

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

LSC Use Only
Number _____
Action _____
Date _____

UWUCC Use Only
Number <u>499</u>
Action _____
Date _____

I. TITLE/AUTHOR OF CHANGE

COURSE/PROGRAM TITLE General Biology (BI 103-104)
DEPARTMENT Biology
CONTACT PERSON Sandra J. Newell

II. THIS COURSE IS BEING PROPOSED FOR:

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

III. APPROVALS

Michael A. Kerner
Department Curriculum Committee

Charles P. Ross
College Curriculum Committee

Director of Liberal Studies
(where applicable)

W.W. Gallate
Department Chairperson

AA 12
College Dean*

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 _____	Semester/Year to be implemented <u>Fall 1989</u>	Date to be published in Catalog <u>Fall 1989</u>
to UWUCC _____		

I. Revision of BI 103-104 General Biology I and II

Department of Biology

Sandra J. Newell

II. Approvals:

Department Curriculum Committee _____

Department Chairperson _____

College Curriculum Committee _____

College Dean _____

Director of Liberal Studies _____

III. Timetable

The Biology Department currently offers on main campus ten lecture sections of 96-120 students per lecture section, plus 49 lab sections with 24 students per lab section. The Armstrong County campus offers two lecture sections of 72 students each and 6 lab sections of 24 students each. The Jefferson County campus offers one lecture section of 72 students and 3 lab sections of 24 students each. Comparable numbers of sections will be offered in Fall 1989 and Spring 1990. Student demand for the courses generally exceeds the ability of the department to offer additional sections. Without additional resources, the department does not plan to increase the number of sections offered in the future. These courses are already listed in the catalog; however, the catalog descriptions are revised and updated in this proposal. The revised descriptions of the courses should appear in the catalog for Fall 1989.

IV. Description of Curriculum Change

1. Catalog descriptions - see appendix 1
2. Course syllabi - old and new - see appendix 2
3. Summary of the proposed revisions

The course syllabi appear to be greatly modified. However, much of the change is simply to bring the-syllabi in line with the format suggested by the Senate. The content of both courses remains much the same; the course outlines have been condensed so that the syllabi are not excessively long. BI 103 emphasizes ecology, biochemistry, cell biology, Mendelian and molecular genetics, and evolution. BI 104 includes neurobiology, animal behavior, plant and animal reproduction and development, and general physiology of plants, animals, and humans. The courses together represent a broad survey of many aspects of biology.

The following revisions are proposed in order to fulfill the criteria for Liberal Studies courses.

1. New emphasis will be given whenever possible in lecture on the roles of women and minorities in developing ideas in biology.
2. Students will be required to read one book each semester in addition to the regular readings in the textbook. These books may vary from year to year, depending on the decision of the lecture professor. The book will focus on an aspect of biology related to the content of the course. For example, books which might be used in the fall semester are "A Sand County Almanac" by Aldo Leopold or "A Feeling for the Organism. The Life and Work of Barbara McClintock" by Evelyn Fox Keller.
3. The laboratory portion of the courses is being revised with the following objectives:
 - a. To increase the students' active participation in hypothesis formation and testing, to increase creative thinking.
 - b. To increase the opportunities for data gathering and analysis, and for observing and describing natural phenomena.
 - c. To increase the opportunities for written and oral communication in the classroom.

These revisions require modifying and strengthening existing laboratory exercises. One new laboratory exercise will involve discussion of the extra reading described above. As part of this lab exercise, students will be expected to summarize, interpret, and evaluate the readings in a written essay of 1-3 pages.

IV. Justification for Revisions

These revisions are proposed in order for the courses to meet the criteria for Liberal Studies courses.

Appendix 1

BI 103 General Biology I

3c-21-4sh

Prerequisite: Non-biology majors only

A basic introduction to ecology, biochemistry and cell biology, genetics, and evolution.

BI 104 General Biology II

3c-21-4sh

Prerequisite: BI 103 General Biology I, Non-biology majors only

A basic introduction to plant and animal physiology, neurobiology, animal behavior, and plant and animal reproduction and development.

Appendix 2

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BI 103 Revised Syllabus (January 1989)

I. Catalog description

BI 103 General Biology I

3c-21-4sh

Prerequisite: Non-biology majors only

A basic introduction to ecology, biochemistry and cell biology, genetics, and evolution.

II. Objectives

- A. The student will know the principles, theories, and facts related to the general topics covered in the course: ecology, biochemistry and cell biology, genetics, and plant and animal physiology.
1. The student will study both "pure" and "applied" science, recognizing the relationship between biological phenomena and the lives of individual humans.
 2. The student will become sensitive to the biological component in decision-making with regard to social and environmental problems.
- B. The student will understand the nature of science with its tentative and self-correcting features.
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.

III. Course Outline

- A. Principles of ecology (approximately 1/4 of the semester)
 - 1. The organism and its environment - limiting factors and physiological ecology
 - 2. Population ecology
 - 3. Community ecology
 - 4. Ecosystem structure and function
- B. Cell biology (approximately 1/4 of the semester)
 - 1. Basic chemistry and biochemistry
 - 2. Cell structure and function
 - 3. Cellular reproduction - mitosis and meiosis
- C. Genetics (approximately 1/4 of the semester)
 - 1. Mendelian genetics
 - 2. Molecular genetics
 - 3. Human genetics
- D. Evolution
 - 1. Natural selection and Darwin
 - 2. Population genetics
 - 3. Speciation and adaptive radiation
 - 4. Human phylogeny

IV. Evaluation Methods

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

75% Tests. Three or four objective tests consisting of multiple choice, true-false, matching, completion, or short essay.

25% Laboratory. Students will have weekly quizzes, oral or written summaries of lab exercises, and one essay (1-3 pages) based on the supplementary reading. Essays will be graded on content and mechanics.

V. Required Textbooks, Supplemental Books and Readings

Textbooks: Audesirk, and Audesirk. 1986. Life on Earth, Macmillan Publ. Co., NY.

Laboratory Manual for General Biology - written by the Biology Department Faculty

Supplementary Readings:

The book chosen in a given semester will vary from year to year. The decision of which book to use will be made by the professor teaching the lecture section. The selection will generally be made

from the following list of representative books, although other books may be used. This list will be periodically updated.

- Abbey, E. 1968. Desert Solitaire. A Season in the Wilderness. Ballentine Books, N.Y.
- Carr, A. 1973. So Excellent a Fish. 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.
- 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.
- 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.
- Ruse, M. 1982. Darwinism Defended. A Guide to the Evolution Controversies. Addison-Wesley Publishing Co., Reading, Mass.
- 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.

Wilson, E.O. 1978. On Human Nature. Harvard University Press,
Cambridge, Mass.

