



The Hebrew University of Jerusalem

Syllabus

Sex - Reproduction from Molecules to Elephants - 72159

Last update 28-10-2024

HU Credits: 2

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Life Sciences

Academic year: 0

Semester: 1st and/or 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Prof. Michael Brandeis

Coordinator Email: michael.brandeis@mail.huji.ac.il

Coordinator Office Hours: By appointment

Teaching Staff:

Prof. Michael Brandeis

Course/Module description:

Sex is, intriguingly, the universal mode of animal and plant reproduction. This unique course, filmed entirely on location, contrasts the richness of sex with its evolutionary conserved foundations, exploring the African savanna, Yellowstone national park, coral reefs, museums and labs.

Course/Module aims:

See trailer

<https://youtu.be/KIP3zAmrTYw>

Learning outcomes - On successful completion of this module, students should be able to:

This course will provide tools, knowledge and case studies that will enable you to reflect upon and appreciate the mysteries and wonders of sexual reproduction.

Among other you will learn about:

- 1. The eukaryotic cell and the animal and plant kingdoms.*
- 2. The principles of heredity and evolution.*
- 3. The significance of meiosis and how germ cells are generated.*
- 4. Sex determination and why there are (usually) two genders.*
- 5. The fundamental gender conflict and how it shapes form and behaviour.*
- 6. The basics of embryonal development.*
- 7. The influence of plant evolution on animal development and the environment.*

Attendance requirements(%):

Online course no attendance

Teaching arrangement and method of instruction: MOOC (Massive Online Open Course)

Course/Module Content:

Sexual reproduction can be defined as the sort of reproduction by which each organism arises from the fusion of two cells. This generally implies, with some exceptions, that each organism has two parents.

This description might sound trivial it is however not at all. Before the appearance of sex, organisms reproduced solely by division. One cell divided into two cells, no partners, no fusion, just simple cell division. This simple cell division is still here. In fact, the trillions of cells that make up your body are all the descendants of a single cell that underwent several dozens of cell divisions. Surprisingly, most multicellular, as well as, many unicellular organisms reproduce by sex. We might take it thus for granted but this course will show you that it is a rather peculiar and enigmatic process.

This course will provide you with the necessary tools to understand how sex works and to marvel at its mysteries. We will start by meeting the actors of this greatest drama in their native habitats, from ancient bacteria that live in thermal geysers in Yellowstone national park to the great mammals that roam the African savanna. The second unit defines the rules of the game explaining the mechanisms of heredity and evolution. We will also briefly discuss the history of life on earth and its contemporary state.

The third unit focuses on meiosis, the fundamental and conserved molecular event that forms the basis of sex. And that might have led to the appearance of sex in the first place. We will also explain the fertility cycle and male and female germ cell development. The fourth unit describes the striking variability of sex determination throughout the animal kingdom. We will discuss the requirement for two genders and their horrendous cost. Finally, we will dive in the gulf of Aqaba to meet organisms that are both male and female either at the same, or at different times. Sex requires cooperation between two individuals - a male and a female - that are in a basic conflict of interest. Furthermore, males and females compete among themselves. This complex network of cooperation and conflict forms the fascinating plot we will tell in units five and six that will discuss the patterns of reproduction and social behavior of different animals - corals, insects, spiders, fish, birds and mammals. We will be intrigued to discover that the same basic conflict is resolved by a huge range of approaches, from altruistic behavior all the way to open warfare and infanticide.

The seventh unit takes us to fertilization and beyond. Starting at an IVF clinic we follow embryonic development throughout the animal kingdom from insects to tadpoles.

The eighth unit is dedicated to flowering plants that made our world colorful, sweet smelling and tasty and that produce almost all animal food.

Required Reading:

All material will be supplied in the online course

Additional Reading Material:

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Grading Scheme:

Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 40 %

Mid-terms exams 60 %

Additional information:

The course is in Hebrew however a similar course will be offered in English on as 72101