DOCUMENT RESUME

ED 070 393 HE 003 626

AUTHOR	Aldrich, James L.; Kormondy, Edward J.
TITLE	Environmental Education: Academia's Response.
INSTITUTION	American Inst. of Biological Sciences, Washington, D.C.
SPONS AGENCY	National Science Foundation, Washington, D.C.
REPORT NO	CUEBS-35
PUB DATE	Apr 72
NOTE	78p.
AVAILABLE FROM	The American Institute of Biological Sciences, 3900 Wisconsin Avenue, N.W., Washington, D.C. 20016; The Conservation Foundation, 1717 Massachusetts Avenue, N.W., Washington, D.C. 20036 (Free copies available)
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Educational Improvement; Educational Objectives; *Environmental Education; *Environmental Research; *Higher Education; *Interdisciplinary Approach

ABSTRACT

This report is an attempt to identify and answer some of the major questions about the role of environmental studies in higher education, and to some extent the role of higher education in environmental studies. To this end, questionnaires were sent to 20 higher eudcation institutions that offered environmental studies programs. Fifteen of the institutions responded to the following questions: (1) What were the original goals of the environmental studies program? (2) To what extent has the program evolved and in what way has it been modified? (3) How does the program or center relate to the other college and university activities? (4) To what extent have the administrative or institutional governance issues been a factor in the development of the center or program? (5) What are the particularly difficult problems that the center has had to deal with? and (6) What are the priorities for the future and why were they chosen? While every institution must chart its own course, the compilation of these statements provides useful data for existing and planned programs. (HS)

ENVIRONMENTAL EDUCATION:

ACADEMIA'S RESPONSE

Publication No. 35

The Commission on Undergraduate Education in the Biological Sciences

ENVIRONMENTAL EDUCATION:

ACADEMIA'S RESPONSE

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April 1972

Published by the
Commission on Undergraduate Education
in the Biological Sciences

Supported by a grant from the
National Science Foundation
to the
American Institute of Biological Sciences

Copies of this report are available

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The AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES
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Washington, D.C. 20016

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Library of Congress Catalogue Card Number 77-188609

FOREWORD

Among the new directions in undergraduate education which CUEBS has watched with particular interest are those in which biology is but part of a much larger intellectual endeavor. Notable among these is that which falls under the general rubric of environmental education. Biology, and largely ecology, contribute significantly to this enterprise but are neither more nor less significant than the input which comes from atmospheric and oceanographic science, geology and geography, physics and chemistry, economics and sociology, and increasingly from computer science. Unlike the intra-house marriages of cytology and genetics which formed cytogenetics and of biology and chemistry which formed biochemistry, the science of the environment is broadly interdisciplinary.

The manner in which the several disciplines are integrated to achieve given objectives is itself a topic of considerable fascination since the *modus operandi* of each is sometimes sharply different. The key appears to be in focus of such endeavors, for here it is not what one can learn about biology (or any other specific discipline) but rather what that discipline can bring to bear on a particular issue or problem. That is, environmental study is a problem-focused arena; it is such in investigation and, in consequence, it is so in its educational component.

Problem-focused education is a significant new direction in undergraduate, as well as graduate, education. CUEBS is pleased to bring to your attention some of the ideas and patterns which have taken shape in a variety of institutions in converting rhetoric to reality, in implementing well-stated goals, in pioneering new directions.

EDWARD J. KORMONDY
Director, CUEBS
January 1972

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INTRODUCTION AND ANALYSIS

Background

Much that has been written in recent months about higher education has been justifiably critical of the existing patterns and modes of the educational experience; particular emphasis has been directed to the lack of both inter- and intrainstitutional diversity. Most of the critics are calling for new directions and approaches. Similar but more piercing calls are coming from the students themselves. Among the responses to these demands are interdisciplinary programs dealing with environmental problems. While some of these programs have been operating for a number of years, most of the more comprehensive developments are of quite recent vintage, largely occurring during the past 2 to 3 years. The literature available on these programs deals to a large extent with the rhetoric of intents and goals. Precious little has been written of the nuts and bolts of genesis and operation or the nitty-gritty of successes and failures, of problems and their resolution. This type of assessment has been precluded because of the recent start of many programs. Now, however, the needed time perspective is at hand for a first round of self-appraisal. This compilation of program statements has been prepared to fill partially the information gap about these programs.

Another prompting to initiate such an assessment has come from numerous conversations over the past few years with colleagues in institutions that have a history of working with interdisciplinary programs. Emerging from these discussions was the felt need for greater understanding of the problems and opportunities that exist in environmental studies, and particularly as they relate to priorities for action within the next few years. Beyond the efforts of several institutions, it is evident to even the casual observer that there is a lack of any significant interinstitutional effort to respond to environmental issues. But, why this should be expected when it occurs so very infrequently in connection with other academic matters and programs is itself an academic matter.

In order to provide some information on these areas of interest and perhaps illuminate items that warrant additional examination, 20 institutions were selected that appeared to highlight the range of issues that characterize different institutional responses to interdisciplinary environmental studies. During September and October 1971, statements were prepared by program personnel from the following 15 institutions: College of the Atlantic, Dartmouth College, Evergreen State College, Hampshire College, Huxley College (Western Washington State College), Indiana University, Pennsylvania State University, Prescott College, State University of New York at Buffalo,

University of British Columbia, University of California at Santa Cruz, University of Michigan, University of Wisconsin-Green Bay, University of Wisconsin-Madison, and Williams College. The statements are based on the format which appears below. The format evolved from an effort to determine those aspects of institutional plans and achievements that were not adequately discussed in the generally available literature. Two institutions (College of the Atlantic and the Evergreen State College) found some of the format inappropriate because their programs are still in the early stages of conception or development.

A. *What were the original goals of the program?*
Under this heading we hope you might address such aspects as the institutional antecedents for the center, the source of the original initiatives for the program, whether they were individual or community inspired, and what was the approximate lag-time between deciding to proceed with the program and in fact implementing the program.

B. *To what extent has the program evolved and in what way has it been modified?*
Here it would be particularly helpful to have some response as to why the program was modified. For instance, was it a question of experience gained in conducting the program; a poor response from a constituency group in support of parts of the program; lack of anticipated funding or what?

C. *How does the program or center relate to the other college and university activities?*
Clearly, this must deal with various categories within the institutional context. For instance, is the activity essentially a coordinating or clearinghouse operation; or does it facilitate the development of programs within other departments; or does it in fact promote basic change within the institution itself? What are its activities under the headings of undergraduate, graduate, and continuing education? To what extent does it deal in research projects? Is there a community service function? And how do all of these relate to each other? To what extent has the development of the program been affected by other interdisciplinary programs or, in turn, in what ways has it affected existing or proposed programs?

D. *To what extent have the administrative or institutional governance issues been a factor in the development of the center or program?*
Under this heading, for instance: what is the relationship of staff to the center and to the university? How is staff recruited and assigned? Who controls promotion and salary positions and how is tenure granted?

E. *What are the particularly difficult problems that the center has had to deal with?*
This area may very well be treated under any of the categories above, but it would be helpful to have them highlighted in this separate section. For instance, the questions of levels of funding, recruitment of

staff, or community resistance to programs might well be significant deterrents to the successful implementation of the original goals.

F. *What are the priorities for the future and why were they chosen?* Here the questions may deal with either substance, such as particular research projects and educational specialities, or organizational issues such as the way the center relates to other activities and sectors of the university.

Finally, it would be helpful if you would suggest items for a *short* bibliography that you feel are unusually useful in explaining and thinking about these issues.

At the outset of this project someone suggested that in seeking reports of programs from program staff, biased, self-serving statements would be received. Largely, this has not been the case. Instead, the reports appear to establish some sense of the community of interests that surrounds interdisciplinary studies related to environmental quality; the caliber of individual and basic interests of the various programs exceeds the desire and need for public relations information.

Analysis

Direct or quantifiable comparisons of the programs was not sought nor would the discursive nature of the statements submitted support such efforts. Our interest, at this stage, was in acquiring subjective assessments of a variety of programs dealing with environmental issues. With this in mind, institutions were selected that represented a broad range of programs. Quantifiability was neither an expected nor a desired outcome.

The possibility of a thorough-going analysis is further complicated by informational gaps, intentional or otherwise, that appear in the statements. Only through individual follow-up could such gaps be removed, a project which we hoped could be more clearly considered as a result of this compilation of statements. In spite of these inherent and anticipated limitations, some general observations can be made about the various modes and patterns emerging in these programs. They are advanced with due temerity and with the confident expectation that the reader will more likely consider the individual statements that follow.

Original Goals. Program genesis extended from faculty only to administrative only to all intermediate degrees of faculty-administrative initiative as well as to interaction with outside funding agencies. In the large universities, program focus ranges from exclusively undergraduate to exclusively graduate/faculty, again with various degrees of undergraduate/graduate orientation in between. Some programs serve largely a fund-granting or fellowship-awarding function whereas others are concerned with research activity only. Few programs are coordinative only; most are multi-functional over the range of teaching/research/community orientation. With all their differences in objectives, the common thread is an interdisciplinary attack on whatever a particular program defines as its *raison d'etre.*

Educational programs range from those of a heterogeneity of courses already available in existing departments to a rather highly structured core curriculum, from broad-based, generalized directions to combinations of the

comprehensive with discipline competence. Some offer double degree programs, but most do not offer degrees under their own aegis.

Program Modification. Remarkably, on this point there is essential unanimity: little or no modification of a substantial sort is reported with regard to the original plans of the programs. At least one effort was based on a programmed evolution or modifications developed from experience. However, while program goals have not been altered, it is noted that the tactics and strategies for achieving these goals have shifted in several cases. Consideration of how these changes in game plan might implicitly affect basic goals would be pure speculation if based on the data in hand. This might be an area well worth further exploration and analysis.

One of our basic concerns in undertaking this project was to focus some additional light on the problems of institutional change as it relates to interdisciplinary environmental studies in higher education. Clearly, many of the programs included here have not been in operation long enough to warrant critical assessment and modification of their operations. Nevertheless, when the original goals are compared with the problems and the priorities identified, it appears that the time for a review of goals and strategies is close at hand. Of course, it is understood that to a large degree this is a continuing function of the process of administering a program. What we wish to suggest here as a product of our review of the statements is that a more objective review may be most useful. We do not underestimate the difficulties in achieving and utilizing such assessments. We do feel that one resource worth exploiting is the experience of others whose aims may be similar while their approaches are different. How this might be done is a topic that we feel is worth substantial thought, discussion, and action.

Relations with Other College Activities. Most programs appear to be very closely integrated with, and many are in fact entirely dependent on, other existing administrative/instructional units within the institution. Some, however, stand more independently, serving largely a clearinghouse and/or coordinative activity or fund-granting function. Most of the programs have a definite community orientation expressed in great measure through the vehicle of student research projects on matters of local or regional environmental concerns.

Governance. Autonomy to complete integration is the range: from one program with its self-contained faculty and control of all personnel and program, to joint faculty appointments (a rather common mode) to complete incorporation with other governance units, and, in between, small, essentially independent administrative units. In some, the curriculum is in the hands of the program whereas personnel decisions rest in what is commonly referred to as the "home department," a euphemism which indicates where the bread is really buttered.

Problems. Although one could quite readily anticipate that the major problem faced by new programs would be money, and in fact this was so identified by about half the respondents, it is noteworthy that several of the statements placed other issues as of more primary consequence (though it is doubtful any would admit to a surfeit of monies). Among the more salient of these kinds of major problems are: student insecurity in nondiscipline-oriented programs and student heterogeneity in core courses; absence of critical disciplinary inputs; inter- and intraprogram communication about the

nature of the program; too little input from the humanities faculty and student difficulties with an unstructured curriculum; building rigor into programs; administrative structure; generation of substantial interdisciplinary research; integration of courses; and the gap between institutional capability and community needs. Perhaps many of these problems are common to most programs, but were not specifically identified by the respondents.

Priorities. Since funding was indicated as a major problem by so many, "fund-raising" might have been expected to have been a high priority item. This was not the case although it was so identified in one or two cases. Some priorities were of a more or less pragmatic sort, dealing with increasing the number of courses, seeking more student internships and field opportunities, developing new job opportunities for students, and pure survival. On a more idealistic note, others identified such priorities as getting students to make more responsible decisions, developing more public involvement, and marshalling institutional capability toward developing policy and practice.

Statements

This collection of statements may prove to be a significant step in developing a greater dialogue with regard to important questions in this area. It should lead to more in-depth studies of the common strengths and problems that face environmental interdisciplinary programs. If this report is on target, it should assist each center in doing the better job that we are all committed to achieving, as well as to aid those operating programs currently experiencing difficulties or those still being contemplated.

This report is a small step toward identifying and ultimately answering some large questions about the role of environmental studies in higher education. While every institution must chart its own course, the compilation of these statements provides useful data for existing and planned programs. At a minimum, it suggests some of the opportunities that environmental studies present with regard to educational responses to complex social problems. The data in these statements provide an agenda for further study and dialogue which directly relates to the interests of anyone concerned with education and environmental quality.

The statements which follow are presented in three categories (with the institutions listed alphabetically therein): large, multi-purpose universities; smaller, largerly undergraduate, liberal arts colleges; and experimental colleges. As a reading of the statements will demonstrate, in several parameters these are quite artificial distinctions.

ENVIRONMENTAL PROGAMS

AT

LARGE, MULTI-PURPOSE UNIVERSITIES

HUXLEY COLLEGE OF ENVIRONMENTAL STUDIES

Gene W. Miller, Dean, Huxley College
and
Frederick Sargent II, Provost, Western Washington State College

What Were the Original Goals of the Program?

Huxley College of Environmental Studies was conceived in 1966 by a group of administrators and faculty at Western Washington State College (WWSC). At that time the Long-Range Planning Committee, which is chaired by the President of WWSC, undertook a study of the feasibility of establishing a cluster college which would have environmental studies as its programmatic focus. The creation of a cluster college was an ideal arrangement for the initiation of an innovative environmental program (Gaff et al., 1970). Environmental studies are really adisciplinary. They involve bringing together of a faculty and initiating programs that cross many disciplinary lines.

On the basis of this, the Long-Range Planning Committee recommended to the Academic Council, in May 1967, the establishment of a cluster college to encompass upper-division and graduate study of the environment. Dean and faculty were to be appointed at the earliest possible moment. These recommendations were approved by the Academic Council and forwarded to the President in the spring of 1968.

In July 1968, the Board of Trustees approved the establishment of Huxley College of Environmental Studies and directed that environmental studies be given the widest possible definition, recognizing that man's environment extends from his immediate surroundings to the biosphere and includes not only physical and biological entities but also the social structure within which he functions and his cultural heritage which molds his behavior. The Board directed that the dean and faculty be appointed with broad curricular directives within which specific programs could later be developed, and that temporary quarters for the college be provided. In 1969, a dean was appointed and during that year, with the help of a committee of faculty members from Western Washington State College, curricular programs were outlined, and the first faculty members were recruited. The planning for permanent facilities to house this college, which had begun a year earlier, was brought to a conclusion.

The program conceived by the dean and his advisory committee was based on general areas of environmental studies called concentrations. A concentration constitutes a focus on a general problem area that might involve studies

in a number of disciplines. The areas were broad enough to allow the student to emphasize either social or natural science programs.

Huxley was to incorporate selected aspects of the liberal arts disciplines with certain applied or professional emphases. A coordinated program of undergraduate and graduate studies, research, and community involvement was proposed. The concentrations of study would be problem-oriented, but students could choose an option in a professional discipline. The concentrations of study were: (1) Ecological Systems Analysis; (2) Environmental Control; (3) Environmental Planning; (4) Hunger, Food, and Malnutrition; (5) Marine Resources; (6) Population Dynamics; and (7) Environmental Education.

These concentrations represent problems that confront man and society. A student seeking a degree in environmental studies would enter Huxley at the junior level. A major would not be selected in a concentration such as population dynamics. Students could tailor their programs emphasizing natural, physical, and social sciences or humanities within a particular concentration area. For example, a student could select a concentration-option of population dynamics-sociology; population dynamics-biology; environmental control-chemistry; etc.

Huxley students would receive instruction from both the Huxley faculty and the departmental faculties at WWSC. The former would work closely with students throughout their junior and senior years. They would be responsible for advising students and teaching a sequence of studies which included seminars, problem series, independent study, and formal courses. WWSC courses would also serve Huxley students.

All students would take certain core courses to give them a common background essential for comprehension of man, his natural and social environment, and his relation to the ecosystem. These courses would survey the major ecological principles and give examples of delicate environmental interactions and the effects of man on natural systems. Major evolutionary mechanisms and ecological factors affecting man would be discussed including population and pollution problems, behavior, social structure, economic systems, environmental law, political action, and social values.

Seminars would be taken in each quarter of the year and be designed to serve as a meeting ground for interaction between students and faculty. The objectives of these seminars would be to give relevance to programs and allow information flow among concentrations.

Problem series would be an important part of each student's program at both the junior and senior year level. This would allow students the opportunity to become involved in action-oriented programs. Students would react to problems in the community and participate directly in programs such as environmental planning, use of outdoor laboratories for training, urban renewal, pollution control, and effects of pollutants on organisms.