VI. Laboratory Schedule for BI 103

Organization; Topographic Maps

Food Chains, Food Webs, and Trophic Levels*

Taxonomy and Systematics*

Population Biology I*

Population Biology II*

Stream Ecology*

Ecological Succession*

The Cell

Variation Among Organisms

Mendelian Genetics

Evolution

Fermentation

Contemporary Biology and Final Lab Quiz
10 articles

*Denotes Outdoor Field Trip

BI 104 Revised Syllabus

I. Catalog Description

BI 104 General Biology II

3c-21-4sh

Prerequisite: BI 103 General Biology I, Non-biology majors only

A basic introduction to plant and animal physiology, neurobiology, animal behavior, and plant and animal reproduction and development.

II. Objectives

- A. The student will know the principles, theories, and facts related to the general topics covered in the course: evolution, neurobiology, animal behavior, and plant and animal reproduction and development.
1. The student will study both "pure" and "applied" science, recognizing the relationship between biological phenomena and the lives of individual humans.
 2. The student will become sensitive to the biological component in decision-making with regard to social and environmental problems.
- B. The student will understand the nature of science with its tentative and self-correcting features.
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.

III. Course Outline.

A. Physiology of Animals and Plants (approximately 1/4 of the semester)

1. Food procurement and nutrition
2. Gas exchange
3. Internal transport
4. Osmoregulation and excretion
5. Chemical control - hormones

- B. Neurobiology
 - 1. Structure and function of neurons
 - 2. Nervous systems and sensory perception
 - 3. Brain function
 - 4. Muscles
- C. Animal behavior
 - 1. Innate behavior
 - 2. Learned behavior and reasoning
 - 3. Social behavior and social systems in insects and vertebrates
 - 4. Behavioral ecology
- D. Plant and animal reproduction and development
 - 1. Pattern and process in development
 - 2. Life cycles, reproduction, and breeding systems

Evaluation Methods

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

75% Tests. Three or four objective tests consisting of multiple choice, true-false, matching, completion, or short essay.

25% Laboratory. Students will have weekly quizzes, oral or written summaries of lab exercises, and two essays (1-3 pages) based on the supplementary readings. Essays will be graded on content and mechanics.

V. Required Textbooks, Supplemental Books and Readings

Textbooks: Audesirk, and Audesirk. 1986. Life on Earth, Macmillan Publ. Co., NY.

Laboratory Manual for General Biology - written by the Biology Department Faculty

Supplementary Readings:

The one book chosen in a given semester will vary from year to year. The decision of which book to use will be made by the professor teaching the lecture section. The selection will generally be made from the following list of books. although other books may be used. This list will be periodically updated.

- Carr, A. 1973. So Excellent a Fische. A Natural History of SeaTurtles. Doubleday & Co., Inc., Garden City, N.Y.
- Carson, R. 1955. The Edge of the Sea. Signet Science Library, N.Y.*
- Ehrlich, P.R. 1968. The Population Bomb. Ballentine Books, N.Y.
- Glasser, R.J. 1976. The body is the Hero. Bantam Books, Inc., Toronto and 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.*
- Lewontin, R.C., S. Rose, and L.J. Kamin. 1984. Not in Our Genes. Biology, Ideology, and Human Nature. Pantheon Books, 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.
- Sagan, C. 1977. The Dragons of Eden. Speculations on the Evolution of Human Intelligence. Random House, N.Y.
- Schaller, G.B. 1980. Stones of Silence. Journeys in the Himalaya. The Viking Press, 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. Laboratory Schedule for BI 104

Organization and Human Circulatory System

Frog Dissection

Winter Field Trip

Nervous System

Animal Behavior

Plant Reproduction

Physiological Effects of Temperature

Beginning of Elective Lab Program

The Elective Lab Program consists of a series of laboratory exercises and field trips offered by the faculty teaching General Biology II. This program is unique in that both the faculty and the students can choose which activities they find most interesting and enjoyable. The faculty publish a description of the offerings (see attached example from Spring 1989), and students then sign up for these activities based upon their own interests. The labs are an unusual assortment of activities, many of which would be impossible to do within the regularly scheduled laboratory times. For example, one of the most popular elective labs is a trip to the National Zoo and the Smithsonian Institute in Washington, D.C. Other field trips are to the Cleveland Zoo, Cook Forest, McConnell's Mill State Park, Keystone Power Plant, Phipps Conservatory, The Pittsburgh Aviary, and the Carnegie Museum of Natural History. This program takes the place of the regularly scheduled labs in the second half of the Spring semester.

ELECTIVE LOTTERY LABS - SPRING 1989

1. CLEVELAND ZOOLOGICAL PARK

DESCRIPTION: Students will have the opportunity to spend some time observing animals in one of the finest zoos in the eastern United States. Students will also be assigned a group of animals on which they will make behavioral observations. NOTE: There is a mandatory meeting on Feb. 22, Wednesday, 8:30 pm in 32 Weyandt. Bring \$13.40 for bus fare and admission fee to this meeting. (Make checks payable to Biology Dept. Transportation Fund).

DATE: April 19, Wednesday

TIME: 6 am - 8 pm

LOCATION: Buses will be at Cogswell Patio

POINTS: 40

COST: \$13.40. Bring additional money for food.

NUMBER OF STUDENTS:

PROFESSOR: Newell, Nastase, and Butler

2. COOK FOREST NATURAL AREA

DESCRIPTION: This park along the Clarion River contains the largest stand of virgin white pine in the United States east of the Rocky Mountains. Of the some 8,000 acres in the park the class will study three sections which demonstrate three distinct forest types. They are: The Cathedral area white pine stand; the upland hemlock stand along the Clarion River; the wetland swamp hemlock stand along the Baker Trail. The first and third areas will be viewed as the class hikes through the area. The second forest type will be viewed while on a canoe trip down the river. Wear warm clothes. Since you will be canoeing during part of the trip, bring an extra change of clothing. Students will be provided with an informational packet. For the lottery winners there will be a general meeting that you must attend on Feb. 22, Wednesday, 7:30 pm in 32 Weyandt. Bring your cash at that time.

DATE: April 24, Monday

TIME: 7:00 am - 7:00 pm

LOCATION: Weyandt 120

POINTS: 40

COST: \$2.30 + snack money *Bring your own lunch.

NUMBER OF STUDENTS: 56

PROFESSOR: Nastase and Newell

3. MCCONNELL'S MILL STATE PARK

DESCRIPTION: Students will be shown various ecological systems in the park. Identification of various organisms will be conducted and a group "scavenger hunt" will also be done. Students will need to dress for hiking and the weather. Each student will also need to pack a lunch.

