

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

LSC Use Only
Number LS-77
Action _____
Date _____

JWUCC Use Only
Number 46
Action _____
Date _____

I. TITLE/AUTHOR OF CHANGE

COURSE/PROGRAM TITLE Contemporary Biology
DEPARTMENT Biology
CONTACT PERSON Sandra Newell

II. THIS COURSE IS BEING PROPOSED FOR:

_____ Course Approval Only
X Course Approval and Liberal Studies Approval
_____ Liberal Studies Approval only (course previously has been approved by the University Senate)

III. APPROVALS

Department Curriculum Committee

Department Chairperson

College Curriculum Committee

College Dean*

Director of Liberal Studies
(where applicable)

Provost
(where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. TIMETABLE

Date Submitted
to LSC _____
to JWUCC _____

Semester/Year to be
implemented Fall 1989

Date to be published
in Catalog Fall 1989

Revised 8/88

[Attach remaining parts of
proposal to this form.]

LIBERAL STUDIES COURSE APPROVAL FORM

About this form: Use this form only if you wish to have a course included for Liberal Studies credit. The form is intended to assist you in developing your course to meet the university's Criteria for Liberal Studies, and to arrange your proposal in a standard order for consideration by the LSC and the UWUCC. If you have questions, contact the Liberal Studies Office, 353 Sutton Hall; telephone, 357-5715.

~~Do not use this form for technical, professional, or pre-professional courses or for remedial courses, none of which is eligible for Liberal Studies. Do not use this form for sections of the synthesis course or for writing-intensive sections; different forms will be available for those.~~

PART I. BASIC INFORMATION

A. For which category(ies) are you proposing the course? Check all that apply.

LEARNING SKILLS

- First English Composition Course
- Second English Composition Course
- Mathematics

KNOWLEDGE AREAS

- Humanities: History
- Humanities: Philosophy/Religious Studies
- Humanities: Literature
- Fine Arts
- Natural Sciences: Laboratory Course
- Natural Sciences: Non-laboratory Course
- Social Sciences
- Health and Wellness
- Non-Western Cultures
- Liberal Studies Elective

B. Are you requesting regular or provisional approval for this course?

- Regular
- Provisional (limitations apply, see instructions)

C. During the transition from General Education to Liberal Studies, should this course be listed as an approved substitute for a current General Education course, thus allowing it to meet any remaining General Education needs? yes no

If so, which General Education course(s)? _____

Liberal Studies Form -- 2

PART II. WHICH LIBERAL STUDIES GOALS WILL YOUR COURSE MEET? Check all that apply and attach an explanation.

All Liberal Studies courses must contribute to at least one of these goals; most will meet more than one. As you check them off, please indicate whether you consider them to be primary or secondary goals of the course. [For example, a history course might assume "historical consciousness" and "acquiring a body of knowledge" as its primary goals, but it might also enhance inquiry skills or literacy or library skills.] Keep in mind that no single course is expected to shoulder all by itself the responsibility for meeting these goals; our work is supported and enhanced by that of our colleagues teaching other courses.

Primary Secondary

A. Intellectual Skills and Modes of Thinking:

- 1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process. ✓ _____
- 2. Literacy--writing, reading, speaking, listening _____ ✓
- 3. Understanding numerical data ✓ _____
- 4. Historical consciousness _____ ✓
- 5. Scientific inquiry ✓ _____
- 6. Values (ethical mode of thinking or application of ethical perception) _____ ✓
- 7. Aesthetic mode of thinking _____ _____

B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person

 ✓ _____

C. Understanding the Physical Nature of Human Beings

_____ ✓

D. Certain Collateral Skills:

- 1. Use of the library _____ _____
- 2. Use of computing technology _____ _____

PART III. DOES YOUR COURSE MEET THE GENERAL CRITERIA FOR LIBERAL STUDIES? Please attach answers to these questions.

A. If this is a multiple-section, multiple-instructor course, there should be a basic equivalency (though not necessarily uniformity) among the sections in such things as objectives, content, assignments, and evaluation. Note: this should not be interpreted to mean that all professors must make the same assignments or teach the same way; departments are encouraged to develop their courses to allow the flexibility which contributes to imaginative, committed teaching and capitalizes on the strengths of individual faculty.