Students could prepare themselves for graduate work in a specific discipline or in environmental sciences.

The program in environmental education would allow students to select a specific concentration and, at the same time, provide them with competence in at least one established teaching discipline. In some cases a program would involve a combination of several concentrations. The environmental education program would include student teaching and field experiences starting

with the freshman year. Students would be equipped to make decisions and form policy. The structure of such programs would be flexible and allow individual students latitude in selecting their areas of emphasis. This approach to environmental education recognizes the need for more personalized counseling and advising in all 4 years of undergraduate study.

The first Huxley faculty was appointed and students accepted into the program in the fall of 1970. The lag-time between conception of the program and actual implementation was approximately 4 years.

To What Extent Has the Program Evolved and in What Way Has It Been Modified?

The program is still in its infancy and the original goals have not been changed. Projections at the present time envisage that within the next 5 years the college will have a full-time enrollment of 700 students and a faculty of 50. Of necessity, such a program is flexible and will be modified with the experiences gained in its conduct. Facilities are now under construction and fully developed graduate and undergraduate programs are not possible until such facilities are completed. By January 1973, Huxley College will be housed in the Northwest Environmental Studies Center on the campus in Bellingham and in the Shannon Point Marine Center at Anacortes.

How Does the Program or Center Relate to the Other College and University Activities?

The undergraduate program of Western Washington State College is comprised of four distinct academic divisions; Huxley College of Environmental Studies is one of these divisions. Huxley students receive instruction from both Huxley faculty and the faculties of the departments of the College of Arts and Science. Their programs may be made up of courses from either or both areas. Graduate programs in Huxley College have not yet been initiated but are proposed for the fall of 1972. Such graduate programs will be administered by the graduate school.

Research is an important aspect of the overall program at Huxley College. All faculty members are encouraged to develop investigations both at undergraduate and graduate levels.

Environmental education is all education; consequently it must include elementary, secondary, college, and adult education. Adult education programs including in-service training of teachers are coordinated through the Center for Continuing Studies for all units at WWSC. Programs in environmental education are initiated and implemented by Huxley College, sponsored by Continuing Studies, and made available to communities in this region. By the very nature of its programs, Huxley College is problem-oriented and community involvement is an essential component.

The environmental problems that confront the world today also affect individual communities. These problems must be understood and dealt with by all concerned individuals and citizen groups. Huxley students with the cooperation of community participants have organized a Huxley Environmental Reference Bureau (HERB). The goal of HERB is to provide free information relating to the environment on request from anyone or any group in Whatcom County or surrounding areas. Responses from local community groups as to types and kinds of environmental information which

would best serve their goals are solicited. HERB is also interested in maintaining correspondence on a regular basis with any group or organization which may be of assistance in the achievement of its goals. A HERB recycling center has been started; it operates with voluntary help. This center is a pilot project that could later be used as a pattern for a community recycling center. Individuals that are really concerned with their environment are invited to aid in the recycling process by bringing all types of metal cans, newspapers, magazines, glass, etc. These materials are sold to distributors. The proceeds are used to improve the operation with a view to making the center self-sustaining.

In 1970 the State Superintendent of Public Instruction identified the efforts of the Northwest Environmental Education Center (NEEC) as a state model which could provide other regions in Washington State with both plan and program. NEEC is now advisory to the Huxley Environmental Education Center. The State Superintendent has housed an environmentalist in Huxley College to help coordinate the State Plan in environmental education in the Northwest region.

To What Extent Have the Administrative or Institutional Governance Issues Been a Factor in the Development of the Center or Program?

Within the regulations set by the Trustees, the President, and the Provost pertaining to general policies governing curricular programs, college personnel, and students, Huxley College has autonomous control over its faculty, which includes its selection, retention, tenure, and promotion. New faculty are recruited by committees established within Huxley College. Their assignment in teaching and research activities is through the dean of the college. Each separate academic unit at WWSC, including Huxley College, has a special committee that evaluates its faculty members for promotion and tenure. Recommendations are made from the Huxley committee to the dean of Huxley College. All administrative academic functions at WWSC are the responsibility of the Provost. A council of academic deans advises the Provost in matters concerning curriculum, budget, and appointment, promotion, and tenure of faculty.

Since at WWSC an entire college has a focal point on environmental studies, many problems are alleviated that would have to be confronted in a typical center or institute. Most faculty members have full-time appointments in the college. Some joint appointments between the college and other academic units tend to strengthen ties throughout the institution. The perplexing problem of crossing departmental boundaries in programs of environmental studies has been alleviated by an adisciplinary college where faculty members with diverse backgrounds come together and work toward a common effort of implementing the programs. Other problems have been alleviated by giving the dean of Huxley College the opportunity to coordinate environmental studies on campus. This involves such environmental units as a marine station, freshwater institute, and environmental education sites. With proper input from various departments and other colleges, this tends to utilize all of the available talent on campus for environmental programs.

What Are the Particularly Difficult Problems That the Center Has Had to Deal With?

Huxley College is a unit of WWSC and receives its funding from the state. As an academic unit, funding is provided by established budgetary formulas based on student-credit hours, full-time faculty equivalents, and facility utilization. Under these conditions, any developing academic unit in the State of Washington has difficulties in acquiring adequate funds for academic programs and facilities. Funding has been the only really significant problem to date. Surprisingly, there has been no feeling of insecurity among a faculty not housed in traditional departments. It has been our experience at other institutions that such feelings have been quite marked. Some insecurity among students has been noted in relation to absence of traditional departments. The heterogeneity of student backgrounds has been a problem in core courses.

What Are the Priorities for the Future and Why Were They Chosen?

The college was named for Thomas Henry Huxley, a member of a family of eminent British scientists and writers. The following quotation (by his grandson) gives a philosophical cornerstone of the college:

> Sooner rather than later we will be forced to get away from a system based on artificially increasing the number of human wants and set about constructing one aimed at the qualitative satisfaction of real human needs—spiritual and mental as well as material and physiological.
>
> Sir Julian Huxley, *The Humanist Frame*

With this long-range goal in mind, the educational objectives of Huxley College are at least threefold: to enable concerned students to obtain the information essential to making responsible decisions and predictions concerning environmental problems; to identify alternatives open to society and define the common elements of the kind of life to which society aspires; and to provide in certain areas intensive instruction that may be incorporated into the student's vocational plans. Understanding man's ecological relations demands study in many disciplines. Huxley College, consequently, offers multidisciplinary study encompassing all of the physical, biological, and social dimensions of environmental problems. The contemporary demand for educational relevance requires that Huxley graduates understand not only the workings of our environment but also ways in which environmental order may be maintained. Problem-oriented study is stressed at Huxley and concepts from a classroom are applied to specific and real situations.

Huxley was formed recognizing the very special educational advantages inherent in the location of WWSC in Bellingham. Within a 100-mile radius lies an unrivaled variety of environmental conditions: salt water, estuarine and freshwater habitats, lakes and rivers, mainland and islands, farmland and forest, alpine meadow and glaciers, and rural communities and industrialized urban centers. Because of these opportunities and the close proximity of the marine environment, research and teaching will always emphasize these natural resources and their uses by man.

THE ENVIRONMENTAL STUDIES PROGRAM AT INDIANA UNIVERSITY

Lynton K. Caldwell,
Arthur E. Bentley Professor of Political Science
and
Toufiq A. Siddiqi, Visiting Assistant Professor
of Environmental Studies

Goals of the Program

The need for an interdisciplinary program dealing with the influences of science and technology in society, with special emphasis on the human environment, had been recognized at Indiana University for several years. As early as 1963, individual faculty members had submitted memoranda to the University administration urging attention to this neglected area of human experience. A joint proposal to establish institutional arrangements for interdisciplinary environmental studies was initiated in 1965 by Professors Thomas D. Brock (Microbiology), Lynton K. Caldwell (Political Science), and Richard B. Curtis (Physics). However, it was not until the summer of 1970 that support for such a program reached a "point of critical mass" and moved to an action phase.

The initiative for the program clearly came from the faculty and at first received sympathetic but noncommittal administrative support. Two factors influenced University receptivity to the idea in the 5 years between 1965 and serious consideration of proposals in 1970. The first of these was a marked change of attitude in the natural sciences. Skepticism of the need or feasibility of an interdisciplinary approach to environmental problems gave way to a widespread concern that scientific knowledge be applied to environmental issues upon which the government was beginning to act. The second influence was the discovery of ecology and the environment by great numbers of students, especially during 1969. Environmental studies seemed to offer a partial answer to their demand for relevance in higher education.

In a memorandum outlining a tentative program, submitted by Professor Lynton K. Caldwell to the Dean of Research and Advanced Studies in May 1970, it was pointed out that the University lacked several of the professional schools or disciplines essential to consideration of the technical aspects of environmental management, e.g., engineering, agriculture, forestry, wildlife management, natural resources administration, architecture, landscape architecture, and environmental planning, and that the contribution of Indiana

University could most effectively be made in the policy area, notably with an emphasis upon law, economics, business, political science, and sociology.

A meeting of the natural sciences faculty was convened in July 1970 on the initiative of Professor Warren Meinschein (Geology). As a basis for discussion, a representative of each of the disciplines and a Regional Campus representative were invited to make brief presentations. There was unanimous agreement on the desirability of a program, but several questions remained unanswered. Should degrees be given in environmental studies? Should double majors (of which environmental studies would be one) be awarded? Should the student select a specific major, with a minor in environmental studies? Should undergraduate or graduate degrees be awarded, or both? Representatives from each discipline were asked to bring specific proposals to the next meeting.

Due to the absence of several members during the summer, the next meeting of the ad hoc group was held in September. Environmental programs at other major universities were studied and relationships among relevant existing courses at Indiana University were discussed. It was decided to appoint a curriculum subcommittee under the chairmanship of Professor Craig Nelson (Zoology).

The Program submitted by the subcommittee was approved with some modifications at a meeting held on November 3, and it was presented to the Science Advisory Committee the following month. After approval by the University administration, the Environmental Studies Program was included in the list of offerings of the College of Arts and Sciences for the Fall Semester 1971. Since the program is being offered for the first time in the current academic year, it is too early to evaluate possible modifications.

Relationship of Program to Other University Activities

It was felt desirable to initiate an undergraduate environmental studies program within the existing structure of the University, and to offer "double major" degrees to students in the natural and policy sciences. Students receiving degrees in the program must major in an established discipline as well as in environmental studies. Two options are available in the program—one is meant primarily for the students in the biological and physical sciences and the other, for students in social or behavioral sciences or the humanities.

Most of the required courses are offered by the individual departments, but the program will supplement this by offering interdisciplinary courses of its own. Graduate degrees and community services are not within the current scope of the Environmental Studies Program, but a School of Public and Environmental Affairs has been proposed at Indiana University and if established, as now appears probable, will undertake these activities:[1] A large

[1] According to an addendum filed by Dr. Caldwell on February 1, "... on January 14, 1972, the Indiana State Commission on Higher Education confirmed earlier action by the Board of Trustees of Indiana University establishing a School of Public and Environmental Affairs. The new School is established particularly to provide an appropriate home for interdisciplinary research and teaching, and it will afford the institutional base for the Environmental Studies Program at Indiana University. Unlike the other schools, which are the major divisions of Indiana University, the new School will not be organized around academic departments. Its work will develop through projects and programs and will be carried on not only on the oldest and largest campus at Bloomington, but will also be established on other campuses of Indiana University throughout the state, notably at Gary and Indianapolis."

number of graduate courses dealing with various aspects of the environment are now offered at the University, so the basis for a graduate level program already exists.

Among several interrelated interdisciplinary programs at the University is the Program on Science, Technology, and Public Policy, which was initiated in 1965 with the help of a grant from the National Science Foundation. Members associated with this program have been very closely associated with the development of the Environmental Studies Program. The Director of the Science, Technology, and Public Policy Program, Professor Lynton K. Caldwell, has been one of the prime movers behind the Environmental Studies Program. One of the two appointments made so far, the appointment of Visiting Assistant Professor has been made jointly by the two programs.

Administrative Factors in the Development of the Program

At present, there are only two staff members directly connected with the program. Its Director, Professor Craig Nelson, is an Associate Professor in Zoology. Dr. Toufiq A. Siddiqi has an appointment as a Visiting Assistant Professor jointly with the Program on Science, Technology, and Public Policy. Additional staff will be appointed as the Program develops and budgetary considerations permit.

The impending establishment of a new School of Public and Environmental Affairs will provide an institutional setting conducive to closer working relationships among several interdisciplinary-type programs. Among these are public administration, urban and regional planning, policy studies in science and technology, natural resource studies, and public safety and forensic science. Emphasis is being placed on structural arrangements that will be readily adaptable to change in substance and focus over the years. It would be consistent with tradition at Indiana University to provide wide opportunity for the new School to define its mission and to evolve through experience. As Vice President for Administration, David R. Derge observed, "we want to be sure that our forms are 'right' before pouring concrete."

Unlike all other Schools within the University, it is anticipated that the School of Public and Environmental Affairs will be decentralized among Indiana's regional campuses, notably at Bloomington, Indianapolis, and Gary. Intercampus coordination would be provided by a representative council or committee with an all-University dean or chairman as its presiding officer. The School is expected to optimize the use of existing course offerings and facilities. It would help to promote such coordination as might prove desirable among campuses and related programs. It would supplement departmental faculty with a relatively small staff of its own and would assist other divisions of the University to strengthen the environmental content in their programs. It would serve as a clearinghouse and in cooperation with other departments and schools develop graduate, undergraduate, and community service programs of its own.

Some Problems Associated With the Program

The Environmental Studies Program shares with other interdisciplinary programs the problems inherent in an undertaking which cuts across the traditional departmental structure of a University. The physical separation of faculty members on a large campus hinders continuous communication be-

tween them, and is a barrier to joint undertakings by multidepartmental groups. The reward structure of the departments is also geared to encourage research and teaching in the traditional disciplines, rather than in groups of an interdisciplinary nature.

Although it would have been desirable to recruit additional faculty and offer more courses directly under the program, this has not been possible because of budgetary considerations. The University administration shares with the faculty and the students the desire to strengthen the program, but the current tight allocations to the University (a feature common to universities in most parts of the country) necessitate a gradual buildup of the program.

The absence of certain fields of study such as engineering, agriculture, and architecture places limitations on the scope of the Program. It is also at a disadvantage as far as library resources are concerned, since many of the books and journals dealing with the environmental aspects of these fields have not hitherto been available on the campus. Interuniversity cooperation possibly under the sponsorship of the Committee on Institutional Cooperation (CIC) may help to fill certain gaps in the environmental programs of the cooperating universities and to optimize the utilization of their total resources.

Priorities for the Future

It is planned to increase the number of courses offered under the program, primarily under the auspices of the individual departments. Implementation of the plans for a School of Public and Environmental Affairs would give a strong impetus for the initiation of a graduate program and community services in the environmental field.

It is too early to say what priorities may be adopted when the present phase of institutional establishment is completed. But given the present structure and past history of Indiana University, emphasis is likely to be on policy rather than upon technique. The consideration and projection of priorities over the next few years will surely be one of the first major tasks for the School of Public and Environmental Affairs.

OFFICE OF ENVIRONMENTAL QUALITY PROGRAMS
THE PENNSYLVANIA STATE UNIVERSITY

Richard D. Schein, Director

Original Goals and Evolution of Programs

To understand the mission and role within the university of the Office of Environmental Quality Programs at the Pennsylvania State University a certain amount of background is necessary.

The Office of Environmental Quality Programs is not a supra-college organizational structure with its own programs of education, research, and public service. It results from a year-long analysis of the state of university activities in environmental affairs, an analysis which revealed that although the University is highly active in many environmental areas, it has a great deal of unrealized potential. Through use of its existing structure, we must attempt to utilize this potential before deciding to develop a super institute or a special college of environmental studies. We find, for instance, that within existing departments and colleges we have a great degree of expertise in such areas as sanitary engineering, meteorology, ecology, forestry, and other such environmental areas. Further, we recognize that some of our colleges are multidisciplinary units themselves. This is certainly true of the College of Agriculture which can itself undertake environmental studies of a broad multidisciplinary nature, utilizing largely its own faculty since that faculty has competence in such diverse areas as biology, geology, hydrology, soils, sociology, and economics. Similarly, the College of Earth and Mineral Sciences has broad and deep competence in geology, meteorology, geography, economics, mining, etc.

In addition, it was decided some years ago to establish intercollege research institutes whose mission and work clearly transcended collegiate lines. We have a number of years experience, therefore, with the Center of Air Environment Studies, the Institute for Research on Land and Water Resources, which institute contains the Pennsylvania Water Center, and the Pennsylvania Transportation and Traffic Safety Center. The staff of these institutes is drawn largely on a part-time basis from the departments of the University and graduate students involved in the research of the institutes have as their preceptors institute faculty who have bona fide appointments in academic departments in which the degrees are taken.

What our analysis did reveal was a clear need for the development of further cooperation to facilitate the accomplishment of missions of the intercollege research programs. Further, we saw that there should be a coordination office within the central administration to take the initiative and leader-

ship in developing further intercollege programs of undergraduate and graduate instruction and of public service activities such as continuing education, public information, television and films, etc.

