

Biology 3182
History of the Life Sciences in the 20th Century
Spring, 2007
Tu-Th 11:30 – 1:00

Syllabus and Class Schedule

The purpose of this course is to explore the broad development of the life sciences during the twentieth century. The topic is obviously vast, so that in order to explore any topics in some depth the coverage will be somewhat selective. The core areas to be considered are: heredity (genetics), embryology, evolution, general physiology and neurophysiology, biochemistry, ecology, molecular biology (including molecular genetics). In each of these areas, where relevant, the relationship between biology and economic, social and political issues (social Darwinism, eugenics, high-energy radiation and mutation, ecological disruption, genetic engineering, stem cell research, and the implications of human behavioral / psychiatric genetics for current social and medical policy). We will also examine the development of biology in its institutional and national contexts. Class will involve a combination of lecture and discussion, while readings will be based on both primary and secondary sources.

The major theme of the course will be the transition of biology from a largely theoretical, descriptive and speculative science in the late 19th century to an experimental, quantitative and predictive science in the early 20th century. The areas in which this transformation first manifested itself were embryology and heredity, but similar motivations emerged in evolutionary biology and ecology by the 1920s and early 1930s. A secondary theme will trace the influence of changing economic and social policies in the industrialized nations as they came to see the life sciences, like the physical sciences in the 19th century, as profitable for capital exploitation (agriculture, medicine, pharmacology and, at present, genomics and pharmacogenomics). Emphasis will be placed on understanding the technical ideas of biology in each of these areas while also exploring the interaction among the various branches of biology and with the physical sciences (chemistry and physics). While no specific courses are prerequisite for this course, if you have not had at least the Biology Department's introductory sequence (Biology 2960, 2970 and 3050) you will have to be willing to learn some of the hard-core science as it developed throughout the century.

Readings

All readings will be on electronic reserve (ERes) for the course. To access the reserve list you will need to go to any computer and type in the reserve **url**:

<http://eres.wustl.edu>><http://eres.wustl.edu>
find the class by dept and # or by professor's name
click on the class (Bio 3182)
enter password: 20cent

The main text for the course will be:

Allen, G.E. *From Little Science to Big Science: The Development of the Life Sciences in the Twentieth Century* [Formerly, *Life Science in the Twentieth Century* (Cambridge University Press, 1978)]. You will find on ERes revised drafts of the chapters of this book, which are being prepared specifically in relation to this course. Two copies of the original book are on reserve in the Biology Library. The revised chapters of this book are contained in a folder in Eres, "Life Sciences in the Twentieth Century-Revision Chapters."

Primary and secondary sources will consist mostly of published articles or selections from longer monographs, and will also be found in ERes. **Please Note:** ERes lists works alphabetically by title rather than author (it does not include prefatory articles like "A", "An" or "The"), so you will have to know the exact title of the book, article or chapter.

Course Requirements

- **Attendance:** Attendance is not required but is *strongly suggested*, as the give-and-take of classroom discussion provides a deeper and more well-rounded understanding of almost any subject. In addition, some of the issues and perspectives presented in the course will be drawn primarily from lecture-discussion and are not always as well represented in the readings.
- **Exams:** There will be a mid-term exam, and a final. These will involve some combination of short-answer and short essay questions.
- **Chapter Critiques:** Every student is expected to write a critique (1-2 pages) of each assigned chapter in the textbook, *From Little Science to Big Science* due on dates the respective chapter is assigned for class. The purpose of this assignment is to get your feedback on the chapter revisions. These critiques have been very helpful in the past, and this will be the last opportunity for student feedback before the book goes to the publisher. In order to insure fully honest evaluations, you will not be given a letter grade on the critiques, but it is part of the course requirement to turn them all in.
- **Discussion Sections:** There will be six discussion sections throughout the semester. In addition, you will be responsible for attending four out of a total of six scheduled discussion meetings throughout the semester. The times for these will be decided after the first meeting of the class and in accordance with your individual schedules. The discussion meetings will be based on assigned readings for which you will have to prepare a précis. The discussion sections will be led by the TA for the course, **Inna Ekhaus**, a graduate student in the Department of Molecular Genetics in the Division of Biology and Biomedical Sciences (DBBS). Her e-mail and laboratory phone are:

ivkrayte@artsci.wustl.edu (best form of contact)
(314) 362-3150
- **Website Project:** There will be a major project in which all students must take part. Working in pairs (or if that is not feasible, individually), everyone will be responsible for designing a web site for the course, focusing on a particular experiment or series of experiments on a particular issue (The Roux-Driesch controversies on totipotency of embryonic cells, the Meselson-Stahl experiment on conservative *vs* semi-conservative replication of DNA) drawn from the book, *From Little Science to Big Science: The Development of the Life Science in the Twentieth Century*. Each web site will contain items such as historical images of the field (for example, early representations of the organization of the spinal cord, or of the relation of genes to chromosomes), important primary sources in the field, with your own "Introductions" for potential readers, important secondary sources, data bases and the like. These websites are open to as much imaginative energy as you can put into them. The idea is that they will serve as companions to the book in a real and useful way (not just an academic exercise). Each group will report on and demonstrate aspects of, their work in the last class period(s) of the semester. A more detailed set of instructions will be handed out in two weeks about this assignment. Meanwhile, you can view web sites designed over the last three years by going to the Biology Department Home Page, clicking on "courses", and then onto Bio 3182.
- **Grade Determination:** The mid-term will make up 25% of your grade, the final 35% , discussion meetings (and written work) 10% and the web-page project 30%.