What are the strategies that your department will use to assure that basic equivalency exists? Examples might be the establishment of departmental guidelines, assignment of responsibility to a coordinating committee, exchange and discussion of individual instructor syllabi, periodic meetings among instructors, etc.

B. Liberal Studies courses must include the perspectives and contributions of ethnic and racial minorities and of women wherever appropriate to the subject matter. If your attached syllabus does not make explicit that the course meets this criterion, please append an explanation of how it will.

C. Liberal Studies courses must require the reading and use by students of at least one, but preferably more, substantial works of fiction or nonfiction (as distinguished from textbooks, anthologies, workbooks, or manuals). Your attached syllabus must make explicit that the course meets this criterion.

[The only exception is for courses whose primary purpose is the development of higher level quantitative skills; such courses are encouraged to include such reading, but are not expected to do so at the expense of other course objectives. If you are exercising this exception, please justify here.]

D. If this is an introductory course intended for a general student audience, it should be designed to reflect the reality that it may well be the only formal college instruction these students will have in that discipline, instead of being designed as the first course in a major sequence. That is, it should introduce the discipline to students rather than introduce students into the discipline. If this is such an introductory course, how is it different from what is provided for beginning majors?

Liberal Studies Form -- 4

E. The Liberal Studies Criteria indicate six ways in which all courses should contribute to students' abilities. To which of the six will your course contribute? Check all that apply and attach an explanation.

1. Confront the major ethical issues which pertain to the subject matter; realize that although "suspended judgment" is a necessity of intellectual inquiry, one cannot live forever in suspension; and make ethical choices and take responsibility for them.
2. Define and analyze problems, frame questions, evaluate available solutions, and make choices
3. Communicate knowledge and exchange ideas by various forms of expression, in most cases writing and speaking.
4. Recognize creativity and engage in creative thinking.
5. Continue learning even after the completion of their formal education.
6. Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.

PART IV. DOES YOUR COURSE MEET THE CRITERIA FOR THE CURRICULUM CATEGORY IN WHICH IT IS TO BE LISTED?

Each curriculum category has its own set of specific criteria in addition to those generally applicable. The LSC provides copies of these criteria arranged in a convenient, check-list format which you can mark off appropriately and include with your proposal. The attached syllabus should indicate how your course meets each criterion you check. If it does not do so explicitly, please attach an explanation.

Knowledge Area Criteria which the course must meet:

- Treat concepts, themes, and events in sufficient depth to enable students to appreciate the complexity, history, and current implications of what is being studied, and not be merely cursory coverages of lists of topics.
- Suggest the major intellectual questions/problems which interest practitioners of a discipline and explore critically the important theories and principles presented by the discipline.
- Allow students to understand and apply the methods of inquiry and vocabulary commonly used in the discipline.
- Encourage students to use and enhance, wherever possible, the composition and mathematics skills built in the Skill Areas of Liberal Studies.

Natural Science Criteria which the course must meet:

- Examine a body of knowledge of natural science that will contribute to an understanding of the natural world.
- Provide an understanding of the development of natural science theories and their modification.
- Teach students to formulate and test hypotheses.
- Provide an understanding of some of the "great moments" in the history of natural science and the individuals, including women and minorities, responsible for them.

Natural Science Laboratory Criteria which the course must meet:

- Provide students with opportunities to learn and apply data-gathering techniques.
- Provide students with opportunities to develop skills in making accurate observations, in formulating concise and appropriate descriptions of natural phenomena, and in producing meaningful systems of classification for natural objects.
- Provide students with opportunities to apply theories to practice in the the working world of science.

Additional Natural Science Criteria which the course should meet:

- Encourage an appreciation of the complex interrelationship of natural science with the life of the individual.
- Develop in students the abilities necessary to cope with the consequences of natural science in the modern world.
- Develop an inquiring attitude consistent with the tenets of natural science, an attitude that is willing to expose fallacy on the basis of reason, that demands evidence for scientific assertions, and yet is tolerant of hypotheses in the absence of contradictory evidence.

Part II.