The Office of Environmental Quality Programs, therefore, is that office within the structure of the central administration which functions to coordinate existing work, to facilitate the development of existing or new programs, to identify capabilities latent within the University and assist in the development of these, and also to identify needs of society to which the University might respond and then to assist in the development of the appropriate response.

Relationship of Program to Other University Activities

Monies available to the office are allotted by the Director with the advice of advisory committees to existing intercollege multidisciplinary research programs, to intracollege multidisciplinary programs, to intercollege undergraduate and graduate education programs, and to other intercollege multidisciplinary operations such as the development of advanced ability in technology transfer in environmental areas. (Because this is not a discrete interdepartmental program in competition with other interdepartmental programs, but a transcendent operation of coordination, facilitation, and cooperation, it is not possible to answer most of your questions under this item.)

The Office of Environmental Quality Programs does not have a staff actively engaged in research, education, etc., because it does not have such programs of its own. What the office does instead is to help in the development of those programs which are extant in other parts of the University, helping to achieve the necessary multidisciplinary cooperation. Often it is able to do this simply because it has money available to assist in the development. This kind of operation then means that all of the problems of promotion and salary (and, generally, of the reward structure) are in the hands of the normal university components and we have not created new problems in this regard.

Difficult Problems

Perhaps the largest problem that the Office of Environmental Quality Programs has had to deal with has been to bring people to the understanding that we are *not* a super institute, that we are *not* staffing up with people redundant with other departments or centers, and that we are *not* going to compete with existing components of the University for funds or for students or for money. Instead, we are here to assist in coordination and, as a matter of fact, to provide seed money for interdepartmental, multidisciplinary, cooperative efforts in instruction, research, and public service.

Priorities for the Future

Our priorities for the future are to do all we can to develop greater capability on the part of our university to muster all of its necessary resources for an attack on environmental problems. We recognize that the role of the university is not that of an action agency but is, rather, to provide for society an agency which can operate with disinterest and with third party credibility

in the development of policy and practices which will result in wise policy, wise law, and fair regulation.

We are fostering two new intercollege research centers, one for the study and development of environmental policy and a second for the study of environmental noise. In each case we have recognized that this intercollege mechanism is what is needed if we are to bring together the many kinds of disciplines from the many departments and several colleges necessary for effective work in each of these areas.

We are further giving considerable attention to our programs in extension, continuing education, and technology transfer and are once again trying to utilize our experience, staffs, and abilities in agricultural and home economics extension, in general extension and continuing education, and in such activities as public information, television, radio, etc.

We are finding that our office discovers interfaces and opportunities which are not apparent to the people working in more restricted subsets of environmental problems and we are often able to achieve synergism in both activity and monies available. A further role being developed for the future by the office is as the advocate of environmentally concerned faculty and students within the central administration, speaking with a credible voice for the further development of necessary adaptive programs, education, research, and public service.

RACHEL CARSON COLLEGE AND ITS PROGRAM OF ENVIRONMENTAL STUDIES STATE UNIVERSITY OF NEW YORK AT BUFFALO

John A. Howell, Master

Environmental problems have often been caused through a narrow perception of the world—a perception which leads to solutions to a problem formulated from the standpoint of single discipline. The scope of environmental education should, in consequence, encompass the totality of the educational experience, bringing in the complex relationships and interconnections which influence our surroundings. Such concepts must begin with an individual's awareness of the connection between his own conscious decision process and his own environment on both the micro- and the macro-scales. We thus envisage environmental education as containing a heavy component of active as opposed to passive learning. This action can be within or without the classroom's conceptual exercises or manual exertion. The first necessity is to place the student in the situation where he can perceive conflicts between his own decisions and his environmental beliefs.

Rachel Carson College undertakes to promote awareness and understanding of the environment and how it operates and interacts with man, and also undertakes to work toward creating a better environment. We believe that in order to promote environmental awareness we must have a multidisciplinary perspective and close cooperation between disciplines, since an understanding of more than one discipline is essential to our studies. The College intends to further educational programs through the classroom, the laboratory, field work, and in the community. To promote environmental awareness we intend to take every opportunity to generate concern both within the community and the university. To further this aim, we propose to work on problems relevant to, and posed from within, the community, thus furthering the service role of the university. Initiatives from the community might originate with legislators, community action groups, concerned individuals, industries, and regulatory agencies.

The Original Goals of the Program

A new campus is being built for the State University of New York at Buffalo which is intended to serve some 40,000 students. To counteract some of the problems of identification associated with a multiversity, former President Meyerson proposed that a number of "colleges" be created, each catering to some 1,000 students of whom about 400 would be in residence. Collegiate workshops were formed in advance of the move to the new campus

so that the viability of various collegiate concepts could be evaluated. In this context, the Ecology Collegiate Workshop was formed in the fall of 1969 in response to proposals from several faculty groups. Several working sessions were held during that fall semester, and in the spring semester of 1970 the first credit-bearing program was offered to about 50 students. It was a program of independent investigation into the environmental problems of the local community, with some 15 faculty supervising the various student investigators. Student demand was such that registration was closed on the first day. Another large effort of the workshop at this time was in producing a 3-day Earth Week Program.

Up to this point the workshop had been proceeding without any long-range plan or philosophy. We had a general awareness that we wanted to offer an interdisciplinary program, but we were also aware that there were minimal institutional resources available (the first year's budget was $1500) and it was not clear how much could be done. A faculty-student steering committee was formed in the summer of 1970 under a Mentor and the College was named after Rachel Carson and pledged to a philosophy of interdisciplinary education.

A number of faculty members then combined forces to offer an interdisciplinary summer course called "Survival Workshop," based on John Fisher's article in *Harper's* "Survival U." In addition, we inventoried all existing environmentally related courses offered in the University, dividing the courses into four general areas of knowledge. These areas representing four environments of man are shown in Table I.

TABLE I

	Man Made	Not Man Made
Animate	Sociological	Biological
Inanimate	Technological	Geological

Only a few courses in the inventory were in more than one of these areas. We suggested that students who wished to understand man's total environment should have some acquaintance with each of these four areas, with deeper knowledge of two of the four.

The Evolution of the Program and Subsequent Modification

The first step was to start using a general university degree program, known as a special major, in which any student may design his own major with the approval of two faculty advisors and the Dean of Undergraduate Studies. Based on the course inventory, we designed a framework for a major program within which students could plan an environmental studies degree to be sponsored by at least two members of the faculty of the college. Although we hoped that we could offer several courses in this program through the college, it became clear that, since the faculty were still all teaching full-time in their various departments, it would be more economical to have the new courses offered by our faculty through their own departments, as part of their regular teaching duty. This method was in fact used with three new

courses in the fall of 1970. It is hoped that a number of other new courses can be created in this way.

It became apparent, however, during our second year that making use of predominantly existing courses to provide the basis for the environmental program was an error. The existing courses, although environmentally relevant, were hard to piece together into a coherent program. Thus we are planning to institute six new courses to complete an eight-semester program. This sequence will be taken generally as an elective program by a student majoring in a traditional discipline, or as half of an Environmental Studies major—the remaining courses to be concentrated in one or two existing disciplinary areas.

The Relation of the College to the University

The college is totally dependent on the rest of the university for most of its program. The new eight-semester sequence will be taught through regular departments or faculties although some courses are so multidisciplinary that they will probably be team-taught on overload. These courses will be:

1. Environmental Problems — Resources, pollution, population, etc.
2. Ecology
3. Comparative Societies I — Egypt, Peru, Japan, Norway.
4. Comparative Societies II — USA, USSR, India, Nigeria
5. Agriculture and Human Nutrition
6. Human Settlement
7. Pollution Control
8. Tactics and Strategies for Environmental Change.

Details of these courses follow.

1. Scope of Environmental Problems—A broad introductory survey, covering natural cycles, energy and mineral resources, air and water pollution, natural environmental change.

2. Ecology and Behavior—A standard course in population, evolution, and ecology suitable for nonbiology majors.

3. Comparative Societies I—A study of four societies—their physical environment and adaptation to it as reflected in the sociology, anthropology, and political and economic structure of the country. The societies studied will depend on the available faculty with detailed knowledge. Initial plans are to study Tokyo, the Province of More og Romsdal in Norway, the Peruvian Altiplano, and the swamps in Nigeria.

4. Comparative Societies II—(as C.S.I.) studying Los Angeles County USA, Ural Mountains, The Nile Delta, and East Bengal. Hopefully, some students will be able to spend a summer visiting one of the societies studied. Subsequent courses in the sequence might emphasize, or choose examples from, the societies studied here.

5. Agriculture, World Food Resources, and Human Nutrition—A course detailing the potential growth of agriculture and food production on a worldwide scale. Regional problem areas will be noted and the different solutions possible in the different regions. The incidence and distribution of deficiency diseases will also be discussed. This will lead to planning future action based on a critical assessment of the Indicative World Plan of FAO.

6. Human Settlement—The form, structure, and function of human settlements, their location as a function of environment. Soft and hard support systems. Recent proposals for new types of settlement; the megalopolis; acropolis and an introduction to ekistics. Urban Migration—its causes and effects.

7. Pollution Control—Technological solutions to some of the problems of environmental pollution in both developed and developing areas. Techniques of recycle and reuse of resources.

8a. Tactics and Policies for Change—The methods of effecting change in the short term: legal and political changes. Myths and fallacies surrounding attitudinal changes. How economic policies can change the environment. Policy-making.

8b. Strategic Environmental Policies, seminar format.—The long-term policies which must be instituted to maintain environmental quality. An analysis of the macroscopic forces acting on society and synthesis of various simulated futures following certain strategic environmental decisions.

The new core curriculum will be taught in such a way as to maximize student participation and teacher learning. A *resource room* will be established in which course-related materials will be made available to students. Such material may be written, on tape, or on film and would be available at least 12 hours a day to be used in place. As part of the course assignments, students would produce material which would be designed for addition to the resource room if it were of sufficiently high quality. To maintain quality each student's project would be evaluated up to four times during the semester, so that he would be given the opportunity to perfect his work. The final grade would depend only on the final product. Acceptance into the resource room would be indicative of excellent work. The resource room would be continually reviewed to prevent accumulation of unsuitable material. It would thus be possible for any diligent student to earn an A on this project while the multiple evaluations would automatically enable the student to know what was expected. In addition, the use of the room will be encouraged by the assignment of papers based on material available in the room. Students using this scheme can get a feeling that their work would last beyond the final and would have some educational purpose and value to a larger number of persons.

Community awareness can be promoted by having materials prepared which apply particularly to the local community, using techniques taken from studies on other communities.

Some materials which will be used to start the resource room include tapes of sessions of AAAS meetings, environmental film loops, annotated bibliographies, and a number of books and periodicals. Some assistants would also be hired in the beginning to help assemble and run the room.

An unplanned development has been the emergence of "new life-style" courses. We were approached by a gentleman who had educated himself on wild foods, and organic gardening, and cooking, which he proposed to teach as a course in "Organic Survival."

The life-style courses are peculiarly college courses as it is the unique ability of the colleges to offer courses outside the main stream of departmental disciplines which gives them much of their educational flavor. It is planned to integrate several of these courses into a form of Outward Bound curriculum, possibly taught as summer courses, i.e., one summer to be spent on an organic farm, another in a wilderness area, etc. The life-style curriculum centers around the "Organic Survival" course and is intended to teach sensitivity to the natural environment and the ability to survive in wilderness areas. We hope to add courses on primitive camping, subsistence farming (organic), and wilderness hunting and fishing this coming fall. All of these classes will be small (less than 20 students) and will emphasize practice rather than theory. Organic Survival and Wilderness Survival were given in the summer of 1971 as intensive 3-week courses on a subsistence farm in West Virginia. In the fall of 1971, a wooded area will be available for these courses.

As far as graduate programs are concerned, there is nothing being done currently by the College, although the University is making some moves toward having graduate degrees in Environmental Studies with which the College would be concerned.

Research projects are conducted through independent study, taking the form of individual investigations into fairly small problems. The College does not appear to be the appropriate vehicle for initiating large interdisciplinary research projects.

The seminar program has been fairly light in 1971, except for an international 2-day conference on Technogenic Diseases, co-sponsored with the Office of Credit Free Programs. Four multidisciplinary symposia were given on the topics of Aerosols, Toxicity, Urban Overcrowding, and Noise Pollution. These sessions were keynoted by Dr. Jesse Steinfeld, Surgeon General of the United States.

Problems

Funding has remained low and enables us to pay one-third of a faculty member (the mentor) or a graduate assistant and one-half a secretary and some undergraduate assistants. All other faculty time is donated. Fortunately, we have extremely good relations with the faculty, the administration, and the Buffalo community (at a time when the university as a whole has many problems). Further funding is, however, essential if we are to survive beyond a further 12 months.

Priorities for the Future

Development of the coherent sequence of courses, resource room, and working center are most important. Also, proceeding with such projects as the development of environmental curricula for elementary and secondary schools (started in summer of 1971) and preparing educational materials such as films take priority.

RESOURCE SCIENCE CENTER
UNIVERSITY OF BRITISH COLUMBIA

C. S. Holling

Goals of the Program

In 1968 a Resource Science Centre was established at the University of British Columbia, with the support of a development grant from the Ford Foundation. Its intent was to join the activities of major groups on the campus interested in resource science. At the moment, these groups comprise elements of Agriculture, Architecture, Community and Regional Planning, Commerce, Ecology, Resource Economics, Geography, and Forestry. In total, therefore, we represent a very broad spectrum of interest that ranges from a concern for theoretical ecology through studies of the dynamics of communities of aquatic and terrestrial animals, the dynamics of populations, and behavioral and physiological ecology to resource management, geography, and planning. The emphasis primarily is on graduate training and research with the major intent to develop interaction between these various disciplines, to stimulate truly interdisciplinary research, and to introduce new techniques of mathematical analysis and synthesis that have emerged from the development of computers.

There was a very short lag time between deciding to proceed with the program and, in fact, implementing it. This was only because we adopted a very pragmatic approach rather than insisting on inclusion of every discipline relevant to Resource Science programs. We concentrated first on identifying individuals throughout the University who already had an interest and commitment. Unity of purpose among individuals is more important than an idealized spectrum of disciplines. In fact, the disciplines represented by these individuals did cover quite a broad range and it was our hope that any success we had would attract, as a natural evolutionary process, other groups whose talents are essential.

Program Evolution

The history of separation between the relevant disciplines has been long enough, however, to make it unlikely that the kind of interaction we wished would emerge through simple administrative fiat. Rather, we established a five-phase program that would proceed by a series of modest steps to gradually increase the cooperation and interaction between the disciplines. Throughout, we emphasized the benefits of cooperation around specific programs in graduate training and research and placed considerable emphasis on

the value of computer simulation languages and techniques as a common language through which the separate disciplines could communicate.

Step 1: Graduate Training

Fellowship support was available for Ph.D. students who had a thesis topic with an interdisciplinary or synthetical character. Three were available the first year, six the second, and seven for each of the succeeding years. In each instance, the students were registered in existing departments or faculties jointly with the Resource Science Centre and the committee advising the students was drawn from a number of departments. A sequence of interdisciplinary core courses was established at the start of the program and organized in four sections: Principles of Renewable Resources; Regional Planning; Resource Economics; and Systems Analyses and Statistics. Some of these courses were initiated because of the new center and others were drawn from existing courses modified to encompass the larger concern.

Step 2: New Faculty

Six new faculty were brought in over a 3-year period. The criteria were to bring in people with new techniques of synthesis rather than of analysis and in every instance the individual had a joint appointment between two groups. It was in this way that we hoped to introduce not only new approaches and methodologies but bridges between separate groups. The appearance of new faculty spawned new courses that very often took the form of workshops in which a variety of methods and concepts were explored around the focus of a specific policy issue or research problem.

Step 3: Resource Science Computing Center

The computer occupies a central place in the development of a resource science program, for it is the computer that has generated the languages and integrated techniques that can, in principle, cope with the complex interactions within and between resource systems and man. It provides the integrative focus needed to stimulate cooperation between disciplines. With funds provided by the Fisheries Research Board of Canada, the Institute of Resource Ecology obtained a small but powerful scientific computer (IBM 1130) for use initially by the ecologists of the Departments of Zoology and Botany. Its function was to emphasize man/machine interaction. The Ford Foundation grant helped expand this facility and open it to use by the Resource Science Centre by the addition of optical and graphical output devices as well as an analog computer. By having the machine operated on an open shop basis, physically close to students and faculty—and readily available for both training and research—a radically new dimension was opened for the training of resource scientists and for the development of simulation models and of management games. It has now operated long enough to make clear that its initial focus on man/machine interaction was a valuable one. It has introduced many students and faculty to computer application and has opened quite new avanues to teaching and research.

For the first 2 years, the Resource Science computing facility was separate from the main University Computer Centre. This arrangement had to be maintained because of the legitimate reluctance of the University Computer Centre to undertake new activities before their merit was well established.

Now, however, we have cooperated with the University Centre to interface our facility with the large 360/67. The necessary equipment was purchased with National Research Council of Canada funds and the programming required for interfacing has been done. This now provides an extremely powerful device whereby the 360/67 handles the large-scale memory and high-speed computing requirements and the Resource Science computing facility controls the input and graphical output. This enables us to develop major programs in computer mapping, resource management games, and the analysis of multidimensional simulation models.