A general course outline follows on the next few pages. If past experience is any guide, we will not keep rigidly to this schedule. I want class time to be as unconstrained and flexible as possible. At each class session assignments will be distributed for the following class period(s), with assigned readings listed and questions to guide you in reading the material. All assignment sheets, as well as lecture presentations (Power-point) will be posted on the course web page.

Web page

There is a web page for the course where all assignments and Power-point presentations will be listed. Power point presentations will be up and available for printing out before each class period (hopefully, the night before!). The web page will *not* contain the electronic reserve readings. The **url** for the web page is:

<http://www.nslc.wustl.edu/courses/Bio3182/bio3182.html>

Gar Allen Office House

Wednesdays 1:30 – 3:00
Life Sciences 202D
(314) 935-6808
allen@biology2.wustl.edu

I can make appointments at other times if the office hours are not convenient.

E-mail is probably the easiest way to reach me.

Biology 3182

Life Science in the Twentieth Century

General Course Schedule, Spring, 2007

Tu Jan 16	Introduction and Scope of the Course; Overview: The Uses of History of Science
Th Jan 18	Historical and Philosophical Background: Observation, Fact, Conceptualization; Inductive and Deductive Logic As Forms of Scientific Reasoning
Tu Jan 23	Historical and Philosophical Background: Schools of Thought in Modern Science: Idealism, Materialism (Mechanistic, holistic and dialectical materialism), Paradigm Shifts, Social Construction of Science
Th Jan 25	Economic, Political and Social History of the Twentieth Century
Tu Jan 30	The Darwinian Background: Evolutionary Biology 1859-1900. Darwin's Six Theories and Morphology. Haeckel and Weismann: Ontogeny, Phylogeny and the Continuity of the Germ Plasm
Th Feb 1	Social Darwinism in Germany and the United States
Tu Feb 6	"On the Deathbed of Darwinism": Alternatives to Darwinian Theory, 1890-1920
Th Feb 8	The Revolt from Descriptive Biology I: Roux, Driesch and <i>Entwicklungsmechanik</i> ; the Founding of Marine Research Stations (Naples, Woods Hole)
Tu Feb 13	The Revolt from Descriptive Biology II: Heredity (Pre-Mendelian Theories of Heredity; Rediscovery of Mendel in 1900)
Th Feb 15	Revolt from Descriptive Biology III. Development of the Mendelian-Chromosome Theory: Mendelism and Cytology (<i>Drosophila</i> Takes Center Stage)
Tu Feb 20	Capitalism Discovers Agriculture: Genetics & Hybrid Corn for Profit, 1910-1950
Th Feb 22	The Control of Human Evolution: Eugenics in Europe and the United States
Tu Feb 27	Eugenics and the Contemporary Context of Human Behavior Genetics
Th Mar 1	MID-TERM EXAM
Tu Mar 6	Mechanistic Materialism and Its Metamorphosis: General Physiology and the Mechanistic Conception of Life (Jacques Loeb)
Th Mar 8	Mechanistic Materialism and Its Metamorphosis. Sherrington, Cannon and Henderson: Integration and Self-Regulation in Biological Systems
March 10 - 18	SPRING BREAK
Tu Mar 20	Ecology and the Environment, 1900-1940
Th Mar 22	Class/ Consultation on Website Design (David Heyse)
Tu Mar 27	Mechanistic Materialism and Its Metamorphosis. The Evolutionary Synthesis I: From Hardy-Weinberg to Fisher, Wright & Haldane

Th Mar 29	The Evolutionary Synthesis II: Dobzhansky, Simpson and Mayr
Tu Apr 3	Evolution and Evangelical Religion: The U.S. Controversy from the Scopes Trial to "Intelligent Design"
Th Apr 5	Integrative Approaches in Developmental Biology: Experimental Embryology, 1920-1960
Tu Apr 10	Biochemistry and the Origins of Molecular Biology, 1890-1945
Th Apr 12	Postwar Developments in Cell and Molecular Biology: Elucidating the Structure of Proteins and DNA, 1940-1963
Tu Apr 17	The Genetic Code and the Integration of Cell and Molecular Biology
Th Apr 19	Biology, Biotechnology and Big Science: From Gene splicing to the Human Genome Project (1980-2000)
Tu Apr 24	Web Page Progress Reports
Th Apr 26	Web Page Progress Reports
Th May 3	Web Page Projects due (e-mailed or disk form to David Heyse (Natural Sciences Learning Center, Rm 138)
Wed May 9	F I N A L E X A M (Life Sciences 118)