Four Liberal Studies goals are primary goals of this course. The focus of the course is on topics which are essential for understanding many of the current issues in contemporary biology. In particular, the student will acquire a body of knowledge in the field of cell biology and genetics. This background will be used by the student as the basis for discussion of issues in genetic engineering, among other topics. The student will also acquire a body of knowledge relating to evolution and ecology. Based upon this background the student will discuss problems in environmental science. Because of the orientation of the course toward discussion of important social issues resulting from recent biological research, the student will be actively involved in inquiry, critical analysis of current technology and decision making within the context of these issues. Laboratory exercises will focus more specifically on scientific inquiry, how knowledge is created, inference and abstract logical thinking, and analysis of numerical data.

An additional four Liberal Studies goals are secondary goals of the course. Discussion of the impact of biological technology on individuals and society requires an ethical mode of thinking, consequently students will develop their ideas and opinions within their own value systems. Much of the content of the course will deal with the physical nature of human beings as well as other living creatures. All aspects of literacy will be important in the course. Students will write a paper based on readings from the supplementary readings list. The list contains books which are classical or recent writings in biology. Speaking and listening will be encouraged in the lecture and lab classes. Class size is small to encourage greater participation by students in the lecture component of the class. Also, several lab sessions are devoted only to discussion. Finally, historical consciousness will be developed within the lecture when possible. This involves an awareness of how ideas and knowledge developed over time and how certain individuals, including women and minorities, were involved in the process of creating knowledge.

Part III.

- A. The Biology Department has several ways to assure that equivalency exists between sections of this course. The course has been designed by a team of faculty members, and the syllabus has been approved by the entire department. Any faculty member who teaches the course will use the same syllabus. The syllabus includes a built-in flexibility to allow for some differences in interest. For example, the contemporary issues discussed in class may vary depending on the interests and expertise of the faculty member. At the same time, certain basic concepts and topics will be covered by all faculty involved in the course (e.g., Mendelian genetics). If student demand necessitates many sections being taught at one time, the faculty involved in the course will constitute a team with an elected coordinator. This is the method used in the existing general biology course, and it works well.
- B. This course does not have as a primary goal a historical approach to the content. Many scientists have contributed small pieces to the puzzle of expanding scientific knowledge. Concepts and biological phenomena are generally presented without discussion of the contributors, except in a few cases such as Darwin and Mendel. However, every effort will be made to discuss contributions by minorities and women. Even where the contributors work is beyond the scope of the course, the faculty will develop ways to include discussion of female and minority contributions in a broad or generic sense. [REDACTED]
- [REDACTED] For example, Barbara McClintock is well-known for her contributions to genetics, but even a biology major wouldn't encounter her work in an introductory course. However, she can be cited as a scientist whose work has been integral to our current understanding of genetics. Her research can be discussed at the level found in such publications as the New York Times or Time Magazine. In an attempt to incorporate the contributions of minorities and women, the supplementary readings list includes several books by or about minorities and women. These are indicated by an asterisk. In general, the professors involved in the course will be sensitive to gender and race in their choice of ancillary reading materials, test questions, examples in class, and textbook.
- C. The student will read at least one book from the supplementary reading list and use it as the basis for an essay worth 10% of the grade for the course. Most of the list is nonfiction, although one work of fiction by I. Stone is included. A book not on the list may be used for the essay with permission of the instructor.
- D. This course is different from an introductory course for majors in that no attempt is being made to cover the gamut of topics in biology. This course has a relatively narrow focus on the most important concepts in biology - cell theory and evolutionary theory. We expect students to develop an understanding of how science is done, of the process of science, or science as a way of knowing, within the context of these two theories. In addition, this course is oriented toward discussion of issues or problems faced by all citizens (e.g., genetic engineering,

environmental degradation). We expect students to be able to read and understand biological articles in newspapers and magazines and to make intelligent informed decisions about health, family, and government.

