

ADVANCED COORDINATED STUDIES  
LIFE ON EARTH: PAST AND PRESENT  
A ONE YEAR PROGRAM

Life began in some shallow sea on earth perhaps three billion years ago. From that time, many lines of evolution have led to the diversity of species and the complexity of life processes we presently observe. Successful and not-so-successful evolutionary experiments can be deduced from the forms and functions of modern species and from the geological and fossil records. Thus, the interpretation of the history of life and its environments requires a search into all facets of biology, paleontology, and the geology of sedimentary rocks. It is this broad historical perspective of life and life processes which forms the organizational motif of this advanced coordinated studies program concentrating on marine, estuarine and freshwater organisms and habitats.

The content of the program will be integrated studies in the life and earth sciences. Concern will primarily be focussed at the organism level of organization -- how the organism lives, how its life is integrated with the demands of its environment, what we can deduce about the answers to these questions as they pertain to fossil organisms. This emphasis is not to be construed as systematically eliminating study of organisms at other levels (e.g. cell and population) -- we may indeed want to attack problems at precisely those levels -- but rather as guiding us to seek the meaning of studies at those levels for the organism which is subject to the process of natural selection as an integrated whole unit.

The program will heavily emphasize practice as the basis of theory. We expect about 80% of the student's time to be spent in the field and lab, with only 20% of his time to be spent in discussion, lectures, etc. Students will undertake numerous small projects during the quarter, ranging from short standard-type exercises such as dissections, identification of samples from the field, taking different kinds of measurements, etc., to longer, more open-ended projects involving experimental design, paper writing, etc. In addition, the class might undertake several extended studies to be the responsibility of small groups of students (e.g. plankton surveys -- what is present, in what quantities, at what times of the year; measurements of physical parameters of the environment over a quarter or through the year; settling studies -- setting out substrates and counting organisms present after given times; extended metabolic adaptation studies, etc).

We expect that students, at the end of the year, will know a variety of field and laboratory techniques and experimental approaches to subject matter; will have some familiarity with organisms of the aquatic environment, their ecological and evolutionary (taxonomic) relationships, and their physiology and behavior; will have learned through frequent practice how to write a scientific paper; will know how to use the library and have a habit of reading journals.

Students must have previous science background to enter this program. At least some high school science is prerequisite, but more experience is recommended. Students with background derived from current coordinated studies (Evergreen Environment, Environmental Design, Political Ecology, Causality) would be able to handle the work. Familiarity with any of the following would be desirable, but not essential: basic chemistry and physics, evolution, genetics, cell biology (elementary), calculus, statistics, organic chemistry, physical chemistry. Students leaving this program should be ready to contract for independent research projects in organism biology or earth science with either a field or laboratory orientation, or could go on to take up further advanced coordinated studies such as chemistry/biochemistry/cell biology; matter and energy/the ocean; brains and other information processing devices; history of the earth and universe, etc.

Program events - Fall Quarter 1972

Field trips - Geological:

Columbia River Valley; John Day and Clarno Formations - Oregon (2 days); Palouse Falls; Channeled Scablands E. Washington; Dry Falls of the Columbia; Ginkgo Petrified Forest; San Juan Island (4 days); Sucia Island, San Juan Islands (1 day); \*Porter and Satsop, W. Washington (1 day each).

Geology Workshops and Labs:

\*Mineral Workshops I & II: An introduction to the structure and composition of minerals.  
\*Rock Workshops I - IV: Introductions to the characteristics and classification of Igneous, Sedimentary and Metamorphic rocks.  
Laboratory Exercises:  
Fossil Protozoa, Sponges, Coelenterates.

Geology Lectures:

Characteristics and classification of Protozoa, Porifera and Coelenterata, discussions of fossil reefs, volcanism, glaciation and aspects of field geology.

Biology Lectures:

Oceanography of Puget Sound; Coral Reef Ecology; Ecology of Shoreline Environments; Invertebrates: Protozoa through Platyhelminthes.