Step 4: Resource Science Workshop

One of the essential ingredients for the development of interactions between disciplines that have traditionally remained separate is a working focus. For this reason, a course entitled "Resource Science Workshop" was established so that students and faculty from the various disciplines could grapple with a specific resource problem of interest to all. Now that this course is well established, it is recognized as a formal offering of the Faculty of Graduate Studies—Resource Ecology 500. The course has operated for 3 years and during the first 2 years concentrated on the development of a simulation model of recreational land use in the Gulf Islands in British Columbia. The goals of the workshop were: (1) to develop communication between the disciplines; (2) to use the interdisciplinary group to discover how to go about doing interdisciplinary research; and (3) to provide solutions for the specific problem.

The achievement of these goals then led to the development of simulation models that can be used to test the consequences of alternate policies. It was because of the lessons learned in these workshops that we initiated the next phase of major research conducted in an interinstitutional as well as interdisciplinary environment.

Step 5: Research Focus

Any graduate training program can only persist if some major research programs develop in conjunction with training. We are now facing resource problems that require bridging the gaps between methodologies, between disciplines, and between institutions and these bridges can best be established through the formation of interdisciplinary and interinstitutional research programs.

The interdisciplinary Gulf Islands study was successful in devising a viable mechanism for synthesizing the specific and relatively narrow contributions of individuals from various disciplines. Its successes suggested the same techniques could be applied to bridge not just the gaps between methodologies and disciplines but between institutions as well.

With this in mind, the Vancouver Regional Simulation Study was established in the third year. It was conceived as a new approach to solving large-scale and complex regional problems. Concern for our environment has been voiced with increased intensity and frequency during the last part of the 1960s, and it was this concern and a desire on the part of the university to move into the community that gave birth to the study.

Its initial aim was to develop a simulation model of man/environment interaction in the Lower Mainland of British Columbia. Its real goal is to produce a policy-testing device by which politicians, citizens, technicians, and academics can intervene in a simulated world to see the consequences of their intervention. The models have ecological, economic, social, and physical dimensions and the emphasis is to generate visual output on a television screen in a form that anyone can relate to quickly.

The other feature of this project is that it is interinstitutional—a cooperative effort of the University of British Columbia, City of Vancouver, and the Greater Vancouver Regional District. In this way, we hope to combine the pragmatic realism of those responsible for implementation with the flexibility and systems experience of the University. Approximately 75 people are involved—ecologists, economists, architects, sociologists, geographers, foresters, and planners—and it provides, we believe, a vehicle to demonstrate new approaches to regional environmental planning.

As the project progresses over the 4 years remaining, the technical development of the model will be paralleled by a growing effort in designing an environment for its proper use. The final goal is to use the model as a catalyst to direct new interinstitutional frameworks and public involvement programs to improve decisions affecting quality of life.

In summary, we have taken a very pragmatic step-like approach involving only those people who want to be involved. Each step was chosen so as to be adjustable and any success was to provide the basis to proceed to another step. We feel convinced that the past history of fragmentation and the charge of superficiality in interdisciplinary activities requires this step-like progression. Moreover, we placed great emphasis on the methodology provided by the computer and computer languages. Otherwise, the different disciplines with their radically different concepts would sunder any interdisciplinary program. The computer and its language provides a powerful device to handle complex resource environmental systems and provides a common language that different disciplines can communicate through.

Relation to Other University Departments

The Resource Science Centre acts to facilitate the development of programs within existing groups. In fact, as a measure of our strong belief in evolutionary approaches to institutional change, we insisted that the Resource Science Centre not be a formal administrative entity. It is simply an ad hoc committee within our Faculty of Graduate Studies (which in itself is an interdisciplinary faculty) and has never gone through the necessary steps for formal recognition. Again, we feel that, if we have any success, it would be much better to allow formality to develop as a logical consequence of our success. Interdisciplinary research does not develop through an administration fiat.

Normally, the great disadvantage in this approach would be that the budget would have to be obtained totally from outside the University. This is, in part, true. However, one of the existing institutes in the University, the Institute of Animal Resource Ecology, has had a long history of research and training in population ecology and resource management. Members of this Institute generated the development of the Resource Science Centre and the Institute provided and continues to provide an administrative home for it.

Institutional Problems

Because of the informal nature of the Resource Science Centre, all appointments are in existing groups. While the initial support often comes, in part, at least, from soft money, no appointment is made until there is a commitment on the university's part to take over salaries within at least 5 years. The choice of staff recruited is through informal committees comprising the Chairman of the Resource Science Centre and the appropriate Deans or Department Heads. This arrangement does not, of course, make for a neat administrative control, but if that is what is needed to make a program good, then there is something wrong with the program. The involvement of the new faculty and others committed to the Resource Science Centre activity develops through involvement in relevant research and graduate training programs.

Difficult Problems

With the informal and evolving structure and program we have developed, there are major problems of communication, but these can be resolved through persistence and commitment of a small core group of people. So long as there are cooperative research programs, real interaction will always flow. Perhaps the greatest difficulty is communication at administrative levels. The real difficulties in communication occur among those who are committed to the venture but simply do not have time to be involved in the research. We have not been at all successful in maintaining this kind of communication.

Future Priorities

In furthering the step-like character of our program, our next high priority is to develop public involvement in our activities. An admirable vehicle is provided through the development of the regional simulation model since it is designed so that citizens can intervene in a simulated world with their own value biases and policy ideas. But again, the public involvement program itself has to be pragmatic and proceed by a series of steps. In our case, the first step will be to establish an air pollution monitoring study for school children in the region. This will provide useful information to the project, but, more important, it will be the first step to begin to develop community awareness and involvement. Similar projects will follow and lead to the participation of politicians, vested interests, and citizens in playing the simulation game.

ENVIRONMENTAL STUDIES AT SANTA CRUZ

Benjamin A. Shaine
Coordinator of Environmental Studies

Founded on the premise that the university should participate directly in the solution of environmental problems, the environmental studies program at the University of California, Santa Cruz, sponsors an undergraduate major, operates a central office on campus, and initiates research and public service projects. Workshops, seminars, lectures, and problem-oriented task forces bring students, faculty, and nonacademic professionals together in investigations of specific issues. In addition, through several seminars, students and faculty are working to develop a theoretical base for the analysis of complex environmental problems. In these projects, the distinction between teaching, learning, research, and action is being erased.

Origin of the Program

Since it opened 7 years ago, the Santa Cruz campus has been involved in environmental issues. The location of the campus (amid the redwoods, on the coast, on the growing edge of the San Francisco regional city) attracted people who were interested in the natural environment. Once they were on campus, the flexible academic structure gave them the opportunity to incorporate their concern into the curriculum. Until 1970, however, this activity arose spontaneously without coordination, mostly in the form of interdisciplinary courses sponsored by the individual colleges of the Santa Cruz collegiate system.

In 1970, the environmental movement sweeping the country struck especially hard at Santa Cruz. The primary initiatives that led to the present program came from Professor of Politics Grant McConnell, who chaired a committee of students and faculty charged with coming up with an environmental studies curriculum. Things moved very quickly. Professor McConnell had arrived on campus only in September 1969. By the following April, his committee had reported, recommending: (1) that the resources of the entire campus should be coordinated in a new environmental studies program; (2) that the program should start with an undergraduate major; (3) that the possibility of establishing an environmental center should be studied; and (4) that the whole project should be supervised by an interdisciplinary committee.

Actually, events moved even more quickly than the report would indicate. By fall 1970, Professor Richard Cooley had come from the University of

Washington to chair the new program and the environmental center was in existence, unofficially and small scale, under a full-time coordinator. Funding for this center was $13,000 from the state and $17,000 from a small, private foundation. Seventy-five students registered in the new environmental major that first year.

Original Goals

Underlying the original proposal for an environmental program was the belief that environmental studies is not a discipline in itself and that the environmental program should not develop as a department competing with other departments. It would not hire faculty. It would not sponsor many courses itself. Instead, it would lobby among the disciplines and within the individual colleges at Santa Cruz to influence the hiring of faculty and the creation of interdisciplinary courses. The environmental center was conceived as a service facility for the campus, assisting in the writing of grant proposals, disseminating information throughout the campus and community, and sponsoring public lectures.

Evolution of the Program

The faculty and staff hired to man the program brought new ideas with them. They saw the center becoming the initiator of a wide range of projects, as a tool for developing a problem-focused undergraduate education. The center was to provide a library and a meeting place; but more than that, it was to sponsor issue-oriented research task forces. With the help of the center staff, undergraduate teams would study environmental problems and issue reports, receiving academic credit for their work. Taking advantage of the flexible Santa Cruz system, the program was able to offer credit for virtually any worthwhile student project. Going beyond its original goals, the program envisioned establishing a center where visiting faculty, postdoctoral students, undergraduates, and nonacademic professionals would work together without the harassment of grades, formal classes, and examinations. The vision was of a center which would help change both the world and the nature of a college education.

During the first year, much was accomplished. The undergraduate majors participated in a program of minimum structure in which the primary requirements were a substantial senior thesis and participation in a broadly conceptual seminar in the junior year. Emphasis was placed on student research and independent study. The student task force idea was implemented. Under the leadership of a graduate student in geology, a team began studies of the ecology and geology of the Santa Cruz Mountains. The former county planner was hired to lead a workshop which produced a substantial report on coastal land use regulation. Students from that workshop led off testimony before the State Assembly hearings on coastal legislation. A program staff member was loaned to the community to organize the local Earth Day celebration. Under the leadership of an undergraduate student, five students worked in environmental education in the public schools of Santa Cruz. The program assisted the student organic garden project through the bureaucratic maze of the university, as the garden grew toward a full model farm in the center of the campus. The program obtained a grant from the Sierra Club

Foundation and sent five students and a staff member to Alaska to initiate a major study of wilderness resources.

Campus support for the program was strong. All three academic divisions (natural sciences, social sciences, and humanities) contributed to the program, enabling it, for example, to bring ecologist Stanley Cain to teach the environmental seminar required of all majors. Student support was very strong, swamping the workshops and seminars.

Ambitiously and optimistically, the program set out to get substantial outside funding for 1971-72. Grant proposals went to Rockefeller, Ford, Mellon, and several smaller foundations. By the current academic year, the program hoped to hire half a dozen young research associates to work with undergraduate projects, to sponsor student internships with agencies and environmental organizations across the country, and to bring several top notch experts to campus as visiting faculty. But over the summer the rejection letters came in, and at present the program is operating on less money than during the first year.

The lack of anticipated funding meant a postponement of plans and a revision of some of the methods used to reach the goals of the program. The flexible, personal nature of the undergraduate major places a huge demand on faculty time. Originally, it was intended that a staff of ambitious young activists and qualified nonacademic professionals (including lawyers, planners, and others) would provide the necessary guidance for undergraduate students. The presence of a small number (10 to 15) of graduate students in environmental studies, who would participate as workshop and task force leaders, has since emerged as a possible way to supplement the full-time staff. In addition, a small graduate program in which students worked with great independence on problem-oriented research would help fill a national need for highly trained environmental activists. At present, the environmental studies program is revising its grant requests to include such a graduate program.

Kresge College

In the fall of 1971, Kresge College, sixth residential college in the Santa Cruz system, opened with three hundred students and an academic theme of "Man and his Environment." Eighteen new professors were hired for Kresge, and the opportunity was there to develop the best faculty of environmental studies in the country. From the point of view of natural environment studies, Kresge has been partially successful. The Chairman of the environmental studies program was an advisor to the Provost of Kresge College; and several fine faculty members were hired in critical areas, including paleoecology, applied environmental science, and environmental economics. But faculty hiring at Santa Cruz is a complex process involving bargaining between the traditional academic departments (which pay half of a professor's salary) and the colleges (which pay the other half). A further complication was the desire of Kresge College to have a faculty interested not only in the natural environment, but in building Kresge as an experimental social environment, using encounter groups and other community-building techniques. The net result was a compromise all around. A large portion of the new students at Kresge have strong environmental interests; and as Kresge develops its own courses, field studies, and internship program, the environmental curriculum at Santa Cruz will be greatly enriched.

UC-Santa Cruz as a Place for an Environmental Program

Santa Cruz is a new campus with a flexible academic structure and a policy of educational innovation. As a result, it is almost ideal as a setting for interdisciplinary or problem-oriented programs. Within the undergraduate residential colleges, faculty and students can create courses or dissolve them at will and can design special academic majors to suit their needs. The entire campus is on a pass-fail system; no grades are given in courses. There are no entrenched professional schools in subjects like forestry or planning which might feel threatened by a new environmental studies program.

As it is now, the environmental studies program is a central agency stimulating the growth of environmental concern throughout the campus, taking advantage of the Santa Cruz flexibility without treading on the toes of other existing programs. Under the direction of the chairman of the environmental studies committee, the program hires its own staff to man the informal environmental center and to develop the program as a whole. At present, environmental studies does not hire faculty, but with the strong cooperation of Kresge College and many academic departments has succeeded in bringing sympathetic faculty to campus. Environmental studies can, however, hire special faculty on a short-term basis and currently a planner and a horticulturalist are listed as lecturers in environmental studies. The chairman of the environmental studies committee is also chairman of geography, which does control several faculty positions directly.

At Santa Cruz, as at most university campuses, faculty are expected to publish within their academic discipline. This emphasis has made it difficult in some cases to retain faculty who have participated in interdisciplinary teaching and public service to the neglect of their other work.

Problems the Environmental Studies Program Has Faced

As discussed above, the program has had great difficulty raising the funds to support its special research projects and public service efforts. On the other hand, institutional support for faculty hiring and curriculum flexibility is generous. There is virtually no institutional resistance to the goals of the environmental program.

Faculty from the humanities have not been as active in the program as those from the natural and social sciences. Exploration of the values and needs of people as they relate to the natural environment has suffered as a result. New faculty hiring for 1972-73 may, however, strongthen participation of the humanities.

The great flexibility of the environmental studies major makes it suitable only for those students with a firm sense of direction and the capacity for independent work. But many students who are unsure of their scholarly interests are drawn to the program by its lack of specific requirements and its idealistic problem-solving focus. Some of these students are becoming lost. Starting this fall, the program has required a substantial essay, outlining a proposed course of study, from each of its majors. This essay is designed to help students understand their own goals and to assist academic advisors. In addition, the essay will weed out students not seriously interested in environmental studies.

The program will never be able to handle large numbers of major students because of the faculty time required for the workshops, seminars, and indi-

vidual study projects. How to cope with the many students requesting a major in environmental studies is a real problem.

The program is acutely aware of another deficiency: the Santa Cruz student body is almost exclusively white and upper middle class. Located in the redwoods above a scenic coast, the campus tends to promote an aristocratic concern for conservation of beautiful places without sufficient emphasis on the problems of urban areas and minority groups. A black professor whose appointment is shared by community studies and geography is attempting to rectify this situation. New appointments in college VII (which is to be an undergraduate college with an urban focus) and stress on minority faculty hiring in existing colleges will also help change the character of the campus.

Priorities for the Future

The program will continue to seek outside funds to develop an environmental center which is a hub of varied activity. Top priority goes to student research projects and student internship and field opportunities. Possibly as soon as this spring, half a dozen or more students will be working full time in Washington, D.C., for the Environmental Protection Agency and for lobbying groups such as the Highway Action Coalition and Zero Population Growth. Upon their return to Santa Cruz in the fall, these students will play a leading role in a series of seminars on environmental politics. As the environmental studies program grows into a full fledged center, it will be more able to meet its primary goal: educating its students and the public in the analysis of environmental problems and in carrying those problems through to solution in the public arena.

When Kresge College doubles in size next fall, environmental studies hopes that an environmental lawyer, a professional in environmental design, and a demographer will be added to the faculty. With those additions, the program will be able to draw on a very complete environmental faculty housed in a dozen different disciplines.

Finally, by the fall of 1972 the program hopes to have established a small graduate program, one involving graduate students in undergraduate activities and taking advantage of the varied graduate level courses offered at the other University of California campuses.

INSTITUTE FOR ENVIRONMENTAL QUALITY
UNIVERSITY OF MICHIGAN

William C. Jolley
Assistant Director

Original Goals

The Institute for Environmental Quality was established by the Regents of the University of Michigan to encourage interdisciplinary studies and research in relation to environmental quality problems.

The initiative for the Institute arose out of conversations between U-M officers and officials of the Rockefeller Foundation. The Foundation was seeking ways in which it might move substantially into the environmental quality field, particularly in higher education. The Foundation wished to optimize its investments by concentrating efforts in universities already proven capable of research and graduate education of high calibre. The University of Michigan, for its part, had such a history of successful endeavors in many of its component units such as the Schools of Natural Resources and Public Health, and the Colleges of Architecture and Design, Engineering and Literature, Science and the Arts. However, integration of efforts was suboptimal, in part, because of the separate missions of individual units and the resultant diffusion of university competence and resources.