- E. 1. Students will confront ethical issues in relation to cell biology and genetics (e.g., genetic engineering) and ecology and evolutionary biology (e.g., conservation of biological diversity).
2. Students will analyze problems in the context of controversial issues and within the context of use of the scientific method. Approximately 80% of the laboratory exercises emphasize the use of inference, hypothesis formation and testing, data analysis and interpretation, and development of conclusions and generalizations based on observations.
3. Students will communicate in written form by writing an essay based upon the supplementary reading and by writing lab summaries or reports each week. Oral communication includes two laboratory sessions set aside for discussion of issues. (This discussion will be based upon readings from an anthology). Also, small class size (24 students) allows for greater participation by students in the lecture component of the course. Students will be encouraged to discuss course content during the lecture. Finally, labs will include oral discussion of results.
4. Creativity will be nurtured by encouraging students to take biological information and develop the questions for which there are no answers. In other words, students will attempt to explore the boundaries of knowledge in biology. Often, non-biologists do this very well because they are not restricted by past training in how to think about certain biological problems. This is a process or a way of thinking which can be developed in lecture and lab. Several of the labs are specifically designed to encourage creative thinking (e.g., inferences lab, hypothesis testing lab); however, many of the labs will require creativity in the interpretation of results.
5. Science is a way of knowing. Students will develop an ability to gather information to address a specific problem or answer a question. This problem-solving approach, used initially in the context of biology, can be transferred to any aspect of the student's academic life.
6. One of the primary goals of this course is to focus on current issues and problems related to the basic concepts of cell biology and genetics, and ecology and evolution. This type of material will be incorporated into both the lecture and lab, including two lab sessions devoted entirely to discussion of such issues.

Part IV. Check List - Natural Sciences

A. Knowledge Area Criteria

The course focuses on several topics in depth and does not try to include a broad survey of biology. The topics were carefully chosen to

represent the most important concepts in biology, areas of active research which also have important implications for non-scientists (e.g., genetic engineering, evolution/creationism controversy). The laboratories have been designed to allow students to apply methods of inquiry used in biology, both within the context of contemporary issues and in the use of scientific method to develop new biological knowledge. In addition, students will write extensively in the course; with an essay based on supplementary readings and weekly lab reports. Many of the labs involve mathematics, including data collection and statistical analysis.

B. Natural Science Criteria

In addition to examining a body of knowledge, (i.e., cell biology and genetics, ecology and evolution), students will actively participate in hypothesis formation and testing in the course. By using problem-solving approach to scientific questions, students will appreciate the tentative nature of science. The content of science courses changes often and sometimes drastically. (Twenty-five years ago DNA was probably not mentioned in introductory biology courses.) Where possible, "great moments" in biology will be incorporated into the course; however, the course does not emphasize a historical approach. Biographical information is included in the supplementary readings.

C. Natural Science Lab Criteria

Students will have ample opportunity for gathering data, making accurate observations of the natural world, and applying theories to practice in the laboratory portion of the course. (See list of lab exercises in syllabus.)

D. Additional Criteria

Because this course is oriented toward issues of importance to both scientists and non-scientists, students will readily appreciate the complex interrelationship of natural science with the life of the individual and begin to deal with the consequences of natural science in the modern world. The nature of the labs as well as the encouraging of students to participate in lecture will tend to develop an inquiring attitude in students, although some students are better able to handle ambiguities that can result from this way of thinking.

I. BI 101 Contemporary Biology

Department of Biology

Sandra J. Newell

II. Approvals:

Department Curriculum Committee _____

Department Chairperson _____

College Curriculum Committee _____

College Dean _____

Director of Liberal Studies _____

III. TIMETABLE

If resources are available, the department will offer one section of the course in Fall 1989 and Spring 1990. Inclusion in the catalog is scheduled for Fall 1989. Additional sections may be developed at a later time if additional resources become available and there is sufficient student demand.

IV. DESCRIPTION OF CURRICULUM CHANGE

1. Catalog description - see appendix 1
2. Course syllabus - see appendix 2
3. Course analysis questionnaire

Section A: Details of the Course

- A1. This course was designed to be part of the Liberal Studies course list. It fulfills the academic need for a one-semester laboratory course in the new Option II of the science requirement in Liberal Studies. This course can not be used to fulfill biology requirements for a degree in biology.
- A2. The course does not require changes in content of existing courses.
- A3. The course follows the traditional type of offering by the department.
- A4. The course has not been offered at IUP on a trial basis.
- A5. This is not a dual-level course.
- A6. The course will not be taken for variable credit.

- A7. Other schools offering a similar course include Old Dominion University, Bowling Green State University, Oberlin University, Western Illinois University, and Cleveland State University.
- A8. No accrediting authority or professional society recommends or requires the course.