DATE: March 31, Friday

TIME: 9:00 am - 6 pm

LOCATION: Weyandt 110

POINTS: 32

NUMBER OF STUDENTS: 36

PROFESSOR: Patrick

4. TODD BIRD SANCTUARY
 DESCRIPTION: Identification and lecture on winter bird species and survival. Students will need to dress for hiking and bring a lunch.
 DATE: April 14, Friday
 TIME: 9:00 am - 5:00 pm
 LOCATION: Weyandt 110
 POINTS: 32
 NUMBER OF STUDENTS: 36
 PROFESSOR: Patrick
5. PENNSYLVANIA GRAND CANYON
 DESCRIPTION: We will look at erosion patterns in the canyon and how it shaped the area's plant, animal, and mineral resources. Beware of the porcupines! Need to dress for hiking. Bring lunch and money for dinner.
 DATE: April 29, Saturday
 TIME: 6:00 am - 8:00 pm
 LOCATION: Meet in Room 110
 POINTS: 40
 NUMBER OF STUDENTS: 20
 PROFESSOR: Patrick
6. PITTSBURGH AVIARY AND PHIPPS CONSERVATORY
 DESCRIPTION: Our visit to the Aviary will include a guided tour with emphasis on behavior, adaptations, nesting, and endangered species project. The visit to Phipps Conservatory will include a guided tour of the Spring Flower Show with emphasis on adaptations, reproductive methods, evolutionary considerations, and economic botany topics.
 DATES: March 31, Friday OR
 April 7, Friday OR
 April 14, Friday
 TIME: 8:00 am - 5:00 pm
 LOCATION: Weyandt 108
 POINTS: 36
 COST: \$5.00 fee. Bring lunch or lunch money
 NUMBER OF STUDENTS: 28 for each date
 PROFESSOR: Baker
7. CARNEGIE MUSEUM #1
 DESCRIPTION: As part of this lab, a discussion of the role that museums serve in society will be held before the trip to Pittsburgh. When we visit the Museum, we will take a guided tour behind the scenes of the natural history section with a staff member or, as a group tour and discuss one exhibit. After the tour, students are free to explore the museum's exhibits on their own. You must attend both the lecture and the museum trip to receive credit for the lab.
 DATE & TIME: Lecture - Wednesday, April 26, 1989, 7:00 pm - 9:00 pm
 Trip - Thursday, April 27, 1989, 8:00 am - 4:00 pm
 Students must attend both times.
 LOCATION: Lecture - Weyandt 4
 Trip - Weyandt 13
 POINTS: 40
 COST: \$2.00 admission fee and money for lunch
 NUMBER OF STUDENTS: 24
 PROFESSOR: Rebar

8. CARNEGIE MUSEUM #2

DESCRIPTION: There will be a guided tour of the Dinosaur exhibit by the instructor. After the tour students will explore the other exhibit areas of the museum on their own. Completion of a worksheet is required.

DATE: April 1, Saturday

TIME: 8:30 am - 5:00 pm

LOCATION: 120 Weyandt

POINTS: 32

COST: \$2.00 admission charge. Lunch can be purchased in the cafeteria.

NUMBERS OF STUDENTS: 28

PROFESSOR: Gendron

9. CONSERVATION WORK EXPERIENCE

DESCRIPTION: This will be a conservation work experience in Elk State Forest under the direction of Bureau of Forestry personnel. A major component of the work will be planting several thousand seedlings on Forestry lands. These seedlings will be provided by the Pennsylvania Game Commission and the Bureau of Forestry. The plantings are part of a continuing program of land reclamation and habitat improvement for wildlife. Depending on availability of workers and time, other habitat improvement practices may be performed.

During the trip students will visit some of the habitat areas known to be utilized by the Elk of Pennsylvania, students must recognize that these are free roaming animals and may or may not be available for viewing at the time of our visit. Forestry personnel will provide a slide illustrated briefing on Elk in Pennsylvania and discuss the management plan for Elk in the Commonwealth.

Since no restaurants are available in the area in which we will be working, students must make certain to bring a sack lunch and beverages (non alcoholic) for themselves.

DATE: May 1, Monday

TIME: 7:00 am - 9:00 pm

LOCATION: Weyandt

POINTS: 40

NUMBERS OF STUDENTS: 26

PROFESSOR: Ferrence

10. NATIONAL ZOO AND SMITHSONIAN INSTITUTION, WASHINGTON, DC.

DESCRIPTION: The specific itinerary will be distributed on the bus. Lottery winners and alternate names will be posted on the bulletin boards across from room 112 and outside room 32 in Weyandt Hall on February 20. Lottery winners MUST confirm their enrollment and deliver a check or money order (not cash) payable to the Biology Department Transportation Fund for eighteen dollars (\$18.00) in room 5 Weyandt Hall during one of the following times:

Wednesday, February 22: 3:00 pm - 5:00 pm

Thursday, February 23: 3:30 pm - 5:30 pm

Monday, February 27: 1:30 pm - 3:00 pm

Tuesday, February 28: 3:30 pm - 5:30 pm

Unclaimed seats will be assigned to Lottery Alternates Only on a first-come-first-serve basis on Wednesday, March 1 between the hours of 2:00 pm and 4:00 pm. Any seats remaining after March 1 will be

available to any G.B. II student on Thursday, March 2 between the hours of 3:00 pm and 4:30 p.m. on a first-come-first-serve basis. Non-G.B. students will not be permitted on the bus.

DATE: Saturday, April 8, 1989

TIME: 4:00 am - Midnight

LOCATION: Cogswell Patio

POINTS: 40

COST: \$18.00 for bus fare, plus take extra pocket money for meals.

NUMBER OF STUDENTS: 224

PROFESSOR: Winstead, Rebar, Peterson, and Katz

11. DEER RESEARCH PENS AND FISH HATCHERY

DESCRIPTION: Students will visit the wildlife research facility at Penn State and have the opportunity to study the research efforts of Penn State scientists and Pennsylvania Game Commission researchers as they attempt to unravel the natural histories of wildlife of the Commonwealth. The major focus will be on the white-tailed deer, its life history and efforts to manage the herd in Pennsylvania. After this the students will travel to a nearby fish hatchery. At the hatchery they will learn the various methods employed in the production of game fishes for the stocking of the state's lakes and streams. In addition, a side trip will be taken to one of the natural areas in a state forest. Dress appropriate for the weather. Bring your lunch.