When the Rockefeller Foundation awarded the University a $750,000 grant in December 1969, the means to address the problems more coherently were provided. At this same time, a university committee, consisting of faculty and students of the School of Natural Resources and faculty drawn from six other university units and chaired by the Dean of the Graduate School, was assessing the status of future roles of the School of Natural Resources. This committee included among its recommendations to the President "... the early establishment of an inter-college interdisciplinary Institute or Center for Environmental Affairs."[1]

Regental action formally established such an umbrella structure in the form of The Institute for Environmental Quality in March 1970. While a Director was not appointed until July 1970, early action by the Vice President for Research led to establishment and awarding of ten graduate fellowships in environmental quality by April 1970, and to two new faculty appointments effective for the 1970-71 academic year.

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[1] Progress Report, Natural Resources Review Committee, January 8, 1970.

Program Evolution

IEQ has operated with a Director but 14 months, and the original conceptual pattern for the Institute as developed in the University proposal to the Rockefeller Foundation has been adhered to. This blueprint for development has seen the graduate fellowship program expanded to support 20 students in Academic Year 1971-72. Institute funds are supporting part of the salaries of three new faculty members on a prearranged phaseout schedule as the home academic units build toward permanent, full budget support.

Initiation research grants to faculty and faculty student teams have been made to support first-phase efforts of over 20 projects involving students and faculty representing a score of academic disciplines. Grants are normally for less than $10,000 each, and for a maximum of a year's time.

Some action projects, as opposed to research, have also been supported.

Intra-University Relations

IEQ works almost exclusively through other units of the University. Its staff is administrative only and it carries on neither research nor academic activities directly. Rather, research funds, once awarded for work which meets Institute criteria, are spent by the project director and he and his academic (or research) home unit are responsible for provision of research and staff space and facilities.

With respect to undergraduate education, the Institute has little immediate involvement. Minor support for one course needing special equipment on very short notice was rendered but, in general, the teaching and supporting of individual courses are considered the proper province and responsibility of the academic units.

Graduate involvement is largely confined to two principal lines of activity. the aforementioned research grant program of IEQ nearly always involves graduate students in the actual research work and, not infrequently, some undergraduates as well. In fact, Institute criteria for funding "seed research" projects include the degree and nature of student involvement. The second major activity pursued by IEQ relating to graduate education is the Environmental Quality Fellowship Program. These fellowships are open to any graduate student in the university pursuing a doctoral or advanced professional degree. The fellowships provide stipends, dependency allowance, and complete tuition payments for each recipient for either two or two and one-half terms per year. They are annually renewable for a maximum of 3 years. Criteria for selection include intellectual and academic credentials and references, but particularly the relevance and promise of the student's proposed graduate program to career-professional work on one or more environmental quality problems. Preference is given those applicants who seek to develop inter- or multidisciplinary skills to apply to environmental problem-solving. Fellows retain their academic homes in the departments and carry out their degree work under traditional faculty committee guidance. However, the Institute requires all Fellows to meet in a seminar biweekly throughout the academic year. This seminar seeks to foster interdisciplinary communication and cooperation, and to give the students practical experience in assessment of each other's programs and of selected faculty research projects which strive for interdisciplinary approaches to environmental problem-solving.

The Institute has no formal involvement with continuing education, but the Director spends a considerable amount of time addressing professional, academic, and lay groups on environmental matters. He has also been involved in several management training sessions and symposia aimed at public utility executives as they deal in a corporate sense with environmental quality.

Community service has been aided by the Institute primarily through its initial support of the Student Environmental Consulting Service (S.E.C.S.). It is a unit within the officially recognized student organization, ENACT (Environmental Action) at the University of Michigan. SECS is dedicated exclusively to assisting community environmental groups and individuals concerned with the technical aspects of environmental problems. SECS became operational on the basis of a seed grant from IEQ.

Finally, some attention must be given to IEQ's role as an information clearinghouse. The Institute has become increasingly visible and is often contacted by individuals on and off campus for information and assistance. Because IEQ staff seeks to keep up-to-date on developments in education, research, and government which relate to environmental quality and because IEQ is sought out by others with information or other needs, it is in a unique position to serve as an information conduit on an informal basis. Coordination among units on campus is pursued by IEQ in this manner, but not in the sense of operational line authority.

Governance

Institute staff consists of a Director, an Assistant Director, and a Secretary. There are no other paid positions budgeted for nor contemplated at present, therefore no problems of recruitment, hiring, promotion, tenure, etc.

The closest activity IEQ has in this regard is that mentioned earlier pertaining to new faculty. When an academic unit, usually the department, wishes to recruit a particular individual, perhaps opportunistically, and yet hasn't budgetary flexibility to do so, it can request short-term, finite assistance from IEQ. The department must have in sight a bona fide faculty opening for the individual, must be able to build the new person into its budget within 3 years, and must initiate the request to the Institute. If the individual combines sound disciplinary credentials with interest and competence in an environmental area, he may be supported, in part, for up to 3 years while his department gradually absorbs his salary. At no time does the Institute exercise control over his promotion or tenure, however.

Problems

The principal difficulty is shortage of funds. Under the IEQ concept in a university such as Michigan, much larger funds could be used to advantage. For every worthy graduate student who wishes the support and freedom an IEQ Fellowship brings to pursue programs of study and degree research somewhat out of the mainstream of any single department, there are many others not so supported and without that freedom. There are other research efforts of the same or larger scale as those IEQ supports which fail to get off the ground or falter because of the lack of crucial support at critical times and which may not be in concert with external funding agencies' tempo. There are more "high risk" or nontraditional programs that merit support. Few

traditional sources of funds will experiment with them as IEQ can do to some degree.

There have been very few instances of resistance to what IEQ seeks to do or of criticism of what it has done.

Future Priorities

A prime consideration is to seek a broader and larger base of support in dollars than presently exists. The tight fiscal situation in this as in other states has precluded the degree of general fund support by the University contemplated when IEQ was created and required if the Institute is to have an optimal impact on environmental affairs within the University.

There is no present intent to deviate from the basic operating philosophy of the Institute with respect to other University units or activities.

THE UNIVERSITY OF WISCONSIN – GREEN BAY

Edward W. Weidner, Chancellor

The University of Wisconsin-Green Bay is a relatively recent arrival on the educational scene. Its new main campus was occupied and its new academic plan was implemented in the fall of 1969. In the few years that have passed since that time, UWGB has become well known for its institution-wide focus on Man and His Environment. It has been called "Survival U" and "Ecology U" by some who have sought a concise description.

The selection of Man and His Environment as the central theme was made on the basis of pedagogical rather than ecological considerations. The new institution was authorized by the 1965 State Legislature, and within a year the site was identified and the Chancellor appointed. The guidelines for the University were relatively few. The Coordinating Council for Higher Education, the Regents, and the President of the University of Wisconsin system all agreed that the new institution should not be a small carbon copy of the Madison Campus, and yet it should reflect the tradition of quality and liberal education associated with that campus. UWGB was to identify its own distinctive mission within these broadest of guidelines. It had to do so in a very few months, given the commitment to open within 3 years of the beginning of the planning period.

In connection with another assignment, I had begun making a survey of the criticisms of higher education during the late spring and summer of 1966. Upon being appointed Chancellor, I finished the survey as rapidly as possible.

The atmosphere of higher education in 1966 was an unhappy one. Criticisms of universities were mounting at a rapid rate. There was a long list of complaints, perhaps a dozen or so major ones. Yet one continuing point dominated them all: higher education was directionless. It had no theme or flavor. It was each discipline or profession for itself. The world outside the campus was largely ignored. Professors were interested in getting ahead in their professions and not in teaching students. Requirements and courses were piled on top of each other without substantial relation to any central objective. In short, the universities lacked relevance.

The alleviation of these alleged difficulties in a new university seemed to follow rather easily, at least in rather broad terms. Three elements stood out: the importance of affective learning especially in regard to a heightened sense of social responsibility; the need for the undergraduate experience to be integrative; and the demand for application of learning and knowledge to the problems of society.

Discussions ensued with the President's Office, with two small faculty or staff advisory committees, with a series of lay community advisory committees, and with three national institutes or seminars of governing board members and senior administrators. These discussions confirmed the diagnosis and the general prescription. Within 6 months—in March 1967—the preliminary Academic Plan was approved by the Board of Regents and CCHE. During the following year, the plan was studied intensively by faculty and student advisory committees and by a series of outside consultants. The latter were usually brought to Green Bay to attend one of eight planning institutes for the new university. Again, the direction of the plan was greeted with enthusiasm, and the final Academic Plan received official approval in March 1968.

The decision to focus on Man and His Environment thus stemmed from educational considerations. Certainly in 1966 environment was not a particularly crucial problem in the public eye. However, it did provide a means of illustrating how all activities and all areas of knowledge of a university could be relevant to a major social problem. Discussions with faculty, students, and community made it evident that they believed the concept of a problem-oriented, socially concerned, and integrated educational plan could be effectively carried out with a Man and His Environment theme.

At the same time that the problem of Man and His Environment was selected, it was determined to organize the University on the basis of four theme colleges, each college having an aspect of the environment as its special focus. Within each college, the faculty was to be grouped into Concentrations, or more specific environmental problem areas. Thus, from the beginning, UWGB has been organized on an interdisciplinary-transdisciplinary basis.

Students are given a choice of some 12 Concentrations from among which to choose a major. In addition, should they wish, they may select a disciplinary field and/or a professional application. In this instance, they must apply their discipline or profession to the environmental problem area of the Concentration, thus helping to maintain the integrative nature of their educational experience.

Problem-oriented learning also requires an experiential base. It should be community action-oriented. UWGB has specified that students have at least two off-campus experiences during the undergraduate years: one in the Upper Great Lakes Region and one in some other area. The latter experience is to provide a student with a culture contrast. The emphasis is on community problems concerning the environment.

Another requisite of problem-oriented education is to encourage student initiative learning. Problem-solving abilities are not developed very readily by lockstep education. Rather, problem-solvers have attributes of initiative, pragmatic adaptation, and imagination. There is every reason to encourage the flowering of such attributes during the higher education experience.

In the 2½ years of operation under the new Academic Plan, UWGB has made some modifications in each of these three areas. In regard to the colleges and Concentrations, the experience of the first year was instructive. At that time, budget, personnel, and curricular decisions were heavily vested in the colleges, each headed by a Dean. This was inevitable, since the new faculty was just being assembled. The result was that each college tended to

develop barriers that prevented students freedom of choice of all courses and all curricular programs of the University. In addition, the basic faculty units, the Concentrations, were weak, relatively speaking.

Therefore, a realignment of responsibilities was carried out during July 1970. The academic program was unified under a Dean of the Colleges, thus greatly reducing any possible intercollege barriers. In addition, budget, personnel, and curricular decisions were largely decentralized to the Concentrations. The latter move strengthened faculty leadership at the Concentration level and made it possible to flesh out and develop the environment-based, interdisciplinary Concentration themes. Each chairman reports directly to the Dean of the Colleges. At the same time, inter-Concentration barriers have been avoided; the roles of the Dean of the Colleges and his Concentration Council (the chairmen of each Concentration) have been noteworthy in this regard.

Experiential education has developed steadily during the first few years. Substantial energy has been put into identifying opportunities for off-campus student experiences. The number, diversity, and quality of these experiences has broadened. Whether this trend will or can continue even up to a time when UWGB has 10,000 or more students remains to be seen. So far, there is room for optimism.

There have been two particularly promising forms of this off-campus experience, the communiversity project and the Action program. UWGB has engaged in 15 or 20 communiversity projects of some substantial nature. Through the typical communiversity project, undergraduate teaching, applied research, and community outreach and action merge effectively into a single intellectual function. One of the largest of these projects involves a lake that has some problems of water quality. A combination of University resources, assistance from the national government, and support from the county government has permitted an intensive study of the lake, aiming toward community action to eliminate the difficulties.

Undergraduate students receive credit for working on the project, and professors use the lake and the data collected about it as illustrative material in courses in several different disciplines. It is truly a cooperative effort, with people trained in political science, law, economics, sociology, chemistry, biology, limnology, and other fields participating. Thus, many individuals profit, by experience, from an applied research and community outreach project.

The University of Wisconsin-Green Bay has recently been granted funds by the University Year for Action program. This Federal grant, one of six in the country, will enable UWGB students to participate fully in the day-to-day operations of community action agencies engaged in antipoverty work. Students work full-time for 12 months with a particular agency while at the same time earning approximately 30 academic credits toward their degree. During this activity the students are provided with a subsistence allowance and a modest stipend drawn from the grant funds.

The program provides a more comprehensive opportunity for off-campus credit work than previously available to our students. Thirty junior-level students are presently working with agencies involved in legal counseling, economic development, debt counseling, talent search, day care, nutritional planning, offender rehabilitation, and other poverty-related activities. This

program is truly consistent with the communiversity approach, and it provides an additional opportunity for students who have maturity and initiative to explore alternative routes to a degree.

Student initiative education has, in some ways, been the most elusive of the major objectives of the academic plan. The problem here is several fold: (a) to encourage all students to take at least a substantial measure of initiative in their own learning; (b) to provide a rather complete range of student initiative learning opportunities for those who would like them (perhaps 10% of a student body); and (c) to keep all-university requirements down to a minimum.

All-university requirements have been kept minimal, and recently have actually been reduced in number. There are only two of them currently: a 4-year sequence of Liberal Education Seminars and a distribution requirement (five credits in each college). There are several ways in which each requirement can be met, and students are encouraged to petition out of the requirements by presenting alternative ways in which they wish to meet the spirit of the educational philosophy underlying the requirements. The Liberal Education Seminars relate closely to the Concentrations, thus further supporting an integrative approach to education.

Formerly, a tool subject requirement also existed on an all-university level. This has been modified to be adaptive for each Concentration, as appropriate for each student. One basic difficulty with student initiative education is that students coming to a university do not automatically know how to take initiative in their own learning. Some may actually have an antipathy toward the idea. An attempt has been made, not too successfully to date, to assist freshmen in this regard.

UWGB has moved rapidly toward the open university idea, with much flexibility for each student. Much of the operationalization of this objective has taken place in the last year. Thus, any student can develop his own Concentration proposal, if one of the 12 does not seem to be appropriate. Students may get credit for learning outside the classroom, as well as for certain experiences. They may take any course examination, whether they attend class or not. It has been time-consuming, even though not very difficult, to operationalize these facets of the plan.

There have been no difficulties with our first graduates finding jobs or being accepted into graduate or professional schools. In fact, the Man and His Environment approach has been a positive advantage in these respects.

Environmental education is far more basic to academic first principles than adding a few conservation courses to the curriculum. It is a part of a problem approach that emphasizes social responsibility and integrative learning.

We must wait for the longer run for an adequate and full evaluation of what we are doing, of course. In the meantime, the response of faculty members and students at UWGB is encouraging. Esprit is high. Increasing numbers of highly qualified students from an expanding geographical area are applying for admission. This would indicate that the academic plan is especially attractive to the current generation of students.

INTERDISCIPLINARY STUDIES ON ENVIRONMENTAL STUDIES AT THE UNIVERSITY OF WISCONSIN – MADISON

John E. Ross
Associate Director, Institute for Environmental Studies

The offices of our Institute for Environmental Studies at the University of Wisconsin, Madison, are on the 13th floor of the Meteorology and Space Science Building. The view, toward the south is magnificent, across a once glaciated and now heavily wooded area of the city. In the middle distance lies Lake Wingra, a small inland lake bordered by the city and its storm sewers on one side, and the University's arboretum on the other. Lake Wingra is eutrophic. The city has influenced it. To find out how much, the Institute for Environmental Studies has been conducting a 3-year lake system modeling project under the International Biological Program with NSF funding.

The Lake Wingra project requires data from a spectrum of scientists, in phase. It is, by conception, interdisciplinary—students and faculty, across the disciplines. For success, the interface operations must work. We will know in another year or so how well.

The Lake Wingra project is one visible expression of our commitment at this institution to probe our abilities to do interdisciplinary work in environmental studies. This project and others are built on several years of formulation.

Two converging trends of thinking by faculty occurred in the early 1960s. The Interdisciplinary Studies Committee, appointed by the President in 1962, was concerned with the role the University should play in the emerging need for combining the expertise of different disciplines toward the understanding and solution of a number of problems of our times that transcended our traditional disciplinary boundaries: poverty, racism, war and peace, land use and misuse, environmental deterioration, etc.

By about 1964, it had become apparent to the committee that the University had great strength in the component disciplines concerned with particularly those issues on the environment, but that there was little coordination or communication to bring this variety of strengths to bear on the emerging broad environmental problems. It suggested to the University administration that the time was ripe to organize an effort to capitalize on these strengths to make possible a major effort in interdisciplinary environmental studies.

About the same time an ad hoc faculty group largely from Agriculture, Engineering, and Letters and Science put together plans for a pilot project in environmental studies, to involve the collaboration of a number of disciplines in a series of interdisciplinary environmental studies. This led eventually to

the establishment of an Institute for Environmental Studies under the supervision of the Graduate School, directed by Professor Gerald A. Rohlich. The Pilot Project and later Institute were funded by a grant from the National Institutes of Health.

These two developments led the Chancellor to appoint the Madison Campus Special Committee on Environmental Studies in November 1965. This committee consisted of two faculty members appointed by each Dean plus a chairman appointed by the Chancellor. It was charged with reviewing environmental research proposals and recommending long-term administrative arrangements for capitalizing on the great strength of the campus disciplines in the environmental area.

