SEMESTER II
LSM4256 EVOLUTION OF DEVELOPMENT

Prerequisite: LSM3233 or LSM3252

The objective of this course is to integrate two disciplines, Evolutionary Biology and Developmental Biology into a common framework. The module explores the evolution of animal bodies, e.g. legs, segments, eyes, wings, etc., by focusing on changes at the molecular and developmental levels. This course will introduce important concepts such as hox genes, selector genes, homology, serial homology, modularity, gene regulatory networks, genetic architecture, developmental basis of sexual dimorphism, and phenotypic plasticity, and give a broad organismic-centred perspective on the evolution of novel traits.

S/N	Topics
1.	What is Evo-Devo and what does this course cover?
2.	Where do we belong on the tree of animals, and what does this tree look like?
3.	Why do we need comparative work to make sense of how development works? Introduction to early *Drosophila* Development.
4.	What are organizers, fields, morphogens and selector genes?
5.	What is the Pax6 selector gene, and why is it so famous?
6.	What are homeotic (hox) genes and why are they so important?
7.	Legs, and other body appendages – how do they come about?
8.	How does protein evolution alter body plans?
9.	How do changes to hox gene targets alter body plans? Or how beetles get their forewings turned into elytra?
10.	How does *cis*-regulatory evolution alter body plans?
11.	What is developmental modularity, and why does it matter?
12.	CA test
13.	Visit to the Museum of Natural History – Can we identify what is a novel complex trait?
14.	What is genetic architecture and how does it impact the evolution of traits?
15.	What is homology and process homology?
16.	How can novel traits emerge from the co-option of pre-existent gene networks?
17.	How does development constrain or bias the evolution of novel traits?
18.	How do gene duplications affect the evolution of novelty?
19.	How to write and develop a grant proposal in evo-devo.
20.	How do males and females develop different traits when they share almost the same genome?
21.	What is phenotypic plasticity and how does it evolve?
22.	What is genetic assimilation and accommodation and how do these processes contribute to evolution?
23.	What is epigenetics and how can it contribute to evolution?
24-26	Student project presentations

TEXT BOOK: From DNA to diversity: Molecular genetics and the evolution of animal design, by Sean B. Carroll, Jennifer K. Grenier, and Scott D. Weatherbee, 2nd edition. ISBN: 1-4051-1950-0 ($34-50 on Amazon). We will integrate readings from the textbook with those from the primary literature. Most of the topics of the course, however, will derive from discussion of one or two papers (per class) from the primarily literature.

ASSESSMENT: 100% CA

MODULE CO-ORDINATOR & LECTURER:

A/Prof Antonia Monteiro (Tel: 6601-2108; E-mail: dbsfmaa@nus.edu.sg)