DATE: Monday, April 17, 1989; Saturday, April 29, 1989

TIME: 8:00 am - 8:00 pm

LOCATION: Weyandt 120

POINTS: 40

NUMBER OF STUDENTS:

PROFESSOR: Humphreys

12. COOK FOREST & FORESTRY SCIENCE LAB IN ALLEGHENY NATIONAL FOREST

DESCRIPTION: During this trip the student will learn about the forest in its natural state and its disturbed state. Forests are not only habitats but also are agricultural lands where trees are crops. First, we will visit Cook Forest which contains one of the largest virgin white pine stands in the U.S. Then we will travel to the Forestry Science Lab of the U.S. Forest Service in Warren where we will view the results of a study of the impact of deer density on managed forest lands. Students will be provided with an information packet. Dress appropriately for the out-of-doors.

DATE: Friday, April 28, 1989

TIME: 7:00 am - 7:00 pm

LOCATION: Weyandt 120

POINTS: 40

COST: Bring money for a fast food restaurant

NUMBER OF STUDENTS: 25

PROFESSOR: Dietrich

NON-LOTTERY ELECTIVE LABS - SPRING 1989

1. BIOETHICS

DESCRIPTION: Biotechnology has created numerous problems at the interface of science and society. This presentation is an overview of the ethical considerations of these important issues.

DATE & TIME: March 30, or April 6, or April 13, or April 20, or April 27, or May 4 (all Thursdays) 1:00 pm - 4:00 pm

LOCATION: Weyandt 108

POINTS: 12

NUMBER OF STUDENTS: 28

PROFESSOR: Forbes

2. NATURE PRINTING

DESCRIPTION: Using water-based paint and leaves from various plant species you will learn the process of creating nature prints. The objective of this lab is to stimulate more of an interest in biology through art.

DATE: Monday, April 3

TIME: 9:15 am - 11:15 am OR 1:15 pm - 3:15 pm

LOCATION: Weyandt 122

POINTS: 8

NUMBER OF STUDENTS: 24

PROFESSOR: Winstead

3. QUANTITATIVE VEGETATION ANALYSIS

DESCRIPTION: This outside/inside lab will demonstrate one method to obtain and analyze data to determine several characteristics of tree populations. For example, measures of density and the average distance between trees will be calculated for each tree species. Comparisons between different tree species will also be made. These types of parameters are important in comparing community growth and differences in community structure between two areas.

DATE: Wednesday, April 19

TIME: 1:15 pm - 4:15 pm

LOCATION: Weyandt 122

POINTS: 12

NUMBER OF STUDENTS: 24

PROFESSOR: Winstead

4. ANIMAL DIVERSITY AND ADAPTATION: TRIP TO THE PITTSBURGH ZOO

DESCRIPTION: The focus of this trip will be on the diversity of animals, their various ecological requirements, and their adaptations. Students will be given a brief worksheet to be completed during the trip. This worksheet will help the student in asking and answering the right kind of questions, in order to fully appreciate the educational potential of a zoo visit, and to appreciate the importance and significance of zoological parks. Brief presentations by zoo personnel and "behind the scenes" tours are planned.

DATE & TIME: Tuesday, April 18 12 noon - 6:00 pm OR

Saturday, April 22 10:00 am - 4:00 pm OR

Tuesday, April 15 12 noon - 6:00 pm

LOCATION: Weyandt 122

POINTS: 24

COST: \$1.25

NUMBER OF STUDENTS: 26

PROFESSOR: Grau

5. **EVERY BREATH YOU TAKE: HUMAN LUNG FUNCTION**
DESCRIPTION: This lab will include a brief discussion of human lung structure and function, and of the principle of spirometry. Students will be instructed on the use of respirometers to measure various lung capacities and volumes, and will then measure the functional ability of their own lungs. The use of these lung measures in the diagnosis of respiratory disorders will then be discussed, allowing the student to assess the fitness of his/her own respiratory system.
DATE & TIME: Thursday, April 13 9:00 am - 11:00 am OR
Thursday, April 13 1:00 pm - 3:00 pm OR
Friday, April 14 3:00 pm - 5:00 pm
LOCATION: Weyandt 313
POINTS: 8
NUMBER OF STUDENTS: 24
PROFESSOR: Grau
6. **NEUROBIOLOGY IN ACTION**
DESCRIPTION: This lab will include a brief review of nervous system structure and function and of reflexes. A demonstration of actual neurophysiological recordings from a frog nerve will be presented, followed by a demonstration of frog neuromuscular control. Students will then be shown how to elicit various reflexes in frogs, as well as the identification and elicitation of various human reflexes. The meaning of reflex activity and its relation to everyday life will be discussed.
DATE & TIME: Tuesday, April 4 9:00 am - 12 noon OR
Tuesday, April 4 12 noon - 3:00 pm
LOCATION: Weyandt 328
POINTS: 12
NUMBER OF STUDENTS: 24
PROFESSOR: Grau
7. **BIOLOGY OF AMPHIBIANS**
DESCRIPTION: A slide presentation of the natural history, ecology and environmental adaptations of this little known group of animals.
DATE & TIME: Thursday, March 30 10:30 am - 12:30 pm
LOCATION: Weyandt 110
POINTS: 8
NUMBER OF STUDENTS: 30
PROFESSOR: Hulse
8. **ENVIRONMENTS OF THE SOUTHWESTERN UNITED STATES**
DESCRIPTION: With the aid of slides the students will be exposed to the varied habitats and environments of the southwestern United States as well as the incredible biological diversity and rich archeological heritage of the region.
DATE & TIME: Wednesday, March 29 1:00 pm - 3:00 pm
LOCATION: Weyandt 110
POINTS: 8
NUMBER OF STUDENTS: 30
PROFESSOR: Hulse

9. **BIOLOGY OF THE REPTILES**
 DESCRIPTION: A slide presentation of the natural history, ecology, and environmental adaptations of this poorly known and often misunderstood group of animals.
 DATE & TIME: Wednesday, March 29 9:15 am - 11:15 am
 LOCATION: Weyandt 110
 POINTS: 8
 NUMBER OF STUDENTS: 30
 PROFESSOR: Hulse
10. **THE IMPACT OF HUMANS ON SPECIES**
 DESCRIPTION: A discussion illustrated with slides of how manipulations of the environment affect the distribution, abundance, and existence of plant and animal species.
 DATE & TIME: Thursday, March 30 1:00 pm - 3:00 pm
 LOCATION: Weyandt 110
 POINTS: 8
 NUMBER OF STUDENTS: 30
 PROFESSOR: Hulse
11. **NATURAL HISTORY OF THE AMPHIBIANS AND REPTILES OF PENNSYLVANIA**
 DESCRIPTION: Discussion will center on the ecology, behavior and distribution of the amphibians and reptiles of Pennsylvania. The discussion will be illustrated with slides and live specimens of amphibians and reptiles from the state.
 DATE: Wednesday, May 3
 TIME: 6:00 pm - 9:00 pm
 LOCATION: Weyandt 110
 POINTS: 12
 NUMBER OF STUDENTS: 30
 PROFESSOR: Hulse
12. **NATURE PHOTOGRAPHY**
 DESCRIPTION: A discussion of basic camera equipment used in nature photography (with special emphasis on flash, telephoto, and macro equipment), field techniques for photographing a variety of different types of organisms and laboratory techniques. A variety of slides will be used to illustrate the discussion.
 DATE & TIME: Wednesday, March 8 6:00 pm - 9:00 pm OR
 Wednesday, March 29 6:00 pm - 9:00 pm
 LOCATION: Weyandt 110
 POINTS: 12
 NUMBER OF STUDENTS: 30
 PROFESSOR: Hulse
13. **TROPICAL RAIN FORESTS AND CONSERVATION**
 DESCRIPTION: The unique nature of tropical rain forests and the implications of their impending destruction will be explored through a slide presentation and film. A variety of common tropical rain forest products will be brought in and discussed so that your "buying and consuming" awareness can increase.
 DATE & TIME: Tuesday, April 4 7:00 pm - 9:00 pm
 LOCATION: Weyandt 4
 POINTS: 8
 NUMBER OF STUDENTS: 60
 PROFESSOR: Rebar