The Madison Campus Special Committee on Environmental Studies adopted, on March 15, 1966, a series of defining statements about environmental studies that hold today. The essential elements of concern, quoted from that document, are as follows:

1. We are concerned with the environment *of* man.
2. We are concerned with the *total* environment: its social, cultural, economic, and esthetic, as well as its physical and biological, aspects.
3. We are concerned with interdisciplinary studies.
4. We are concerned with integrated studies that have as their ultimate rationale the development of open-ended solutions for environmental problems, rather than short-term solutions.
5. While we recognize the essential importance of strengthening existing disciplines, we look toward teaching, research, and extension configurations that will transcend traditional lines of endeavor, and are concerned with the wholeness of the relationship between man and the total environment. In a real sense, we seek to provide a university environment in which integrated environmental studies can be accomplished and in which the fruits of such research can be reflected in improved campus teaching and community service.

This last thought is echoed in Faculty Document 279, which was adopted by our faculty on December 1, 1969, defining the purpose of the University:

> The primary purpose of a University is to provide an environment in which faculty and students can discover, examine critically, preserve, and transmit the knowledge, wisdom, and values that will help ensure the survival of the present and future generations with improvement in the quality of life.

That document goes on to say:

> Ways should be found to allow students and faculty to engage in the interdisciplinary efforts that are implied by the statement of purpose.

By this time a Committee on Environmental Studies Advisory to the Chancellor was active and in December 1969 submitted a report to the Chancellor. The report of the committee proposed that the Institute for Environmental Studies, which had been operating as a research unit in the Graduate School, be restructured. Some of the key recommendations of that committee are as follows:

1. That the Institute for Environmental Studies be established as a unit within the University of Wisconsin, Madison, to initiate, conduct, and coordinate interdisciplinary programs in environmental studies.

That all elements of the Madison academic community committed to environmental studies shall be eligible to be served by the resources of the Institute and to participate in its programs and their development. In turn, all elements shall receive the benefits provided by the Institute leadership, consistent with the provisions of this document.

2. That the Institute shall have as its functions: Providing leadership in interdisciplinary, environmental research for the Madison campus; initiating and supporting cross disciplinary undergraduate and graduate degree programs and cross-disciplinary courses at the undergraduate and graduate level; improving internal communication among groups involved in environmental research, training, and extension programs of the University.
3. That the Institute will initiate new, and coordinate existing, research programs in the environmental sciences.
4. That the Institute have the authority to initiate interdisciplinary courses at the undergraduate and graduate level and undergraduate and graduate training programs in environmental studies in accord with the procedure of the colleges, including the graduate school.
5. That the Institute will develop and foster programs of internal communications among the campus faculty members on questions of environmental research and education and adult education.
6. That the Institute shall have a director who will be appointed by the Chancellor and who will report to him.
7. That the Institute be the administrative organization for those existing or new centers, research programs, and curricular programs that may elect to join the organization.
8. That the Institute could initiate recommendations for academic appointments within the Institute or in concert with other University organizations.
9. That faculty review be accomplished by the Institute and the existing divisional committees.
10. That the Institute develop a budget.
11. That the Institute director and executive committee shall serve as a committee to coordinate and review those programs and policies in environmental studies referred by the Chancellor.

These recommendations were accepted by the Chancellor in January 1970 and reported to the Regents in February 1970. Reid A. Bryson, Professor of Meteorology, was named director. Since that time the Institute has been moving to conceptualize research, courses, and curricula.

Included in the Institute as research entities at this time are the Center for Climatic Research, the Marine Studies Center, the Lake Wingra Program described briefly in the opening of this article, and the Remote Sensing program. There are a number of other research groupings, some of which are listed below:

A Regional Environmental Decision-Making Study on Lake Superior
A Metal Resources Recovery & Recycling Feasibility Study

A Problem Definition Seminar: Energy Uses
A Problem Definition Seminar: Land Use
Quantitative Ecosystem Development and Modeling Project
A project on the Sensitivity of Society to Environmental Change
A project to Monitor a Thermal (Coal) Electric Power Production Plant
Upper Great Lakes Regional Recreation Planning Study

Several of these are financed through a grant to the Institute by the RANN division of the National Science Foundation. In each case our goal is to bring disciplines together.

It is not currently possible to establish new degrees at the University of Wisconsin. We are, however, working to develop degree proposals at the graduate and undergraduate level. Student interest is keen and there are some exciting courses evolving from our research programs, so we are making available a number of course offerings, including the following:

- IES 101—Forum on the Environment—Philosophical, political, and social implications of environmental problems.
- IES 400—Environmental Core Seminar—Intensive, interdisciplinary study of environmental topics.
- IES 506—Modeling and Analysis of Environmental Systems—An upper-level course in systems modeling intended for students in both the physical and life sciences.
- IES 699—Humanistic Approach to the Environment—Man's societies, values, nature, religion, etc., and the manner in which they have affected his government.
- IES 699—Law in Natural Resources Management—Study and participation in the legal process which influences the use and conservation of natural resources.
- IES 760—Research Proseminar in Quantitative Environmental Studies—Presentations and discussion of its members' environmental research, plus lectures covering relevant research techniques and related methodological questions.
- IES 761—Colloquium in Air Pollution—A broad-based research-oriented seminar in air pollution for graduate students.

Our College of Letters and Sciences this year approved an "Independent Studies Major" for undergraduates. We are working with a number of these students in developing environmental studies programs that then must be approved in their college.

The University also has a committee degree option for graduate students. The Institute currently shares academic responsibility with departments for a number of these programs.

We do not look at the Institute as, nor is it in fact, a clearinghouse operation, nor is its aim one of strengthening programs "within" departments; rather the goal is strengthening programs among and between. It is not designed to build up a mutually exclusive core of faculty residing exclusively in the Institute; rather it is one of bringing together people currently on our campus, adding competence where there are unique new combinations of expertise.

The University has a strong and aggressive extension program with many components interested in environmental problems. The Institute has, as a

goal, building these ties to community education. Currently, one research project is directed by an extension appointee. A good many of our research programs have built-in ties with off-campus organizations. For example, our Remote Sensing project has been conducted jointly with the state Department of Natural Resources. The power plant study mentioned above is supported by industry.

The Institute is one of a number of organizations on our campus interested in environmental problems. On the one hand are the classical, disciplinary studies of the relationships of organisms to their environment. There is also a major School of Natural Resources on this campus with departments and degree programs. The University has a major Sea Grant Program. There are organizational stresses and strains in all of this, but fortunately our campus is one where intracampus communication is alive and kicking.

The Institute currently has a number of professorial and adjunct appointments. Most of the professorial appointments are joint with departments, however two such tenured appointments are in the Institute. There is not currently outside recruitment because of a budget freeze. Curriculum and academic planning is in the hands of the faculty group associated with the Institute. Decision on promotion and salary is shared by the Institute and the home departments of faculty members. Tenure decisions reside in the same place, but with the concurrence of executive committees of faculty divisions (biological, physical, social, and humanities). In addition there is a newly created *interdivisional conference committee* which reviews and acts on appointments and courses.

Challenged to sort out the headaches we have in this operation, I would mention several. Instructional dollars are very hard to come by. This is a time of tightening in our state budget for instructional programs. We need budgets behind the courses we hope to add. We have interest and commitment to teach, and we have rising expectations among students. These expectations are in the area of environmental studies, but the students are wondering if we really can tackle a merging of our highly refined knowledge toward the commonalities of science. There is, we feel, the possibility of a renaissance of science and education.

Research dollars, we feel, are available, if we are successful in defining and explicating the interdisciplinary problems. This is not easy.

Though the atmosphere for it is good, internal communication is a continuously demanding thing. We spend many, many hours trying to understand our varying technical expertise and also to define our goals and operations as unique and beneficial, not merely competitive to existing programs. At least part of what is needed is an honest, not superficial, understanding of where the disciplinary barriers we have erected are interfering with our progress in resolving environmental problems.

We are also very much concerned with building rigor into our programs. It is relatively easy to converse about environmental problems, even relatively easy to define the problems. It is much more difficult to quantify environmental interrelationships. We feel we must work on this issue in our research and in our teaching. Thus, students who take this academic track have more, rather than fewer, intellectual hurdles. We hope that these hurdles are not primarily bureaucratic.

Our general themes are relatively simple in design. We are interested in understanding pollution of the environment and means of abatement. We are interested in population growth, population distribution, and population times resource consumption. We are interested in ecology and ecosystems and man's changing relations with the natural environment. In the relatively near future, we hope to open some doors of teaching and investigation in such areas as population and environmental quality, environmental perception, and environmental health.

Bibliography

(Note: Listed here, with one exception, are Wisconsin documents that bear on the issues discussed in this paper, but might not have had circulation beyond the borders of our campus. These documents are available in the offices of the Institute for Environmental Studies.)

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ENVIRONMENTAL PROGRAMS

AT

UNDERGRADUATE,

LIBERAL ARTS COLLEGES

ENVIRONMENTAL STUDIES AT DARTMOUTH COLLEGE

Frank Smallwood, Professor of Government and Public Affairs

Dartmouth's Environmental Studies Program evolved out of a long-standing commitment to environmental affairs which dates back at least to 1910, when the Dartmouth Outing Club, the first organization of its kind at any American college, was organized to promote student and faculty interest in a wide range of outdoor activities.

It was not until 1970, however, that Dartmouth developed a major new academic program in the field of environmental studies. This program resulted from a sustained planning effort which took place from 1965 to 1970. The most crucial modifications in the Dartmouth environmental studies curriculum actually occurred during this initial planning period before the new program was formally launched in the fall of 1970.

During the early 1960s, a number of Science departments in the Arts and Sciences Faculty at Dartmouth[1] established graduate programs leading to the Ph.D. degree. The original impetus for a new environmental program came from a group of faculty members within the Department of Biological Sciences. In 1965, this group proposed that a research and graduate (Ph.D.) program should be created at Dartmouth in the field of Ecology and Environmental Biology. After considerable study, this proposal was modified in favor of a more broadly based Ph.D. program in Biological Sciences.

As a result, a second group of faculty organized a new interdisciplinary planning committee which included representatives from the Social Science departments, as well as a number of different Science departments. After evaluating Dartmouth's capabilities and historic purpose, this second planning committee concluded that Dartmouth could make the most effective use of its resources by beginning a new environmental program at the undergraduate, rather than the graduate-research, level. There was a difference of opinion within the committee, however, whether it would be most desirable to organize a rather tightly specialized Environmental Sciences *major* along conventional departmental lines, or a more flexible interdisciplinary Environmental Studies *program* which drew upon the resources of a wide number of existing departments.

[1] The Arts and Sciences faculty at Dartmouth is organized into three divisions: The Sciences (with 5 major departments, the Social Sciences with 7 major departments, and the Humanities with 11 major departments). In addition, there are three Associated (Professional) Schools at Dartmouth in Business Administration, Engineering, and Medicine.

In an effort to gain outside advice on this issue, the College organized a special conference on "Undergraduate Education in Environmental Studies" which was held in Hanover in November 1969. The participants at this conference strongly urged Dartmouth to consider an interdisciplinary program. In the words of the conference report:

> It is eminently clear that Dartmouth College, with its small size, emphasis on undergraduate education, and commitment to a liberal arts education, should not attempt to produce professional "environmental scientists." Rather, the College should do what it can do best: it should open the minds of potential leaders in a wide variety of professions to the complexities and dangers of environmental problems. Dartmouth can make a far greater contribution toward modifying the social-economic basis for our survival by producing many informed and committed doctors, artists, businessmen, engineers, and journalists, than it will by producing a handful of specialists.[2]

As a result, the College organized a new undergraduate, liberal arts environmental studies program which was designed to build upon its existing strengths and resources. This new program was not designed as a specialized departmental major, but rather as a series of interdisciplinary courses which were planned so they could be coupled with any of the conventional department majors offered at Dartmouth. The program's core curriculum consists of the following three courses:

Environmental Studies 1: Man's Dependence and Effect on His Natural Environment (i.e., the interaction between population dynamics, technology, and basic resources taught by faculty from Geography, Engineering Sciences, and Chemistry);

Environmental Studies 2: Earth as an Ecosystem (i.e., geological, physical, chemical, and biological cycles in relationship to our planet as a finite environment taught by faculty from Biological Sciences, Chemistry, and Earth Sciences);

Environmental Studies 3: Social and Political Aspects of the Environment (i.e., Man's attitudes and perception of his environment and an evaluation of economic, political, and legal approaches to environmental policy issues taught by faculty from Art, Anthropology, Economics, and Political Science).

All three of the above core courses were offered for the first time during the 1970-71 academic year and student enrollments were very high (at least by Dartmouth standards).[3] A total of 169 students enrolled in E.S. 1, 245 students in E.S. 2, and 110 student in E.S. 3.

During the current 1971-72 academic year, a fourth major course is being added to the Environmental Studies core curriculum. This course, "Environmental Policy Formulation," is designed so that students can work together in 8-10 man teams in order to formulate and justify policy measures which they determine to be appropriate to deal with a specific environmental policy problem they have detected and analyzed. The plan is to organize students

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[2] A Conference Report. *Undergraduate Education in Environmental Studies*, Public Affairs Center, Dartmouth College, (Hanover, N.H., April 1970), p. 88.

[3] Dartmouth has a total enrollment of 3,200 undergraduates and the median class size runs between 15 and 16 students.

from different major departments into these project teams in order to facilitate an interdisciplinary evaluation of the problem under investigation.

Any student who completes the above four core courses will qualify for graduation from Dartmouth with credit in the field of Environmental Studies, plus credit in a major field of departmental concentration. Hence, a student may graduate with double credit in such fields as Art-Environmental Studies, Biology-Environmental Studies, Economics-Environmental Studies, and so on.

In addition to the above four core courses, a number of new optional advanced seminars are being offered by interested faculty this year on such topics as "Environmental Perception," "Environmental Law," "Land Resources Policy," and "Control of Man-Made Diseases." Any students are eligible to take these seminars after completing Environmental Studies 1, 2, or 3.

Although it is too early to evaluate the success of the new Dartmouth program, the initial response has been encouraging. Student enthusiasm has been high and faculty members have worked well together in planning the four core courses that constitute the central focus of the program. Because primary commitment has been spent planning the new curriculum, it has not been possible to devote major attention to the organization of joint research or community service projects, although plans are underway to develop such projects in the future. Actually, the major potential future difficulty facing the Environmental Studies Program at Dartmouth appears to relate to the problems of administrative structure, rather than to the academic orientation of the program.

Since the Dartmouth program was designed to use faculty from existing academic departments, a very calculated decision was made not to establish an autonomous new Environmental Studies Department, Center, or Institute which would be divorced from these existing departments. To date, the Environmental Studies Program has made two different types of faculty appointments.

1. *Part-Time Faculty Appointments:* The major share of the faculty appointed to the Program to date has fallen into this category along one of the following three lines: (a) visiting appointments, involving the services of a nearby "outside" professional expert in such fields as environmental law; (b) joint appointments, involving part-time service in the program and part-time service in one of the traditional academic departments; and (c) cooperative appointments, involving voluntary commitments by faculty members from existing departments who give occasional lectures, lead discussion groups, etc., in the program.

2. *Full-Time Faculty Appointments:* A very limited number of new faculty members have been appointed to the program on a full-time basis without any formal affiliation with a traditional academic department.

With the exception of the part-time visitors, there are potential problems with each of the above types of appointments. The major problem with joint appointments is that the various departments tend to formulate their own priorities and needs with respect to faculty recruiting and these departmental priorities may not always be the same as those developed by the staff of the Environmental Studies Program. In a similar fashion, the cooperative appointments depend upon the "good-will" of the existing departments and while

cooperation has been high to date, there is no guarantee this will continue if departmental and program needs come into conflict in the future.

The issue of full-time faculty appointments represents an even more perplexing long-term problem. Traditionally, tenure appointments to the Dartmouth faculty have been made only to individuals who are affiliated with one of the standing academic departments and it is not clear at this point how long-term (tenure) appointments can be given to nondepartmental faculty under existing college policy. This issue may well be complicated by future competition over financial resources. Thus far, Dartmouth has enjoyed considerable success in attracting outside financial support in order to initiate its new environmental program. In future years, however, it will be necessary to budget regular college funds to continue the program and competition for program funds may well strain relationships between the program and the departments.

The above issues highlight one of the major dilemmas facing any college or university which attempts to develop a new commitment to environmental studies. If this activity is to make the most effective use of existing resources, it should not be too divorced from these resources. On the other hand, if this activity does not possess a meaningful degree of independence, it can become too dependent upon (and possibly overly subservient to) the existing academic departments.

At the present time, the Dartmouth program is attempting to steer a middle ground within this rather perplexing maze. The next few years will be crucial to the development of the new program, and while initial signs are encouraging, it is impossible at this point to evaluate the long-range success of the Environmental Studies Program at Dartmouth College.

