

LSC 455 - DEVELOPMENTAL BIOLOGY

1. Basic principles and approaches in developmental biology, developmental patterns, principles of experimental embryology, genomic equivalence.
2. History of embryology, embryonic development, types and mechanisms of cleavage, gastrulation, cell specification in animals (amphibians and chicks).
3. Cell signaling pathways regulating the developmental program.
4. Organizer in amphibians, progressive determination, regional specificity of induction.
5. Regeneration, epimorphic, morphallaxis/morphallactic and compensatory.
6. Limb development in tetrapod, axes formation, coordination among the three axes.
7. Introduction of model organism/system for developmental studies, advantages of each system with special reference to *Dictyostelium discoideum*, *C. elegans*, *Drosophila* and *Arabidopsis*.
8. Cell division, plane and polarity, radial asymmetry and symmetry, pattern formation, abaxial-adaxial identity, cell lineage vs. cell position, meristem, determinant vs. indeterminate meristem. Gametophyte development, genetic and hormonal regulation of reproduction, pollination and fertilization.
9. Seed formation, cotyledon, endosperm and seed coat development. Seed dormancy and germination, seedling development, genetic regulation of vernalization.
10. Shoot development, structure, function, initiation and maintenance of shoot apical meristem, regulation of meristem size and bud formation, antagonism between shoot apical meristem and lateral organs.
11. Development of leaf primordium, abaxial and adaxial identity of leaf cells, leaf margin, trichome, epidermis and stomata development, vascular differentiation.
12. Development of root, root apical meristem structure and function, development of lateral and adventitious root, and root hair, hormonal regulations.
13. Development of flower, transition from vegetative to reproductive stage, inflorescence meristem, floral whorls specification, ABC model, pattern and development of floral symmetry, structure and development of flower in monocots versus dicots.
14. Applications of Developmental Biology.

Suggested Readings

1. Developmental Biology – by Scott F. Gilbert
2. Essentials of Developmental Biology - by JMW Slack
3. Principles of Developmental Biology - by Louis Wolpert
4. Ecological Developmental Biology integrating epigenetics, medicine and evolution - by Scott F Gilbert and Epel
5. The *Arabidopsis* Book, ASPB publication (available freely at www.aspb.org)
6. Biochemistry and Molecular Biology of plants – by Buchanan, Grussem and Jones
7. Plant Physiology - by Taiz and Zeiger