U WIS — 48

Proposed Outline: Introduction to Microbial Genetics (emphasis on bacteria)

I am assuming 5 lectures / week for 6 weeks , or 30 lecture periods. If more time is available for a 3 credit course, an additional discussion or recitation period and/or seminar would be preferable to adding lectures, judging from local experience. No textbook assigned. Will recommend purchase of Cold Spring Harbor Symposium, 1946, and the concomitant reading of Dubos' The Bacterial Cell.

Prerequisites: at least a year of general or medical bacteriology, or comparable work in microbiology. Elementary calculus desirable, but not necessary. Student should have had some biochemistry. Previous work in Genetics not necessary, unless a sufficiently large group can be found, in which case a more advanced course could be given.

Lecture	Contents
1	The general concept of a hereditary substance, based upon the recurrent behavior of living material. Distinction between intrinsic, hereditary changes and physiological modifications temporarily imposed by the environment.
2	The significance of the cell nucleus in higher organisms, and its present status in bacteria (with Demonstrations).
3 - 5	Spontaneous and adaptive mutations. The distinction between directed adaptive mutation and spontaneous mutation followed by natural selection, with discussion of typical and controversial examples. The "molar indeterminacy of gene mutation [Muller]".
6 - 10	Mutagens. (Radiations and chemicals). Criteria for proof of mutagenic activity (contra selection). Lethal effects of radiations. Interpretation of killing/dosage curves (target theories). Evidence for chemical intermediaries. Photoreactivation. Delayed mutagenic effects of radiation and chemicals. Comparison of X-rays and ultraviolet light. Experimental procedures for practical applications. Chemical behavior and possible mode of action of chemical mutagens.
15-16	Enrichment techniques and indicator media for obtaining various types of mutants in bacteria (and fungi). Applications of genetic methods to biochemical problems. The gene-enzyme hypothesis.
17-18	Population dynamics in bacterial cultures. Dissociation cycles. Selection and mutation in the evolution of species.
19-20	Genetics of Neurospora and similar fungi. The life cycle of Neurospora (with Demonstration), and its technical advantages for chemical-genetic research. Heterokaryosis.
21-22	Genetics of yeast. Winge's discovery of significance of sporulation; Lindegren's heterothallic selections and mass-mating technique. Regular and irregular segregation of genes, and problems of cytoplasmic inheritance briefly discussed.

23–25 Sexual cycle and recombination in Bacteria (E. coli K-12— published work of Tatum and Lederberg, and recent single-cell studies in collaboration with Zelle.) Significance of recombination in evolution. Experimental approaches to problem in other bacteria.

26–29 "Infective heredity" - Pneumococcus transformations, inheritance and cytological demonstration of kappa in Paramecium, and lysogenicity in bacteria as a genetic phenomenon.

30 Genetic recombination in bacteriophages. (Luria & Dulbecco; Hershey & Rotman).