WILLIAMS COLLEGE
CENTER FOR ENVIRONMENTAL STUDIES

Edwin H. Clark II, Assistant Director

The Williams College Center for Environmental Studies was founded in the fall of 1967, primarily at the initiative of the President and a small group of concerned faculty, to provide a focus for undergraduate teaching and faculty research in environmental topics and to relate the resources of the College to the needs of the surrounding region. In order to promote this last objective and to provide a focus for the Center which would not duplicate the work of other similar institutions, it was decided that this Center would concentrate its research on the "metropolitan hinterland," defined as those regions extending 50 to 150 miles beyond the urban concentrations which are now experiencing profound changes in the degrees and types of demands being placed on their environment and natural resources. During its first 3 years, the Center concentrated most of its effort on hinterland research and in assisting the surrounding region to deal with its environmental problems. An undergraduate environmental studies program was not instituted until the fall of 1970.

Basically, there are two ways of setting up such a program. The first is to have the courses taught primarily by members of one department or center who attempt to cover all the multidisciplinary aspects themselves. The other is to bring together a program in which the courses are actually taught within the different departments. Neither is satisfactory, but for various philosophical and pragmatic reasons, Williams adopted the latter approach. As the program was set up, its goal was to provide students with a basic understanding of the environmental problems facing modern societies as they are perceived by different disciplines in the natural and physical sciences, the social sciences, and the humanities. Hopefully, in this process the student could begin to synthesize some of these diverse perspectives, and would also gain an environmental perspective on his or her major field of concentration.

The program was not established as a major. Rather the student must coordinate this program with the requirements of whatever traditional department he or she has chosen to major in. The program requires every student to take an introductory course in each of the subjects of ecology, economics, and planning and design. Students planning to major in the social sciences or humanities are required to take an additional course in the physical sciences, while students planning to major in the physical sciences are required to take an additional course in the social sciences or humanities. During the junior year, the student is required to take a core sequence course in Environmental

Studies, entitled "Perspectives on Environmental Analysis," which focuses on the interrelationships between traditional disciplines necessary to an understanding of the complex, interdisciplinary nature of contemporary environmental issues and problems. He or she must also take one advanced course dealing with environmental topics in his or her major field, and during the senior year take a second core sequence course on "Environmental Planning and Policy." The senior course, being offered for the first time this year, will seek to involve the students in three- to five-person interdisciplinary groups undertaking planning or analysis projects for such organizations as planning boards and watershed associations. By thus transferring the educational experience from the classroom into the community, it should become both more meaningful to the student and more beneficial to the community.

Several courses offered within different departments are complementary to, though not a part of, the environmental studies program. These include two courses in the economics department, courses in the departments of geology, history of science, history, and art and two advanced ecology courses. The trend of increasing numbers of environmental courses is expected to continue until most of the departments in the college offer at least one course which is directly complementary to the program in environmental studies.

It is not clear how the Center can measure success in attaining its various goals. Any attempt to change or innovate is bound to meet with frustrations. In fact, their absence would probably be the surest indication of such a program's failure. We can claim to have experienced at least our share—some of which accompanied accomplishments, others probably rather inauspicious. In many cases it is just too early to tell.

Since the undergraduate environmental studies program has only been in effect a year, it is particularly difficult to make any general conclusions about it. Actual or potential problems have appeared, some of which may work themselves out, some of which may require a reworking of the program. We are probably now even more aware of the difficulties of achieving integration and a synthesis than we were when we began—courses in different departments don't necessarily merge easily into one another. Perhaps the most interesting and challenging of the courses offered in the first year was the junior core sequence course. In order to ensure that the diverse perspectives of the different disciplines were at least juxtaposed (if not synthesized), the course was taught jointly by four instructors—one each from biology, political science, art, and economics. It was organized around a series of case studies varying from the urban environment to the ecology of Fire Island. This was an undertaking in which both the students and the faculty experienced difficulties and frustrations. However, the experience accurately reflected the very great problems inherent in any attempt to deal with environmental topics in a consistent interdisciplinary manner, and may thus have provided a most effective education.

The other activities of the Center have also experienced frustrations. The attempt to generate substantial, original, interdisciplinary research has yet to succeed and is encountering all of the difficulties one would expect, in addition to some particular to a small college where faculty members have an unusually constrained schedule.

Somewhat more effort has been expended on trying to relate the resources of the College to the surrounding region. A rather formal relationship was originally attempted through the formation of the Berkshire Panel for the Public Environment. This Panel, numbering 75 individuals representing the political, social, economic, and educational elite of the county, would hold periodic, formal, half or full day meetings to consider specific environmental issues. The Panel sought to contend with the fragmented approach (resulting from the complex of different decision-making units on the state and local level) to pervasive environmental problems. Although the Center sponsored and supported (with the help of the Title I grant) this Panel, it was not closely connected with the College. Williams faculty and students had almost no input into the Panel and very little knowledge of what it was doing. The Panel, which was started in 1967, has not met since the spring of 1970, although it has sponsored other county-wide activities. There are several reasons for this inactivity. There was strong disagreement about what the Panel should be doing. It was originally proposed only as an informational forum but quickly got involved in the action, or discussion controversy. By the end of 1970, the need for a strictly informational forum seemed to be reduced. People in general had become more aware of the environmental issues, and at least two agencies—with which the Panel could have been in conflict—had been set up locally to deal with these issues as they affected Berkshire County. Finally, there was a combination of inability and unwillingness among the College faculty to support the Panel since it had so little interaction with the normal educational functions of the College.

This experience has forced us to reconsider how our "outreach" goals can be achieved. One conclusion is that the easiest way to relate the College to the region is through the students. Students at any college spend a great deal of time on research. The increasing desire to have this research "relevant" has led Williams to make use of the local region as a lab, particularly in the social science courses. The Center is actively promoting this trend and is attempting to insure that the work that the students do is also of value to the region. Many of the environmental studies courses, including the senior core sequence course described above, involve the students in applied research projects in local communities. We have also hired a staff member at the Center whose major functions are to promote and advise on these types of student research activities and to serve as a liaison between the Center and the region. We hope that this individual will be able to bridge the substantial gap between communities' needs and the traditional academic resources.

Some of the Center's problems have been complicated by the uncertain relationship between the Center and Williams College. The Center was started almost by fiat and was staffed with people brought in from outside. Only the Director had a faculty appointment and his ties with the rest of the College were very weak. This resulted in the Center's acting quite autonomously, a fact which concerned the faculty and the College administration. This conflict often interferred substantially with the Center's activities and programs. The present trend is to integrate the Center much more closely with the institution. New staff members are usually given joint appointments with other departments, and a faculty advisory committee to the Center has been established. It is hoped that this integration will help to further the goals of the Center by getting more of the faculty and the student body involved in its

activities. It will also give the Center more power in determining appointments and promotions. As a further step in this direction, the Center has established a designation "member of the Center," which is open to any faculty member who is sufficiently interested in the Center and its activities to become involved. The members meet weekly over lunch to discuss the Center policies, programs, and plans. This general process of integration parallels a college-wide concern to assure interdisciplinary programs more power in determining faculty appointments, promotions, and college policies, and to integrate these programs more closely into the general college life.

In looking back over the Center's relatively brief history, one sees many difficulties and missteps. There are the problems of integrating courses in the undergraduate studies program; there are the problems of getting people in different disciplines to work meaningfully together in undertaking environmental research; and there are the problems of bridging the gap between the needs of the region and the abilities and interests of an academic institution. These difficulties were not unexpected when the Center was established nor do they represent necessarily failures of the Center. In its own operations and policies, as with the environmental problems in general, progress will only be made by a continuous process of searching, testing, changing directions, and trying new ideas. We are very fortunate in having had sufficient financing throughout our existence to support this process.

In looking to the future, we expect to see this process continue and anticipate that new problems will continue to appear. In the educational program we will continue to search for synthesis and closer integration. Ultimately—perhaps in the next couple of years—we hope to establish a major in environmental studies. We are also considering summer educational institutes for mid-career Fellows in government, and perhaps even a graduate program in environmental studies. In order to support and promote environmental research, we are establishing major research facilities including a comprehensive Environmental Analysis Laboratory, a 1,400-acre Experimental Forest, and an Environmental Library which will contain original source data and research studies. In both the research and "outreach" activities, we will emphasize participation by undergraduates since this seems to be the easiest way of subverting the problem of involving faculty.

In a time of severe financial constraints, the future of any Center like this, particularly at a small, liberal arts college, can never be assured. However, being obsessed with this uncertainty would probably guarantee the Center's demise with nothing to show for the process. We must be willing to take risks, deal with and perhaps even stimulate new problems, and experiment with new programs and policies. "You teach environment by keeping the topic shifting. It is like a highway with exchanges—there is no set pattern, you get on at one point and off at another. You keep loose."[1]

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[1] Andrew Scheffey as quoted in William Carney, *Man, Land: Williams College Center for Environmental Studies, the First Two Years.* Center for Environmental Studies, Williamstown, Mass., 1969.

ENVIRONMENTAL PROGRAMS

AT

EXPERIMENTAL COLLEGES

COLLEGE OF THE ATLANTIC

Samuel A. Eliot, Assistant to the President

The origins of College of the Atlantic represent the efforts of a number of people from different walks of life to bring increased intellectual diversity, environmental awareness, and economic stability to Mount Desert Island. The idea of the college was conceived by the original trustees, a small group of concerned Mount Desert residents, who incorporated COA in July 1969. The trustees leased a 26-acre estate on Frenchman's Bay as a site for the college, and in January 1970 appointed a president, Edward Kaelber, formerly Associate Dean of the Harvard Graduate School of Education. After extensive consideration, the President and Board of Trustees projected an opening date for June of 1972.

In early 1971, a descriptive brochure was prepared. One section of it read as follows:

> That the decline in the quality of human life cannot be reversed by the mere accumulation of more technical knowledge is a concern of Rene Dubos, a College of the Atlantic trustee. In *So Human an Animal*, he wrote: "Contrary to what is generally claimed, increased knowledge of natural forces and the growth of technology have not improved man's control over the environment. While the rate of environmental change has immensely accelerated, the social and biological responses have not kept pace with the new situation thus created. As a result, technicized societies may be close to the threshold beyond which it will be impossible to evaluate, let alone control, the effects on human life by the new environments created by technological innovations."

College of the Atlantic takes the position that to avoid losing touch with ourselves, we must study man as a product of a cultural as well as a biological past. The humanities and social sciences must serve to temper and guide scientific discovery if we are to enhance our human existence. As environments become ever more man-created, the task of relating man to himself will become more difficult and vital.

Interdisciplinary Approach

We consider bodies of knowledge interdependent. Extreme specialization is incompatible with an ecological point of view. The technologist who tries to operate detached from his culture is like a writer with a huge vocabulary but no sense of the use of nuance. Both are likely to be misunderstood and to create destruction.

We will attempt an interdisciplinary approach; but we will recognize the danger of dilettantism. Thus we will expect some students will want to

achieve depth in at least one area. This competency, however, must be related effectively to other disciplines. Otherwise, it risks becoming pedantic and irrelevant to real problems facing the world.

College of the Atlantic aims to embody these trials into a curriculum and a program which will allow students to prepare themselves to do something about the world in a rigorous, understanding and compassionate manner. It will be difficult; there are no easy answers; we could fail. But if we are to develop a college that will make a difference, the risk must be taken.

A pilot program, participated in by the 3-man staff, 3 faculty, and 13 students, was conducted at the college in July and August of 1971. The main focus of this program was the development of an interdisciplinary problem-oriented curriculum centered, for the summer, around a specific environmental question. To speak of modifications in the program would be to ignore the fact that, prior to the summer, there was no program; students, faculty, and staff created, modified, and remodified the program as they went along. The limited amount of time and experience precluded many final or definitive conclusions. It did seem apparent, however, that the problem-oriented approach was a valid one, capable of stimulating people to ask difficult questions and look for the answers together.

College of the Atlantic's relationship to other colleges is as yet undefined. Staff members, visiting such schools as Hampshire, Evergreen State, and the University of Wisconsin at Green Bay, hope to learn about the evolution of innovative programs at other institutions, and perhaps to take lessons from the successes or failures of those programs. As a small undergraduate college, COA will have few (if any) facilities for advanced research or graduate study. The roles of continuing education and community service at the college remain to be fully examined.

College of the Atlantic has three full-time staff members: President Edward G. Kaelber; Dean of Admission Melville P. Cote; Assistant to the President Samuel A. Eliot. Administrative governance is not a factor in the development of the program. Staff recruitment, salary, and tenure are all matters on the "to be considered" list.

Funding is a major problem. Lack of money has not caused any changes in the goals of the college; it has, however, given rise to speculation as to whether or not the college can continue to exist. A major priority for the future, not surprisingly, is the acquisition of a secure financial base. Once some measure of financial stability is achieved, the college can devote itself to the development of a curriculum in Human Ecology.

POLITICAL ECOLOGY: A COORDINATED STUDIES PROGRAM AT THE EVERGREEN STATE COLLEGE

Donald G. Humphrey, Dean, Division of Natural Sciences
and
Edward J. Kormondy, Member of the Faculty

The Evergreen State College greeted its first students in the fall of 1971. At that time it began the continuous process of becoming—becoming the first public 4-year college to be established in the State of Washington during this century, becoming a college that was conceived under a mandate to innovate and to offer alternative ways of learning to students, becoming a response to the issues of our contemporary world, becoming an educational enterprise designed to help people deal self-confidently with change.

The campus, located in a thousand-acre forest on the shores of the Eld Iniet of Puget Sound, just northwest of Washington's capital city, Olympia, provides an excellent location for environment-oriented science programs. Several ecological reserves exist within the thousand-acre campus and the college owns 3,500 feet of precious Puget Sound shoreline. Set down in the evergreen forest is a compact nuclear campus in which students can live humanely, learn effectively and grow in personally satisfying, as well as socially contributive, directions.

Planning for Evergreen began in 1967 when Washington's legislature and others requested the college's founders to avoid creating a carbon copy of existing institutions. Early planning was initiated by the trustees with the help of A. D. Little Associates as consultants, and continued by a small group which included the president, Charles McCann; the provost, David Barry[1]; and newly appointed deans and directors of the college. The academic program that emerged from the planning efforts of these and other individuals satisfies at least the charge that the institution not be a carbon copy of existing ones. Evergreen State will have no divisions, no schools, no departments, no courses, no distribution, no major requirements, and no grades. No bells will ring, there will be no semester exams, and the college will not have an intercollegiate football team. In fact, even the usual campus boundaries will not exist as programs of study will extend out into the "real" world.

Credit at Evergreen will be earned by work well done in two kinds of total-immersion, full-time activities: Coordinated Studies and Contracted Studies.

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[1] Barry served as Associate Director of CUEBS, 1966-67.

Coordinated Studies programs are small, cooperative learning communities, usually involving some 100 students and five faculty members. The relative compactness of the programs makes possible close relationships among student members and faculty members, opportunities for genuine collaboration in learning, and a sense of direct responsibility for one's work. Initial programs to be offered have been designed for thorough exploration of some of man's most urgent problems, his most important challenges, and his most highly prized values. The faculty members have been drawn from different backgrounds and will bring their special experience to bear in a common effort to cut across the usual boundaries between academic disciplines. Students will join them to define problems, to develop skills, to search for answers, and to struggle toward satisfying the common desire for knowledge and the imperative need for wisdom.

As a pattern complementing the Coordinated Studies program, Contracted Studies allows students to work more and more individually and to further their knowledge in a specific area of interest. At an early stage in the planning of the college, President McCann said, "The most valuable service Evergreen can offer is to initiate a process of continuing learning by preparing young people with the methods of learning and experimentation, by encouraging independence in pursuit of inquiries that interest and motivate them and by providing students with counsel and resources to test this knowledge and ability."

Through the Contracted Studies program, the college wishes to create an environment of grass-roots responsibility in which experienced learners and students who want to learn can come together to work on developing the ideas, the information, and the techniques they most need to know.

Coordinated Studies programs and Contracted Studies are designed to provide the college maximum flexibility in responding to the learning interests of a diverse student body. In effect, this flexibility allows for an operational method of teaching science. Instead of locking learning opportunities up in rigid curricula, and in courses, and instead of dishing up separate menus to science majors and nonscience majors, students can focus on problems and ideas and develop the relevant skill and concept base as it is needed.

Political Ecology Program

Political Ecology is one of ten coordinated studies programs offered at Evergreen in 1971-72. It is conducted by a faculty team consisting of an aquatic ecologist, physiological ecologist, population biologist, physical chemist, and a lawyer, complemented by guest resource lectures from other faculty members competent in anthropology, economics, and political science.

This program deals with the nature, manipulation, and regulation of man's environment. It looks at man's environment from the perspective of science (first quarter), then of anthropology and socio-economics (second quarter), and finally of political science and law (third quarter). In addition to helping students develop various communication and investigative skills, the program aims to develop: (1) a competency to examine, judge, and, in some instances, measure the accumulating mass of evidence pertaining to our environment; (2) an understanding of man's views and impact on the system around him;

and (3) an understanding of man's ability to alter his ecosystem through physical and/or legal means.