Biology Labs:

Protozoa; Porifera; Coelenterata; Marine Invertebrates (5 full days, Friday Harbor Laboratories, San Juan Islands).

Field Trips - Biological:

Yacht Harbor Floats & Pilings; False Bay Mudflat; Dredging (On RV Hydah, Friday Harbor Labs); \*Marine Science Educational Exhibit (North Kitsap Environmental Center); Oceanographic Cruise: 1 day Puget Sound with T.C.C.

Guest Lectures:

Dr. R. Albertson, U.P.S.: Interpreting Genesis; Dr. J. S. Lowther, U.P.S.: Paleobotany; Dr. Mark Papworth, TESC: Significance of Genesis.

Videotape and Motion Pictures:

Inherit The Wind (evolution); The Restless Earth (geology).

Readings in:

Meglitsch, P.A. - Invertebrate Zoology - Oxford 1967  
Dunbar, C.O. & Waage, K.M. - Historical Geology - Wiley 1969  
Longwell, C.R., Flint, R.F., Saunders, J.E. - Physical Geology - Wiley 1969  
Genesis

Darwin, C.- Voyage of the Beagle - Natural History Library  
+ Recommended Readings from Cascadia - McKee, B. - McGraw Hill 1972  
and scientific papers on geology of Washington State

Written Materials:

Field Notebook; Lab Notebook; Journal; Written Examination.

PROGRAM EVENTS - WINTER QUARTER 1973

\*items optional

FIELD TRIPS - Geological\*

Tenino and Skookamchuck River(Tertiary volcanics and sediments); Rochester and Porter Cliffs(Mima Mounds, Oligocene Lincoln Creek formation); Helsing-Galvin(Lincoln Creek formation); Pe Ell-Doty(Lincoln Creek formation).

GEOLOGY WORKSHOPS AND LABS\*:

Sedimentary Rocks I-V(curating, sandstones I and II, limestones, shales); Metamorphic rocks I and II(mineralogy, classification); Topographic Maps I and II(introduction, exercises); Geologic Maps(introduction and exercises); Fossil Molluscs

GEOLOGY LECTURES:

Precambrian, Cambrian, Ordovician, Silurian, Devonian, Mississippian, Permian, Triassic, Jurassic, Continental Drift, Cretaceous, Tertiary(2).

MARINE ECOLOGY LECTURES AND DISCUSSION:

Characteristics of the Marine Environment; Phytoplankton; Zooplankton; Nekton and Benthos; concepts in Marine Ecology.

INVERTEBRATE ZOOLOGY LECTURES AND DISCUSSIONS:

Annelids(3); Pseudocoelomates; Origin and Significance of Coelom; Molluscs(4); Onychophora; Arthropods(3); Echinoderms(2); Chordates and Minor Deuterostomes.

FIELD TRIPS, BIOLOGICAL\*:

Willapa Bay Saltmarsh and Tidal Flats; Collecting trips to local Puget Sound beaches(3).

INVERTEBRATE ZOOLOGY LABS:

Platyhelminthes; Aschelminthes; Annelids; Molluscs(2); Arthropods(2); Echinoderms.

GUEST LECTURES:

Dr. Don Chiddick, George Fox College, Special Creation; Dr. Duane Gish, Creation Research Foundation, Special Creation; Dr. Thomas Bogyo, W.S.U., Selection in Human Populations.

FILMS:

Oceanography and Marine Ecology; The Restless Sea; History Layer by Layer; Waves Across the Pacific; Waves on Water; The Beach-A River of Sand; Tides of the Ocean; Ecology of a Tidal Slough; The Sea.