14. **CANCER: ITS NATURE, CAUSES AND TREATMENT**
DESCRIPTION: What is cancer? What causes cancer and how do we know? How is cancer treated and why are these treatments so hard on the patient? These questions will be addressed in a lecture which will include a film. An attempt will be made to include answers to any general questions about cancer submitted by students in advance.
DATE & TIME: Thursday, April 6 7:00 pm - 10:00 pm
LOCATION: Weyandt 32
POINTS: 12
NUMBER OF STUDENTS: 120
PROFESSOR: Butler
15. **INVISIBLE WORLD: PROTOZOA AND OTHER SMALL LIVING THINGS**
DESCRIPTION: This lab is for those who enjoy looking down a microscope. It will focus on protozoa, but other microscopic inhabitants of ponds and puddles will be observed as well. A film will introduce the invisible world and there will be ample opportunity to use the microscope to find, identify and study protozoa and other microscopic life forms.
DATE & TIME: Thursday, April 13 9:00 am - 12:00 noon
LOCATION: Weyandt 122
POINTS: 12
NUMBER OF STUDENTS: 24
PROFESSOR: Butler
16. **HUMAN BLOOD MORPHOLOGY**
DESCRIPTION: Morphology of the "cellular" components of human blood (erythrocytes, leucocytes and platelets) will be covered through lecture and slide presentation, including a discussion of the maturation of each, from their origin in the bone marrow to release into the peripheral blood. The functions of the various types of leucocytes will be explained, followed by an observation (through slides) of the blood in abnormal or diseased states such as anemia, leukemia, sickle cell, mononucleosis, lupus, lead poisoning, etc.
DATE & TIME: Friday, April 7 8:00 am - 10:00 am OR
Friday, April 7 10:30 am - 12:30 pm
LOCATION: Weyandt 110
POINTS: 8
NUMBER OF STUDENTS: 24
PROFESSOR: Jack
17. **KEYSTONE POWER PLANT OPERATION**
DESCRIPTION: The Keystone electric generating plant will be toured. The needs for fuel, staff to run the plant, electrical service area, and waste products produced will be examined. This is an opportunity to learn why coal is used as an energy source, what the peak and average generating capacity is, how long the plant has been in operation, what its remaining life is, and what becomes of waste heat, gases, liquids and solids. **SPECIAL INSTRUCTIONS:** Bring pad and pencil. Wear clothing appropriate for outdoors.
DATE & TIME: Thursday, April 27 1:00 pm - 4:00 pm
LOCATION: Weyandt 120
POINTS: 8
NUMBER OF STUDENTS: 24
PROFESSOR: Jack

18. FOSSIL COLLECTING

DESCRIPTION: An introductory discussion of marine invertebrate fossils followed by a fossil search at a local fossil bed. Wear appropriate outdoor clothing.

DATE & TIME: Tuesday, April 18 1:15 pm - 4:15 pm* OR
 Friday, April 21 1:00 pm - 4:00 pm OR
 Saturday, May 6 9:00 am - 12:00 noon OR
 Saturday, May 6 1:00 pm - 4:00 pm

LOCATION: Weyandt 120
 POINTS: 12
 NUMBER OF STUDENTS:
 PROFESSOR: Jack or Gendron*

19. DINOSAURS: THEIR LIVES AND TIMES

DESCRIPTION: This lecture will cover the origin, natural history and eventual fate of the dinosaurs. Particular attention will be paid to two controversial theories which are currently the subject of much debate among paleontologists. One theory is that dinosaurs, unlike living reptiles, were warm-blooded and very active. The other theory states that the extinction of the dinosaurs was caused by the impact of a large asteroid. The lecture will be illustrated with slides and films.

DATE & TIME: Wednesday, March 29, 1989 7:00 pm - 10:00 pm OR
 Thursday, March 30, 1989 8:00 pm - 10:00 pm

LOCATION: Weyandt 208
 POINTS: 12
 NUMBER OF STUDENTS: 96
 PROFESSOR: Gendron

20. RACE FOR THE DOUBLE HELIX

DESCRIPTION: An inquiry into the scientific and interpersonal relationships of the individuals responsible for the discovery of the structure of Deoxyribonucleic Acid (DNA). By using the BBC dramatization of the activities of Jim Watson and Francis Crick we will, with interpretation by the instructor, examine the events and sharing of information from scientists such as Rosalind Franklin and Maurice Wilkins that resulted in the proposal of the double helix DNA concept.

DATE & TIME: Monday, April 24 8:00 am - 10:00 am OR
 Thursday, May 4 1:00 pm - 3:00 pm

LOCATION: Weyandt 120
 POINTS: 8
 NUMBER OF STUDENTS:
 PROFESSOR: Katz

21. ORGANIC FARMING ON WESTERN PENNSYLVANIA CONSERVANCY'S PLAIN GROVE FEN NATURAL AREA

DESCRIPTION: Ron and Judy Gargasz operate a successful commercial organic farm on 175 acres of land. Mr. Gargasz is trained as a biologist and began organic farming in 1980. The objective of this exercise will be to view first-hand about cropping and cultural practices, soil and water conservation, application of plant nutrients and organic matter, pest control methods, crop yields and quality, marketing processes, impact of organic farming methods on soil productivity and tilth, and the limitations and barriers to organic farming. Wear old clothes-warm enough for the outdoors. Bring your lunch.

