**Making Mutants: An Introduction to Genetics**

MIT HSSP Summer 2014

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­Course Details:

 X-Men, Spiderman, Resident Evil: successful, popular franchises. But where does science meet fiction? The objective of this seminar series is to introduce the concepts and underlying principles of genetics through an interdisciplinary lens. This course will cover the fundamentals of prokaryotic and eukaryotic genetics, as well as classical and molecular models of heredity and gene expression, with a particular focus on gene expression and regulation. Together, we will explore the historical, ethical and scientific aspects of the field. Students will be introduced to subfields like genetic engineering, diseases and disorders, cancer genetics, bioethics and will additionally be exposed to current topics and methods in research.

Learning Goals:

At the completion of this course, students will have a stronger understanding of:

* The language of genetics, from nucleotides to proteins.
* The molecular basis of genetics, including replication, translation, transcription, and mutation.
* The fundamentals and applications of genetic techniques such as recombinant DNA technologies and gateway cloning.
* The distinction between prokaryotic and eukaryotic gene expression.
* Modern research goals, techniques, and difficulties.

Course Materials:

 No textbook is necessary for the course and all readings will be provided, however, owning or having access to an introductory Biology textbook can be beneficial for background information. Certain course materials will be made available in class for the following seminar, including any readings, problem sets (and potential, optional, critical thinking questions).

Course Evaluation:

 Although there is no credit granted by MIT HSSP, a grade is a good indicator of the progress made by a student. This seminar will be graded based on in-class participation in lecture discussions, as well as attempts made on any homework assignments and problem sets (numerical grades and any corrections will be returned to the students as well).

Academic Policies:

Attendance:

Due to the constraints of the HSSP program, attendance is mandatory, with the exception of illness or outstanding circumstances. Every student is an important member of the class and absences affect the whole community in discussions.

 Electronics:

Students are recommended but not expected to take notes to help with any assignments and to help facilitate their learning. Laptops, tablets, and recording devices are permitted, however, smartphones should be put away during the duration of the lecture.

Course Schedule:

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| Seminar 1 | Comparing the models and a brief historical survey, from the classical model (Mandelian genetics), to the chromosomal theory and onto a review of Molecular Genetics. |
| Seminar 2 | What is a Gene? Introduction to Gene Structure and Function.  |
| Seminar 3 | Transcription, Translation, Regulation: Prokaryotes and Eukaryotes |
| Seminar 4 | DNA: Recombination and Replication, Methods in Modern Genetics |
| Seminar 5 | Gene Expression |
| Seminar 6 | The Genetics of Disease, Cancer, and Genetic Targets of Modern Drugs |
| Seminar 7 | Bioethics, Genetic Engineering and Modern Research |