Section B: Interdisciplinary Implications

- B1. For any given lecture section, one instructor will teach the course. However, many faculty in the biology department may teach a section of this course. This is an introductory course, and any faculty member of the biology department is qualified to teach it. Who teaches the course in any given semester will be determined by the department chairperson based upon scheduling constraints.
- B2. This course constitutes the first course in the sequence required by the new Option II in the science section of the Liberal Studies program. The sequence includes two non-lab science courses following the lab course. A variety of non-lab courses are being developed in the Biology Department, either de novo or from existing courses.
- B3. This course does not overlap in content with courses from other departments.
- B4. Seats in this course will be made available to students in the School of Continuing Education.

Section C: Implementation

- C1. The following resources will be required:
 - a. Faculty: Potentially, one additional faculty member will be needed to allow the scheduling of this course.
 - b. Space: A lecture and laboratory room is required. Usable space exists in the Biology Department (Weyandt 110). This room was chosen because it is adjacent to a room which can be used to store and prepare laboratory supplies. The lecture and laboratory are being scheduled in the same room so that lecture and laboratory experiences can be closely integrated. For example, some laboratory exercises may require students to make brief observations of on-going projects. This could be easily accomplished during the lecture periods.
 - c. Equipment: (see appendix 3)
 - d. Laboratory Supplies: (see appendix 3) While provisions can be made for use of existing microscopes until the department can develop a master plan for microscope purchases, this course cannot be taught without the supplies listed on page 22. These supplies

do not currently exist within the department. Note that the left column of numbers represents an initial set-up cost, and the right column represents the expendable supplies which must be purchased every semester.

- e. Library materials: Existing materials are adequate, although some of the supplementary readings are not available. These will be acquired as soon as possible.
 - f. Travel funds: not applicable
- C2. None of the resources for this course are funded by a grant.
 - C3. This course will be offered in both Fall and Spring semester, and perhaps during the summer if there is sufficient demand. It is not restricted to certain seasonal semesters.
 - C4. We anticipate offering two sections of this course in a semester.
 - C5. One section will accommodate 24 students. The class size is limited by seating capacity of the lecture/laboratory room.
 - C6. No professional society mandates parameters or enrollment limits for the course.
 - C7. This course is not a curriculum requirement.

Appendix 1

BI 101 Contemporary Biology

4 credits
3 lecture hours
3 lab hours

An introduction to biological concepts, focusing on the fundamentals necessary to understand contemporary issues in life sciences. Emphasis is on cell biology and genetics, evolution and ecology.

Appendix 2

I. Catalog Description

BI 101 Contemporary Biology

4 credits
3 lecture hours
3 lab hours

An introduction to biological concepts, focusing on the fundamentals necessary to understand contemporary issues in life sciences. Emphasis is on cell biology and genetics, evolution and ecology.

II. Objectives

- A. The student will understand scientific method and differentiate between good and bad science.
 1. The student will formulate hypotheses and understand how to test hypotheses.
 2. The student will observe natural phenomena, and gather and analyze data within the context of testing scientific hypotheses.
 3. The student will demonstrate an understanding of how new knowledge is generated and how scientific theories are modified.
 4. The student will demonstrate development of an inquiring attitude, a healthy skepticism toward unsubstantiated scientific assertions, and a tolerance for diversity of hypotheses in the absence of contradictory evidence.
- B. The student will know the cell theory and evolutionary theory and understand why these two theories form the framework for all biological knowledge.
 1. The student will know the history of these two theories, including the men and women responsible for the development of the ideas.
- C. The student will appreciate the complexity, history and current implications of issues important to both biologists and non-biologists, e.g., genetic engineering, evolution of diseases such as AIDS, environmental impact of industrial and agricultural societies, creationist attacks on science.

III. Course Outline

- A. Molecules, Cells, and Genetics (20 lectures)
 1. Basic chemistry

2. Water in living organisms
 3. Cell theory: history and current ideas
 4. Cell membrane structure and function
 5. Cell nucleus and cellular reproduction
 6. Mendelian genetics
 7. Basic biochemistry
 - a. nucleic acids
 - b. proteins and enzymes
 8. Molecular genetics
 - a. transcription and translation
 - b. regulation of genes in bacteria and humans
 9. Selected topics (These topics may vary from semester to semester, depending on what issues are deemed important and current. Examples of topics are listed below):
 - a. genetic defects in humans and current research on cures
 - b. genetic engineering of agricultural plants
 - c. viruses as causes of human diseases
 - d. cancer: causes and cures?
- B. Evolution, Ecology, and Environmental Biology (20 lectures)
1. Evolutionary theory: history and current ideas
 - a. natural selection and adaptation
 - b. population genetics
 - c. speciation and phylogeny
 - d. diversity of life
 - e. controversies in evolutionary theory
 - f. "Creation, Evolution, or Both": Creationists attacks on evolution, in particular, and science, in general.