DATE & TIME: Monday, May 1 9:00 am - 4:00 pm
 LOCATION: Weyandt 120
 POINTS: 28
 NUMBER OF STUDENTS: 120
 PROFESSOR: Katz

22. MICROBES ON OUR SKIN

DESCRIPTION: Students will grow microorganisms and perform microscopic and biochemical tests on normal microbial flora from their own skin. You must attend both days for credit.
 DATE & TIME: Tuesday, March 28 and Thursday, March 30 3 pm - 5 pm
 LOCATION: Weyandt 210
 POINTS: 16
 NUMBER OF STUDENTS: 24
 PROFESSOR: Alico

23. GOSNELL'S GREENHOUSE

DESCRIPTION: This greenhouse facility is unique because of the cogeneration partnership with the Pennsylvania Electric Plant at Homer City. This 11.5 acre greenhouse is heated with excess cooling water that is used to generate steam. This lab includes a visit to the greenhouse during their busy spring season.
 DATE & TIME: Tuesday, April 4 or Tuesday, April 11 1 pm - 5 pm
 LOCATION: Weyandt 112
 POINTS: 16
 NUMBER OF STUDENTS: 24
 PROFESSOR: Alico

24. SEWAGE TREATMENT PLANT - INDIANA

DESCRIPTION: This modern treatment facility reduces the pollution of our streams and rivers. You will learn about types of waste treatment and see this plant in operation.
 DATE & TIME: Thursday, April 6 2:00 pm - 6:00 pm
 LOCATION: Weyandt 9
 POINTS: 16
 NUMBER OF STUDENTS: 48
 PROFESSOR: Alico

25. MICROBES: EXAMINATION OF FOOD UTENSILS

DESCRIPTION: Students will check various food utensils for bacterial contamination by culturing bacteria on culture media. Utensil sources can be from restaurants, apts., dorm rooms, etc. Microscopic examination of the bacteria will be included. (STUDENTS MAY SCHEDULE ONLY ONE 16 POINT "MICROBES LAB")
 DATE & TIME: Tuesday, April 4 8:00 am - 10:00 am and
 Thursday, April 6 8:00 am - 10:00 am
 (You must attend both days for credit).
 LOCATION: Weyandt 227
 POINTS: 16
 NUMBER OF STUDENTS: 24
 PROFESSOR: Charnego

26. **MICROBES OF THE THROAT**
DESCRIPTION: Students will grow and make microscopic examinations of normal organisms found in their throat. (STUDENTS MAY SCHEDULE ONLY ONE 16 POINT "MICROBES LAB")
DATE & TIME: Tuesday, April 18 8:00 am - 10:00 am and
Thursday, April 20 8:00 am - 10:00 am
(You must attend both days for credit).
LOCATION: Weyandt 227
POINTS: 16
NUMBER OF STUDENTS: 24
PROFESSOR: Charnego
27. **MICROBES: TESTING OF ANTISEPTICS AND DISINFECTANTS**
DESCRIPTION: Students will perform a lab procedure to evaluate the effectiveness of various common antiseptics and disinfectants on two types of bacteria. Drug company testing of products will be discussed. (STUDENTS MAY SCHEDULE ONLY ONE 16 POINTS "MICROBES LAB")
DATE & TIME: Tuesday, April 11 8:00 am - 10:00 am and
Thursday, April 13 8:00 am - 10:00 am
(You must attend both days for credit).
LOCATION: Weyandt 227
POINTS: 16
NUMBER OF STUDENTS: 24
PROFESSOR: Charnego
28. **SUN CLIFF NATURE HIKE**
DESCRIPTION: This is a springtime walk to a unique cliff habitat. Observations will include the geology, ecology, flora and fauna of the area. Spring wildflowers are usually abundant at this time. Dress appropriate for the outdoors.
DATES & TIME:

Tuesday, March 21	8:00 am - 11:00 am
Thursday, March 30	1:00 pm - 4:00 pm
Wednesday, April 5	1:00 pm - 4:00 pm
Sunday, April 23	1:00 pm - 4:00 pm
Tuesday, April 25	8:00 am - 11:00 am
Thursday, April 27	8:00 am - 11:00 am
Tuesday, May 2	8:00 am - 11:00 am
Thursday, May 4	8:00 am - 11:00 am

LOCATION: Weyandt 120
POINTS: 12
NUMBER OF STUDENTS: 24
PROFESSOR: Charnego

Course Title: General Biology I

Course Number: BI 103

Course Description: Introduce biological components of some of man's major problems. Considerable time on information and methodology current in biological sciences: ecology, energy storage and release, molecular transport, chemical control, and genetics. Three hours lecture, two hour lab per week.

Summary of Objectives: The pervasive intent of this course is to enhance the student's information, skills, and attitudes about biological science in order to improve the quality of life. In pursuit of this pervasive objective, student activities for the aggregate of General Biology I and II should reach the following more specific objectives in which students:

1. Learn the facts and principles outlined in the lecture and laboratory topic outlines.
2. Expand the concepts that encompass the facts and principles outlined.
3. Understand the nature of a science with its tentative and self-correcting features.
4. Study both "pure" and "applied" science.
5. Become sensitive to the biological component in decision making.
6. Recognize that judgment and faith may be pivotal in decision making even with an information base.
7. Examine (first hand) a variety of sites and in so doing consider both information and judgments about future events.

Syllabus: General Biology I - BI 103

- I. Principles of Ecology
 - A. Organization of the Ecosystem
 1. Levels of Organization
 2. Structure and Function of the Ecosystem
 - B. Ecosystem Homeostasis
 1. Relationship to Laws of Thermodynamics
 2. Productivity
 3. The Food Web
 - a. Energy Flow
 - b. Trophic Levels
 - c. Pyramids

- C. Biogeochemical Cycles
 - 1. Carbon - Oxygen - Hydrogen
 - 2. Nitrogen
 - 3. Phosphorus
 - 4. Harmful Chemicals
 - D. Populations
 - 1. Growth Curves
 - 2. Impact of Environmental Resistance
 - 3. Survivorship Curves
 - E. Limiting Factors and Population Trends
 - 1. Law of Tolerance
 - 2. Distribution of Organisms
 - F. Density - Independent Limiting Factors
 - 1. Impact of Geological History
 - a. Topography
 - b. Climate
 - c. Microclimates
 - 2. Temperature
 - 3. Moisture
 - 4. Soil
 - 5. Light
 - G. Density - Dependent Limiting Factors
 - 1. Predation
 - 2. Parasitism
 - 3. Disease
 - 4. Social Parasitism
 - 5. Competition
 - 6. Stress
 - H. The Ecosystem as the "Functional Unit"
 - 1. Succession
 - 2. Climax Associations of Pennsylvania
 - 3. Biomes of North America
- II. Cell Structure and Function
- A. Types of Cells - Prokaryotic/Eukaryotic
 - B. Cell Sizes - bird eggs - mycoplasma
 - C. Cell Parts
 - 1. Plasma Membrane
 - 2. Cytoplasm
 - 3. Organelles
 - 4. Nucleus
 - 5. Endoplasmic Reticulum
 - 6. Lysosomes
 - 7. Mitochondria
 - 8. Others, plastids, golgi, complex, ect.
 - D. Active and Passive Transport
 - 1. Diffusion
 - 2. Osmosis

