? Significance of the results?
- 6) What happened when the small eye gene of a mouse was put into flies? Significance of the results?
- 7) What does the expression "many roads leads to Rome" mean? How is the expression being used in this book?
- 8) Did the Pax 6 gene (eye gene) evolve more than once, each time separately? Or, did the Pax 6 gene evolve once in a common ancestor and get preserved?
- 9) What is the "took kit"?
- 10) What's the significance of the title of chapter 3 From E. Coli to Elephants

Chapter 4 – Making Babies: 25,000 Genes, Some Assembly Required

- 1) What are "fate maps"?
- 2) What does the "geography of the embryo" mean?
- 3) What geographic regions do embryos have?
- 4) How is a fly made?
- 5) How is a vertebrate made?
- 6) Flies and vertebrates are very different animals. How are they made similarly? Differently? What mechanisms are similar? Different?

Chapter 5 – The Dark Matter of the Genome: Operating Instructions for the Tool Kit

- 1) What is considered the "Dark Matter of the Genome"?
- 2) What does it mean for switches to be GPS integrators?
- 3) True/False: One gene may be regulated by many separate switches such that the gene is used many times and in different places.
- 4) How does "combinatorial logic" describe how switches and tool kit genes work?
- 5) Switches enable the same tool kit genes to be used differently in different animals.
- 6) Go back to the "organizer" from Chapter 1. They made morphogens. What do organizers have that allowed them to influence the fate of nearby tissues? What do you think the morphogens could be?