g. selected topics (These topics may vary from semester to semester, depending on what issues are deemed important and current. Examples of topics are listed below):

- 1) evolution of disease organisms
- 2) development of resistance to antibiotics by bacteria

2. Ecology

- a. individuals in their environment: abiotic factors and physiological adaptations
- b. population ecology
- c. community ecology
- d. ecosystems: energy flow and nutrient cycling

3. Selected environmental issues (These topics may vary from semester to semester, depending on what issues are deemed important and current. Examples of topics are listed below):

- a. growth of the human population
- b. solid waste disposal
- c. acid rain
- d. pollution of air and water
- e. ozone imbalance

IV. Evaluation methods

The final grade for the course will be determined as follows:

60% Tests. Three objective tests consisting of multiple choice, true-false, matching, completion, or short essay.

30% Laboratory. Students will have weekly quizzes, lab reports, and/or summaries of lab exercises.

10% Essay. Each student will prepare an essay (5-7 pages) on a topic approved by the instructor. The student will use one or more of the books listed in the supplementary reading list as the basis for the essay. Other books may be used by permission of the instructor. Students will be expected to develop, explain, and justify their own opinions on controversial issues. Essays will be graded on content and mechanics.

V. Required Textbooks, Supplemental Books and Readings

Textbooks: Enger, E.D., A.H. Gibson, J.R. Kormelink, F.C. Ross, and R.J. Smith. 1988. Concepts in Biology, 5th ed. Wm. C. Brown Publ., Dubuque, Iowa.

Braun, P.C. (ed.). 1988. Biology, 5th ed. Annual Editions. Dushkin Publ. Group, Inc., Guilford, Connecticut

Supplementary Readings:

The student will choose and read at least one of these books as the basis for the written essay. A book not on this list may be used for the essay with permission of the instructor.

- Abbey, E. 1968. Desert Solitaire. A Season in the Wilderness. Ballentine Books, N.Y.
- Bleier, R. 1984. Science and Gender: A Critique of Biology and its Theories on Women. Pergamon Press, Elmsfor, N.Y.*
- Carr, A. 1973. So Excellent a Fishe. A Natural History of Sea Turtles. Doubleday & Co., Inc., Garden City, N.Y.
- Carson, R. 1955. The Edge of the Sea. Signet Science Library, N.Y.*
- Carson, R. 1962. Silent Spring. Fawcett Publications, Inc., Greenwich, Conn.*
- Darwin, C. 1889. The Voyage of the 'Beagle'. J.M. Dent and Sons, Ltd., London.
- Dawkins, R. 1976. The Selfish Gene. Oxford University Press, N.Y. and Oxford.
- Dawkins, R. 1986. The Blind Watchmaker. W.W. Norton & Co., Inc., N.Y.
- Ehrlich, P.R. 1968. The Population Bomb. Ballentine Books, N.Y.
- Eiseley, L. 1958. Darwin's Century. Evolution and the Men Who Discovered It. Doubleday & Co., Inc., Garden City, N.J.
- Fausto-Sterling, A. 1985. Myths of Gender: Biological Theories about Women and Men. Basic Books, N.Y.*
- Futuyma, D.J. 1983. Science on Trial. The Case for Evolution. Pantheon Books, N.Y.
- Gest, H. 1987. The World of Microbes. Science Tech Publishers, Inc., Madison, Wisc, and the Benjamin/Cummings Publishing Company, Inc., Menlo Park, Calif.
- Glasser, R.J. 1976. The body is the Hero. Bantam Books, Inc., Toronto and N.Y.
- Goodfield, J. 1981. An Imagined World. Penguin Press, N.Y.*
- Gould, S.J. 1977. Ever Since Darwin. Reflections in Natural History. W.W. Norton & Co., Inc., N.Y.
- Gould, S.J. 1981. The Mismeasure of Man. W.W. Norton & Co., N.Y.*
- Hrdy, S.B. 1981. The Woman That Never Evolved. Harvard University Press.*
- Hubbard, R., M.S. Henifin, and B. Fried. (eds.) Women Look at Biology Looking at Women. A Collection of Feminist Critiques. Schenkman Publishing Co., Cambridge, Mass.*
- Keller, E.F. 1983. A Feeling for the Organism. The Life and Work of Barbara McClintock. W.H. Freeman and Co., N.Y.*
- Kitcher, P. 1982. Abusing Science. The Case Against Creationism. MIT Press, Cambridge, Mass.
- Leopold, A. 1949. A Sand Country Almanac. Oxford University Press, London, N.Y. and Oxford.