7. Osmotic Pressure
 - a. hyperosmotic
 - b. hypoosmotic
 - c. isosmotic

E. Pinocytosis and Phagocytosis

F. Cellular Reproduction

1. Mitosis & Cytokinesis in Plant and Animal Cells
 - a. Interphase
 - b. Prophase
 - c. Metaphase
 - d. Anaphase
 - e. Telophase
2. Meiosis
 - a. Meiosis I - reduction in chromosomes number
 - b. Meiosis II - primarily mitotic

III. Genetics

A. Some Definitions

1. Gene
2. Allele
3. Homozygous - heterozygous
4. Dominant - recessive
5. Monohybrid - dihybrid
6. Gamete - zygote
7. Haploid - diploid

B. Mendel Revisited Using the Definitions

C. Mendel's Law of Segregation

D. Probability

E. Test Cross

F. Intermediate Inheritance

G. Multiple Alleles

1. Inheritance of A-B Blood Groups
2. Paternity Suits
3. "Hospital mix-ups" of Babies

H. Lethal Alleles

I. Concept of Genetic Load

J. Sex Determination

1. Sex Chromosomes - autosomes
2. Spermatogenesis
3. Oogenesis
4. Fertilization

K. Sex Linkage

- L. The Dihybrid Cross
- M. Mendel's Law of Independent Assortment
- N. Linkage and Crossing Over
- O. Gene Interaction
 - 1. Epistasis
 - 2. Polygenic Inheritance
- P. Mutations
 - 1. Mostly harmful and Recessive
 - 2. Occur at a given rate quite by chance
 - 3. Frequency determined by natural selection
- Q. Abnormal Chromosomes Number
 - 1. Polyploid
 - 2. Mosaic
 - 3. Aneuploid
 - a. Monosomics
 - b. Trisomics
 - 4. Unusual Sex Chromosome Number
- R. Chromosomal Aberrations
 - 1. Deletion
 - 2. Duplication
 - 3. Inversion

IV. Physiology

- A. Digestive System
 - 1. Food Procurement
 - 2. Anatomy of the Digestive System
 - 3. Chemical Digestion
 - 4. Assimilation and Evacuation
- B. Respiratory System
 - 1. Properties of Gases
 - 2. Anatomy of the Respiratory System
 - 3. Gas exchange (insects)
 - 4. Gas exchange (lower vertebrates)
 - 5. Aquatic vs. Terrestrial
 - 6. Higher Vertebrates
- C. Internal Transport
 - 1. Anatomy of the heart
 - 2. General Circulation
 - 3. Lymphatic System
 - 4. Composition of Blood
 - 5. Blood Clotting
 - 6. Transport of gases
 - 7. Transport of Nutrients and Wastes
- D. Excretory System
 - 1. Osmoregulation
 - 2. Anatomy of the excretory

3. Anatom. of the mammalian
 4. Types of waste products
 5. Renal Physiology
 6. Ecological Significance of Excretory Products
- F. The Endocrine System
1. Hormones
 2. Mechanisms of Hormonal Action
 3. Survey of the Endocrine Glands

Course Title: General Biology II

Course Number: BI 104

Course Description: Completion of background information with study of selected areas of biology, such as neurobiology, evolution, behavior, and development. Three hours lecture, two hour lab per week.

Summary of Objectives: The pervasive intent of this course is to enhance the student's information, skills, and attitudes about biological science in order to improve the quality of life. In pursuit of this pervasive objectives in which students:

1. Learn the facts and principles outlined in the lecture and laboratory topic outlines.
2. Expand the concepts that encompass the facts and principles outlined.
3. Understand the nature of a science with its tentative and self-correcting features.
4. Study both "pure" and "applied" science.
5. Become sensitive to the biological component in decision making.
6. Recognize that judgment and faith may be pivotal in decision making even with an information base.
7. Examine (first hand) a variety of sites and in so doing consider both information and judgments about future events.

Evaluation Methods:

Student grades are computed on the using one (1) hour lecture test grades and laboratory quizzes.

Three (3), one (1) hour lecture examinations are given. Each contributes twenty-five (25) percent of a student's grade.

Each laboratory professor plans and executes quizzes which contribute twenty-five (25) percent of a student's grade.

Special Features:

The first six (6) laboratory sessions are conventional indoor exercises. The remainder of the semester is devoted to elective exercises. Students sign up for special trips and activities that they find interesting. This segment of the

course may best be understood by examining pages 103-111 in the attached laboratory manual.

Course Content and Lecture Topics:

- I. Neurobiology
 - A. Introduction
 1. General Functions of Nervous System
 2. Functions of Neurons
 3. Structure of a neuron
 4. Generalized Pathway of Messages
 5. The Synapse
 6. Method of Communication Along A Neuron
 7. Sodium - Potassium Pump
 - B. Transmission of Stimuli Strengths
 - B. Perception - Several Examples
 - C. Synaptic Accomodation
 - D. Human Receptors
 1. Chemical Receptors
 - a. Taste receptors
 - b. Olfactory receptors
 2. Visual Receptors
 - a. Structure of the eye
 - b. Functions of the structures
 - c. Common disorders and diseases of the eye
 3. Mechanical Receptors
 - a. Hearing: the ear: structure and function
 - b. Balance
 - c. Touch and pressure receptors in the skin
 - E. Effectors
 1. Skeletal Muscle
 2. Cardiac Muscle
 3. Smooth Muscle
 - F. The Nervous System
 1. Reflex Arc
 2. Peripheral Nervous System
 - a. Sympathetic Nervous System
 - b. Parasympathetic Nervous System
 3. Central Nervous System: The Brain
 - a. Structure of the brain
 - b. Functions of the brain
- II. Animal Behavior
 - A. Introduction of Behavior
 1. Definition of Behavior
 2. Definition of Components of Behavior (with short examples)
 - a. Tropisms
 - b. Taxes
 - c. Reflexes