READINGS IN:

Meglitsch, P.A. - Invertebrate Ecology - Oxford 1967  
Dunbar, C.O. and K. M. Waage - Historical Geology - Wiley 1969  
Longwell, C. R., R. F. Flint and J. E. Saunders - Physical Geology - Wiley 1969  
Savage, J., Evolution - Holt-Rhinehart  
Simpson, G. G., This View of Life - Harcourt-Brace  
Wallace, A. R., The Malay Archipelago - Dover  
Powell, J. W., Exploration of the Colorado River and Its Canyons - Dover  
Hedgpeth, J.W., Concepts of Marine Ecology In J.W. Hedgpeth(Ed) Treatise  
On Marine Ecology and Paleoeology Vol. I Geol. Soc. Amer. Mem. 67  
Thorson, G., Life in the Sea, McGraw-Hill 1971  
Laporte, L.F., Ancient Environments - Prentice Hall 1968

WRITTEN MATERIALS:

Journal, lab notebook, field notebook, study questions(6); investigative report

OPTIONAL INTEREST GROUPS:\*

Palaeoecology:

Group sessions on selected readings, four field trips to explore fossiliferous sites of the Lincoln Creek Formation of S. W. Washington, lab sessions to prepare and identify collected specimens. (Taylor and Royse)

Oceanography:

Group discussions and lectures on readings in M.G. Gross 1972.  
Oceanography - A View of the Earth. Prentice-Hall Optional written exam(Taylor)

Vertebrate Evolution:

Group discussion on readings in A. S. Romer 19.  
The Vertebrate Story Univ. Chicago Press. (Taylor and Royse)

Topics in Physical Geology:

Readings and discussions in plate tectonics(continental drift, magnetic anomalies, sea-floor spreading, etc.), volcanism, glaciation and related topics (Royse)

Fossil Inventory in Western Washington:

This group combined with the Paleoeology group in a study of the Lincoln Creek Formation. (Royse)

Animal Physiology:

Each week everyone read one chapter from Ramsay - Physiological Approach to the Lower Animals Plus one journal article. Weekly meetings consisted of brief discussion of chapter plus oral reports on articles. (Kahan)

## LIFE ON EARTH PROGRAM - SPRING QUARTER

Students spent the first two weeks of the quarter on a major field trip to the Oregon Coast or the Grand Canyon. Descriptions of these trips follow below. The rest of the quarter was occupied by work on an individual or small group project. Students began by defining a problem, they then wrote a proposal, made weekly progress reports, and finished by writing up substantial research papers and presenting their work orally to the entire program.

### Oregon Coast Trip

Students not participating in the Grand Canyon/Colorado River trip travelled along the northern Oregon Coast to view marine life and habitats of the intertidal zone. The duration of the trip was seven days, from April 4 through April 10. Four days were spent at beaches in the vicinity of Newport, including visits to Yaquina Head, Yaquina Bay, the Oregon State University Marine Science Center, and Marine Gardens. Other stops included Ecola State Park and Cape Lookout State Park beaches. The habitats visited included rocky shores and sandy beaches of the outer coast and estuarine sand flats.

The trip was preceded by briefings on methods of beach ecological survey and on sources of literature. The field work was followed up by specimen identification. Observations were recorded in field notebooks and journals.

### Grand Canyon Trip

Our nine-day raft trip down the Colorado River began at Lee's Ferry on April 2, 1973. In addition to observing natural splendor unequalled elsewhere, students had an opportunity to study and record various geological phenomena in the stratigraphic sequence that ranged downward from Mesozoic to Precambrian. In addition to noting characteristics of sedimentary, igneous and metamorphic rocks, most students also made relevant observations on botany, archeology, wildlife and other ecologic aspects of this unique area. Geological river guides (Hamblin and Rigby, 1968 and 1969) were available to all and expertise in botany, geology and zoology was represented by specific faculty and by many of our advanced students.

Field notebooks and personal journals were kept by all to record direct observations, thoughts, opinions and questions. Both the time spent in the canyon and days spent in travel were not only academically stimulating but also gave each of us an opportunity to sharpen outdoor skills in new situations and with new companions.

## Equivalency Disclaimer

The faculty of the Life on Earth program do not believe that the program content can be adequately described by an arbitrary translation into "course equivalencies". Therefore we are providing a detailed description, reading list and account of program activities which we believe would allow a reader (e.g. registrar or faculty member at other institutions, potential employer, etc.) to evaluate the course content and determine any equivalencies which they may need.