- Lewontin, R.C., S. Rose, and L.J. Kamin. 1984. Not in Our Genes. Biology, Ideology, and Human Nature. Pantheon Books, N.Y.*
- Lopez, B. 1986. Arctic Dreams. Imagination and Desire in a Northern Landscape. Bantam Books, Toronto and N.Y.
- Matthiessen, P. 1978. The Snow Leopard. The Viking Press, N.Y.
- Meadows, D.H., D.L. Meadows, J. Randers, and W.W. Behrens III. 1972. The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind. Universe Books, N.Y.
- McPhee, J. 1976. Coming into the Country. Farrar, Straus and Giroux, N.Y.
- Medawar, P.B., and J.S. Medawar. 1977. The Life Science. Current Ideas of Biology. Harper & Row, Publishers, N.Y.
- Morris, D. 1967. The Naked Ape. Dell Publishing Co., N.Y.
- Richter, D. (ed.) 1982. Women Scientists: The Road to Liberation. MacMillan Publ. Co., London, U.K.*
- Ruse, M. 1982. Darwinism Defended. A Guide to the Evolution Controversies. Addison-Wesley Publishing Co., Reading, Mass.
- Sagan, C. 1977. The Dragons of Eden. Speculations on the Evolution of Human Intelligence. Random House, N.Y.
- Sayre, A. 1975. Rosalind Franklin and DNA. W.W. Norton and Co., Inc., N.Y.*
- Schaller, G.B. 1980. Stones of Silence. Journeys in the Himalaya. The Viking Press, N.Y.
- Stone, I. 1980. The Origin. A Biographical Novel of Charles Darwin. Doubleday & Co., Inc., N.Y.
- Thomas, L. 1974. The Lives of a Cell. Notes of a Biology Watcher. Bantam Books, Toronto and N.Y.
- Thomas, L. 1980. Late Night Thoughts on Listening to Mahler's Ninth Symphony. Bantam Books, Inc., Toronto and N.Y.
- van Lawick-Goodall, J. 1971. In the Shadow of Man. Dell Publishing Co., N.Y.*
- Wilson, E.O. 1978. On Human Nature. Harvard University Press, Cambridge, Mass.

VI. Special Resource Requirements:

A student may have to purchase a book for the supplementary readings if the book is not available in the library. Many of these books are available in paperback.

VII. Bibliography:

- Alberts, B., D. Bray, J. Lewis, M. Raff, K. Roberts, and J.D. Watson. 1983. Molecular Biology of the Cell. Garland Publ., Inc., N.Y.
- Begon, M., J.L. Harper, and C.R. Townsend. 1986. Ecology. Individuals, Populations, and Communities. Sinauer Associates, Sunderland, Mass.
- Brewer, R. 1988. The Science of Ecology. Saunders College Publishing, Philadelphia, PA.
- Cummings, M.R. 1988. Human Heredity. Principles and Issues.
- Ehrlich, P.R., and J. Roughgarden. 1987. The Science of Ecology. Macmillan Publishing Co., N.Y.