- d. Instincts
 - e. Learning
 - f. Reasoning
 - 3. Definition of Innate Behavior
 - 4. Definition and Example of Perception
 - 5. The Concept of Teleology
- B. Innate Behavior
- 1. Taxes - several examples
 - 2. Reflexes - several examples
 - a. Rhythmic reflexes
 - b. Hierarchy of reflexes
 - c. Escape responses
 - 3. Instinct - Many Examples
 Film Loop: Courtship Behavior of the Sickleback
 - 4. Releasers of Instinctive Behavior - several examples
 Film Loop: Stickleback: Experiments with Models
- C. Comment on Motivation in Innate Behavior and Learned Behavior
- D. Learned Behavior and Reasoning
- 1. Habituation - example
 - 2. Physiological Mechanism of Habituation - Synaptic Accomodation
 - 3. Imprinting
 - a. Film: Imprinting (37 min.) E.P. Reese and B.G.P. Bateson
 - b. Biological Functions of Imprinting
 - c. Major Factors Affecting Imprinting
 - 4. Conditioning - example
 - 5. Trial and Error Learning - examples
 - 6. Reasoning (or Insight Learning)
 - a. Problem solving - Aha! phenomenon
 - b. Formulating concepts
 - c. Examples of failures to reason
- E. Social Behavior in Insect Societies: The Honeybee
- 1. Definition of Society
 - 2. Winter Organization of Honeybee
 - 3. Life of the Worker
 - a. Nurse worker
 - b. Houseworking bee
 - c. Forager bee
 - 4. The Queen Honeybee
 - 5. Formation of New Colonies
 - 6. Communication
 - a. Pheromones
 - b. Waggle dance
 - 7. Film: The Honeybee (30) min.
- F. Social Behavior in Vertebrates
- 1. Agonistic Behavior

- a. Nonreproductive agonistic behavior
 - 1. Types of displays
 - 11. Social hierarchies or peck orders-individual recognition. (Film loop: Social Behavior in Chickens)
 - b. Reproductive agonistic behavior
 - i. Types of displays
 - 11. Concept of territory
 - 2. Reproductive Behavior
 - a. Function of reproductive behavior
 - b. Pair-formation
 - c. Mutual displays
 - 3. Parental Behavior
 - 4. Cooperative Behavior
 - 5. Example of a cooperative Vertebrate Society: the wolf pack
 - a. Geographical range
 - b. Social structure and bonds
 - c. Territoriality
 - d. Howling
 - e. Hunting techniques
 - f. Cooperation is stressed in all activities
 - G. Biological Clocks
(Film Loop: Biological Clocks - 30 min.)
 - H. Communication not already covered, e.g. tactile and electrical
 - I. Migration and Orientation Behavior
 - 1. Classification of Population Movements
 - a. Migration
 - b. Emigration (also irruption)
 - c. Immigration
 - d. Nomadism
 - 2. Reasons for Migration
 - 3. Environmental Stimuli
 - 4. Insect Migrations
 - 5. Fish Migrations
 - 6. Amphibian and Reptile Migration
 - 7. Bird Migration
 - 8. Mammal Migration
 - 9. Homing
 - J. (Optional) Human Body Language
- III. Animal Development
- A. Fertilization
 - 1. Methods of Getting Sperm to Egg
 - a. Internal
 - b. External
 - 2. Changes in the Egg Upon Sperm Contact
 - 3. Parthenogenesis
 - B. Cleavage Stages

1. Morula
 - a. Mitotic cell divisions resulting in increasing cell number from an egg cell
 2. Blastula
 - a. Changes from morula to blastula
 - b. Formation of blastocoel
- C. Gastrulation Stage
1. Changes from Blastula to Gastrula
 2. Terminology: blastopore, archenteron, endoderm, ectoderm, morphogenesis
- D. Neurulation
1. Changes from Gastrula to Neurula
 - a. Terminology - neural plate, neural groove, notochord, spinal column, ect.
 2. Formation of Mesoderm
- E. The Sequence of Events Above is Emphasized with Different Eggs That Vary in the Amount of Animal and Vegetal Hemispheres.
1. Amphioxus - Human
 - a. Small vegetal, large animal
 2. Frog
 - a. Equal amounts of animal and vegetal
 3. Bird
 - a. Small animal, large vegetal
- F. Organ and Tissue Formation from Ectoderm, Mesoderm, Endoderm
1. Interactions of Adjacent Cell Layers and Differentiation
 2. Experimental Transplant Studies That Illustrate Interactions - Induction Studies
 - a. Effect of dorsal-mesoderm on neural tube formation
 - b. Formation of the eye and eye transplant studies in salamanders
- G. Sequence of Events in Human Development
1. Fertilization
 2. Pregnancy
 3. Gestation
 - a. Development of membranes and their function
 - i. chorion
 - ii. amnion
 - iii. yolk sac
 - iv. allantois
 - b. Comparison of these membranes with a bird egg (fertilized)
 4. Size Changes During Human Development
- H. Abnormal Development (this topic covered as time permits)
1. Genetic Factors

- a. Mutations
- b. Gene Interactions
- 2. Environmental Factors - breakdown of placental protection
 - a. Congenital disease
 - b. Fetal infection
 - c. Maternal infection
- 3. Immunological Factors

NOTE: The topic of animal development is well-illustrated through the use of slides and transparencies to emphasize the animal discussed: sequential changes in size and form: and similarities and differences in development.

IV. Species and Evolution

A. Evolution

- 1. The meaning of Evolution
- 2. Environmental modification
 - a. Lamarck
 - b. Lysenko
- 3. Inheritable variation
 - a. Abnormal genes
 - b. Genetic defects
- 4. Darwin's Theory of Natural Selection
 - a. Wallace and his contributions
 - b. Doctrine of Evolution
 - c. Darwin's Contribution - The "how" of Evolution
- 5. Natural Selection
- 6. Evidence of Evolution
 - a. Fossil evidence
 - b. Taxonomic evidence
 - c. Comparative anatomy as evidence
 - d. Embryology as evidence
 - e. Evidence from geographical distribution
 - f. Evidence from Genetics
- 7. Population Genetics
 - a. Hardy weinberg laws
 - b. Gene frequencies

B. The Modern Theory and Mechanisms of Evolution

- 1. The means by which evolution takes place
- 2. Struggle for existence
- 3. Mechanism of Evolution
- 4. The basic role of natural selection
- 5. Formation of races species populations and gene pools
- 6. Micro and Macroevolution
- 7. Adaptive radiation and divergent evolution
- 8. Convergent and Parallel evolution
- 9. The Races of Man
 - a. Mongaloid
 - b. Caucasoids
 - c. Negroid
 - d. Indian and Sub-Continent

C. Species

1. The Species Concept
 - a. The family
 - b. Population
2. Variation
3. Societies
4. Insect Societies

D. Evolution of Man

1. Fossil record of human evolution
2. Emergence of man
3. Fossil Pre-man Ape
4. Ramapithecus
5. Australopithecus
6. Homo Erectus
7. Homo Sapiens Neandertalis
8. Homo Sapiens Sapiens (Cro-Magnon)
9. The future of modern man