- Futuyma, D.J. 1987. Evolutionary Biology, 2nd ed. Sinauer Associates, Inc., Sunderland, Mass.
- Kleinsmith, L.J., and V.M. Kish. 1988. Principles of Cell Biology. Harper & Row, Publishers, N.Y.
- Krebs, C.J. 1985. Ecology. The Experimental Analysis of Distribution and Abundance, 3rd ed. Harper & Row, Publishers, N.Y.
- Mettler, L.E., T.G. Gregg, and H.E. Schaffer. 1988. Population Genetics and Evolution, 2nd ed. Prentice-Hall, Englewood Cliffs, N.J.
- Minkoff, E.C. 1983. Evolutionary Biology. Addison-Wesley Publishing Co., Menlo Park, California.
- Prescott, D.M. 1988. Cells. Principles of Molecular Structure and Function. Jones and Bartlett Publishers, Boston, Mass.
- Ricklefs, R.E. 1979. Ecology, 2nd ed. Chiron Press, Inc. N.Y.
- Rothwell, N.V. 1988. Understanding Genetics, 4th ed. Oxford University Press, N.Y.
- Solbrig, O.T., and D.J. Solbrig. 1979. Introduction to Population Biology and Evolution. Addison-Wesley Publishing Co., Reading, Mass.
- Stine, G.J. 1989. The New Human Genetics. Wm. C. Brown Publishers, Dubuque, Iowa.
- Thorpe, N.O. 1984. Cell Biology. John Wiley & Sons, N.Y.

Laboratory Exercises:

- Week 1: Introduction/Organization/Explanation of Essay
Exercise: Scientific Inference
- Week 2: What is Science? Why Don't Cells Grow Larger? Hypothesis Formation and Testing
- Week 3: Cell Diversity and Intracellular Water Regulation in Single-celled Organisms
- Week 4: Mitosis in Onion Root Tips
- Week 5: Human Karyotypes and Fruit Fly Genetics
- Week 6: DNA Structure and Problem Solving in Genetics
- Week 7: Discussion: Cell Biology and Genetics
- Week 8: Woolly Worms and Natural Selection
- Week 9: Phylogeny and Taxonomy
- Week 10: Distribution of Organisms
- Week 11: "Organism Day" - Diversity of Life
- Week 12: Genetic Drift
- Week 13: Allelopathic Interactions
- Week 14: Discussion: Evolution and Ecology

Appendix 3

Laboratory Equipment:

12	Fisher Micromaster CK Series microscopes, DIN achromatic objectives (4X, 10X, 40X, 100X), monocular, mechanical stage	@ 1000.00	\$12,000
12	Fisher Micromaster EH Series microscopes, DIN achromatic objectives (4X, 10X, 40X), monocular, mechanical stage	@ 500.00	\$ 6,000
12	Fisher Stereomaster II Series microscopes, 1X and 3X objectives, dual illumination	@ 500.00	\$ 6,000
			<u>\$24,000</u>

The department is currently reviewing its microscope needs and developing a master plan for purchase of new microscopes and replacement of existing microscopes. Within this master plan will be provisions for sharing microscopes among different courses which use them, including the course described in this proposal. Until the master plan is completed and the precise needs of the department identified, this course can be taught with microscopes already available in the department.

Supplies (projected cost per lab of 24 students)

		Initial set-up cost (incl. expendable supplies)	Expendable supplies in subsequent semesters
Wk 1	Inferences	\$ 500 \$ 500	\$ 50 \$ 50
Wk 2	Hypothesis testing Cell size	\$ 300 \$ 100	\$ 100 \$ 50
Wk 3	Water Regulation Cell Diversity	\$ 300 \$ 200	\$ 50 \$ 200
Wk 4	Root tip mitosis	\$ 100	\$ 25
Wk 5	Karyotypes Fruit Fly genetics	\$ 50 \$ 600	\$ 50 \$ 500
Wk 6	DNA structure	\$ 90	\$ 20
Wk 8	Wooly worms and natural selection	\$ 30	\$ 20
Wk 9	Phylogeny & Taxonomy	\$ 50	\$ 50
Wk 10	Distribution	\$ 200	\$ 100
Wk 11	Organism day	\$ 200	\$ 20
Wk 12	Genetic Drift - Fruit Flies	\$ 500	\$ 150
Wk 13	Allelopathic Interactions	\$ 200	\$ 50
	TOTAL	<hr/> \$3420	<hr/> \$1385

Additional Expenses

Video-cassette series titled "Origins", 4 programs	\$ 550
Video-cassette series titled "Evolution", 11 programs	\$1350
Work-study student, 10 hours per week @ \$3.35 per hour for 28 weeks, plus fringe benefits	\$1000
	<hr/>
TOTAL	\$2900

The videocassette series are not essential for the teaching of this course. They would, however, enhance the quality of the course. Until arrangements can be made for purchase of the cassettes, they are available through rental services.

Some work study hours can be made available from the existing hours available within the department.