These goals are to be met in the following major ways:

Lectures and films. Once each week, the entire group participates in a resource lecture and/or film dealing with the informational theme of the week (e.g., population dynamics, no-growth economics). The lecture is supported by self-evaluation written work, by the resource lecturer of the week meeting with small groups subsequent to the lecture, and by correlated reading (during the quarter) in the following: Ehrenfeld's *Biological Conservation*; Kormondy's *Concepts of Ecology*; and Scientific American's *The Biosphere*.

Team activities. In addition to discussion of the main lecture topic of the week, each team of 20 students will read and discuss such books (during the first quarter) as Carson's *Silent Spring* and Graham's *Since Silent Spring*; Leopold's *Sand County Almanac* and Bates' *Forest and the Sea*; Ehrlich's *Population Bomb* and the Paddocks' *Famine 1975: America's Decision, Who Will Survive?* Team sessions will also provide opportunity for project reports, holding debates and symposia, and attending legislative hearings.

Individual activities. In addition to various reports and papers, each of which will be discussed tutorially with the faculty, each student will complete three projects, one each quarter. One of these will deal with the natural environment, one with the socio-economic or politico-legal milieu; the orientation of the third project will be optional. At least one of the projects must be conducted individually and one, in a team of two or more persons. Approximately half of the third quarter will be devoted exclusively to the project. At this writing, about 50 students are engaged in a cooperative project with the U.S. Bureau of Sports Fisheries and Wildlife on the Hood Canal. The study is directed toward assessment of physical, chemical, biological, socio-economic, and politico-legal aspects of the Canal and is aimed toward providing a data base for ecologically sensible, multi-resource development of the Canal. Other students are engaged in comparable, but smaller scale, projects on the Nisqually River and Delta, urban and rural sewage systems, lumbering, and freshwater ecosystems.

Field trips. A one-week field trip in the fall (near Goldendale, Washington) provided an opportunity to establish a sense of community and to introduce different biomes (near tundra, coniferous forest, and cold desert), different ecosystems (forest, stream, field, pond) and different techniques (mapping, quadrat analysis, water chemistry). Additional field trips in the vicinity of the campus are also scheduled.

Evaluation. A careful evaluation of each student's performance is prepared by the student's team leader. Samples of work that meet writing requirements, project reports, and similar materials will form part of the student's portfolio. Self-evaluation is viewed as the primary objective in the evaluation procedure.

For Whom. The program is designed for lower division students with interests in both scientific and social scientific aspects of man's environment. Those who complete the program will be prepared to take up further studies at Evergreen dealing with the environment and public affairs.

HAMPSHIRE COLLEGE: THE ENVIRONMENTAL QUALITY PROGRAM

Raymond P. Coppinger, Associate Professor of Biology
and Director, Environmental Quality Program
and
Lorna L. Coppinger

The Environmental Quality Program at Hampshire College was conceived almost simultaneously with the arrival on campus of the first ever of Hampshire's students, in the fall of 1970. Being a brand new liberal arts college dedicated to experimental and innovative education, Hampshire had attracted for its first class of 250 students a group which was in general less interested in science and more oriented toward humanities, arts, and social sciences. Also, within the School of Natual Science and Mathematics, courses in environment and ecology were overenrolled, to the detriment of offerings in the more traditional chemistry, biology, and physics.

The Environmental Quality Program was conceived and designed in order to increase the attractiveness of science courses, to balance enrollments within the School of Natural Science and Mathematics, and to contribute to the College's goal of fresh approaches to undergraduate education. Although originally the idea of one biology professor, the Program includes any professor from any of the three Schools who desires to relate his subject more directly to environmental studies. In 1970, by the time the 3-week fall colloquium was over, the Environmental Quality Program was official, and featured a variety of courses, actually seminars, listed under the title of Environmental Quality (NS 110).

During the first 2 weeks of classes, students who had signed up for NS 110 were expected to attend one or two discussions with each of the professors involved, and then to select a course. That selection, however, was not necessarily binding, and a student could spend weeks with one professor and several weeks with another if he found his interests shifting. Hampshire College has no formal course examinations, but rather broad School examinations, taken at the completion of studies within a Division (Divisions I, II, and III are Basic Studies, School Studies, and Advanced Studies). In addition to the separate seminars within the Environmental Quality Program, a core lecture was given once a week, in the evening, open to the public and the rest of the College, and intended to keep a perspective on environment in front of the enrolled students.

During its first semester, the EQP consisted of seven seminars, five from the School of Natural Science and Mathematics and one each from the

Schools of Humanities and Arts and Social Science. A chemist and a biochemist taught *Chemistry and the Analysis of Pollutants*, presenting the principles of chemistry while analyzing various pollutants. *No Deposit, No Return* was a study of the political, social, and operational aspects of the Amherst sewage system, with a view to finding improved methods of waste disposal; it was taught by a microbiologist. *Campus Design* involved a biochemist, an ecologist, and a graduate student in Landscape Architecture from the nearby University of Massachusetts. They focused on the architectural proposals for the Hampshire campus, tested plausibility and ecological soundness. *Explosion and Control* dealt with environmental physics, the exploitation of nuclear energy, on into the growth and control of human populations, as interpreted by a physicist. *Enzymes and Ecosystems* looked at ecological behavior with a biochemist, in terms of the properties of enzymes and the structures of cells. *Man-Made Environment*, taught by a professor of design, studied form and design in man-made environments and their effect on man. *Environmental Law* investigated governmental decision-making as it affects the environment, led by an ecologist and a professor of law.

As these courses were progressing along through the early weeks of Hampshire's academic existence, there was occurring in another course a great adventure which was to have exciting repercussions within the EQP. The course was ecology, being taught outside the EQP in order to avoid compounding the widespread confounding of *ecology* and *environment*. At the end of October, a Humanities and Arts student decided to merge his reading of Thoreau's *A Week on the Concord and Merrimack* with an ecology project. What happened is best described by Jeff Maguire himself:

> I had hated science for as long as I could remember. In fact, I had never much cared for school. I came to Hampshire to get away from the old academic grind; I wanted to have fun, and I had a faint suspicion that learning might be fun if you approached it right. But *science* was still beyond hope. I intended to steer as clear of biology, chemistry and physics as Hampshire's flexible curriculum would allow.
>
> And yet, as the year unfolded, I was sucked helplessly and happily into the world of natural science.
>
> It started when I took an ecology course. The teacher was rumored to be a good guy, and this seemed a relatively painless way of getting some science out of the way. My independent project for the course began as a comparison of the wildlife and plants of the Concord River today with Thoreau's Concord of more than a century ago.
>
> We paddled down the river in canoes from Concord to Lowell. Our trip began almost as pleasantly as Thoreau's: we observed plant and animal life, took photographs and water samples, and made detailed notes on the ecology of the river. As we neared Lowell, however, the clear water turned a murky green, and the pickerel weed, cattails, and willows at the water's edge were replaced by rusty shopping carts, rubber tires and beer cans. Toward the end of our 22-mile voyage, we saw open sewers disgorging into the river.
>
> A project which had started as a comparative nature study had, by that time, changed to an investigation of man's misuse of his environment. Soon the whole Environmental Quality Program was working on the Concord; testing for pollutants, investigating laws and legal recourse pertaining to contamination, studying the design of riverfront property.
>
> By this time I was getting excited about science—at least this kind of science—and soon three other students and I were planning the EQP for the following fall.

Dozens of students were involved in the Concord River study. They recorded their visual impressions on film and interviewed riverside residents on tape. In the winter of 1970, they assembled an imaginative slide show, complete with music and taped interviews, and presented their findings and

educational experiences to the College and the public. Several other schools, organizations, and a TV station requested the Concord River slide show; state and federal legislators, conservation agencies, and interested citizens also requested information and data from the Environmental Quality group.

The excitement thus generated carried over, and the Program was expanded for the following fall, designed and initiated by students. Jeff Maguire continues:

> Our plan consisted of seminars covering different aspects of an urban environment. We focused on Holyoke, Massachusetts, a city of 50,000 which had been nourished, and later abandoned, by the industrial revolution.
>
> Before we could get very far with our EQP planning, however, there was a major problem to solve. Many of Hampshire's faculty who would be teaching in the fall Program were unfamiliar with Holyoke and its economics, politics, sociology, population, business, public health, sewage system, and general ambience. To save faculty time and to provide myself with useful summer employment, I drew up a proposal requesting a grant for me and another student, Sox Sperry, to gather the needed information.
>
> We spent the month of June traveling back and forth to that city, which is about 15 miles south of Hampshire College, meeting with everyone from the Holyoke Hospital chemist to teachers at Holyoke Community College to the Foreman of Sewers and Drains. We interviewed dozens of people and made copies of the city's water test results, census figures, and innumerable other data. To get access to these documents, we had to don establishment attire—ties, jackets, etc.—and we actually made a good impression on several of the conservative city fathers.
>
> One reaction that we overheard: "They're long-hairs, all right, but they wear ties and seem like nice guys." We liked them, too, because they didn't try to fool themselves about their city. They know Holyoke is facing the same economic and environmental problems as many of our American cities, but they are also realistically hopeful about what can be done.
>
> The Model Cities Program in Holyoke (a federal agency committed to improving the city) has already given us partial funding for the Program. It is an exciting notion that EQP may be of social as well as educational significance.

Courses within the Program at Hampshire this fall of 1971 include: *A Chemistry Laboratory for the City of Holyoke; Clinical and Public Health Problems of an Urban Community; Theatre, Art, and Music as Environment; Urban Ecology* (designed by student Sperry); *Waste Disposal in Holyoke; Air Pollution and Lasers; The Economics of Pollution;* and *The Urban Environment.* The first six of these courses are listed under the School of Natural Science and Mathematics, although the one on theatre, art, and music would have application for a Humanities and Arts student. The last two courses are from the School of Social Science.

It is hoped that students from Humanities and Arts will participate to a greater degree as the program expands. A film professor and several of his students are interested in a January Term project in Holyoke, for example, and the city is making a TV studio available for both Holyoke and Hampshire students to coordinate public education projects.

It is gratifying to see such a young program achieve such a degree of student direction, interdisciplinary study, and public service orientation. There is a feeling of rapport between the students and the professors as they are essentially working together on an off-campus project. A proposal from the current faculty director of the program to the Dean of the School of Natural Science and Mathematics requests that directorship of the program be assumed by student Maguire, and that a faculty board of three advisers be appointed, one member from each of Hampshire's three Schools.

The EQP was funded its first year by Hampshire College, during the summer and second fall by Hampshire and the Model Cities Program in Holyoke. Small funds within the College are tapped for speakers and social meetings with various officials. With continuing support from Holyoke in terms of space and modest equipment, some excellent, reciprocally beneficial projects can be carried out without need for large expenditures of money.

For the future, the specific priorities of the EQP include its own survival and expansion. Although its structure at present is predominantly biological, environment is an interdisciplinary subject and formal recognition of the participation of students and faculty from all three Schools is anticipated. Currently, the Program is administered through the Office of the Dean of the College. Hampshire was designed to attract people interested in field work and independent projects, in students teaching themselves, in close student-adviser relationships, and in community service and social consciousness. In its short but satisfying life, the EQP has been successful in providing an educational structure for students looking for relevancy and useful activity in their college studies.

CENTER FOR MAN AND ENVIRONMENT
PRESCOTT COLLEGE

Charles L. Douglas, Chairman

The Environmental Science Program at Prescott College is a joint program of the Center for Man and Environment and the Center for Systems and Sciences. The concept for such a program reached the talking stage during the 1969-70 academic year when students in the Human Ecology class and faculty members of the Center for Man and Environment produced a one-page outline summarizing the thinking about the program up to that time. The remainder of the year was devoted to development of new courses, evaluation and restructuring of existing courses that appeared suitable for the new program, and numerous meetings between members of both Centers. The dedication of faculty members to the development of this program was truly remarkable; participating faculty devoted weekends and other available hours to innumerable meetings and planning sessions, although all participants also had full-time teaching studies. All course prospectuses and the completed program were in written form by May 1971.

All participants agreed that the program should be comprehensive, rigorous, and should prepare a student to obtain employment in environmentally oriented fields at the termination of his bachelors program, if the student so chose. The student is given as much latitude to design his own program as is possible; this concept is consistent with the philosophy of Prescott College. Unlike any other major program at Prescott College, the Environmental Science Program has course work that is required of all students. Because of the nature of the program, the faculty participants agreed that there is an area of basic knowledge that all students engaged in Environmental Sciences should understand. After considerable discussion and compromise, a core curriculum of 16 courses was chosen from the following disciplines:

Man and Environment Center

a. *Anthropology:*
   1) Man and Culture
   2) Culture Change
   3) Anthropology in the Contemporary World

b. *Biological Sciences:*
   1) Introduction to Biological Form & Function
   2) Introduction to Plant & Animal Diversity
   3) Introduction to Ecology

c. *Economics:*
Political Economy (Macroeconomics)
d. *Geology:*
Geology: The Earth Materials & External Processes

Systems and Sciences Center
a. *Chemistry:*
1) The Chemical Environment
2) Environmental Biochemistry
b. *Mathematics & Physics:*
1) Methods of Statistical Analysis
2) Computers and Programming
3) The Physics of Energy
c. *Management Sciences & Systems Analysis:*
1) Qualitative Theory of Systems Analysis
2) Civil Law I: The American System of Law
3) Environmental Law and Political Ecotactics

Students having an adequate background in one or more of these areas are permitted to proceed to more advanced work. Most students take the foundational courses early in their careers, then proceed to specialize in a chosen field, or to pursue a general Environmental Science Program. Thus, if a student needed to take all 16 of the foundation courses, he would spend about 2 years (students take a minimum of nine courses per year) in foundation work, leaving 2 years for specializing in a field, and for pursuing non-environmentally oriented courses. Programs of all students are expected to contain a well-rounded selection of courses in the Humanities. We have no intention of training narrow specialists; neither do we choose to train generalists who are too broad, academically, to be functional.

The establishment of foundation courses necessitated the development of new courses in several fields. For example, many aspects of Geology are pertinent to environmental problems, but the important aspects formerly were contained in several different courses. The introductory courses in Chemistry and Biology were reorganized and given a somewhat different emphasis in order to be suitable for majors in these fields as well as for Environmental Science majors. In Chemistry, the student now progresses more rapidly into biochemical processes that are critical for understanding functions of living organisms. In Biology, the restructuring enables ecological concepts to receive even more emphasis in the introductory course sequence.

Undergraduate students presently are engaged in working with professors on a variety of research projects that supplement academic training in Environmental Sciences. Biology students and faculty are involved in studying the possible effects of proposed highways on wildlife in remote areas of Central Arizona. This project is being conducted for the Arizona State Highway Department. A study of the effect of phreatophyte control on bird populations along the Verde River in Central Arizona is being conducted in conjunction with the Museum of Northern Arizona, and is funded by the Arizona Game & Fish Department, the Museum of Northern Arizona, Arizona Academy of Science, American Philosophical Society, and the Forest Service. This year's summer field program in Biology was concerned with conducting research on the above projects. A study of birds along Sycamore

Creek is funded by Tonto National Forest and by the Salt River Project. The Society of Sigma Xi recently funded part of an on-going study of birds at Blue Point (Johnson and Simpson, 1971, *Condor*, 73: 379-380). A community service project, funded by H.U.D. through Prescott Tomorrow enables our economist and several students to study zoning and planning for the community. Another small group of students presently is engaged in a form of on-the-job-training with the Chairman of the Center for Systems and Sciences, who is consulting for the Bureau of Reclamation. Other students have been placed in summer positions with the National Park Service and National Forest Service. We hope to expand the range of opportunities available to students for summer, or part-time academic year, employment that will enlarge their frame of reference concerning environmental problems and their remedies. We consider field research and job experience to be critical to the success of our program.

The Environmental Science Program is the most extensive inter-center program yet undertaken at Prescott College. To date we have not hired new personnel specifically for this program. Whether we will do so in the future depends upon the success and needs of the program. Faculty hiring is handled by each Center, as are recommendations for salary raises and promotions. Prescott College has no tenure program per se, although an extended contractual arrangement was established in 1970-71.

The development of the Environmental Science Program has had profound consequences for Prescott College. The Ecological Survey was established at about the same time as the Environmental Science Program, and is used as a vehicle for soliciting contracts and grants of an ecological nature. Programs in other centers have reflected the widespread concern for environmental matters that prevails at Prescott College. For example, the Center for Contemporary Civilizations recently offered a seminar on water, one of the critical concerns of the Southwest. The Center for the Person presently offers course work concerned with the psychological ramifications underlying our industrial and projected post-industrial society. One such course is Values for Survival, which examines the value systems of modern man, and his alienation from other men and from nature. The Center for Arts and Literature offers courses in Environmental Photography Workshop, Mass Culture, and others, that are applicable to concerns of environmental scientists. It is expected that more such courses will develop in the future.

It should not be supposed that the development of an Environmental Science Program was accomplished without opposition. Some of our colleagues felt that environmental concerns of the public were a fad that would quickly die out. Those of us who were committed to development of the program had been deeply concerned with, and active in, promoting environmental awareness for many years, and were distressed to find opposition to the program. It should be added as quickly as possible that the opponents of the program have now joined with us and are strong supporters of the concept. A hurdle that we have not yet resolved satisfactorily is the funding of field operations, including funds to purchase and operate enough vehicles to accommodate our growing classes.

Our priorities for the future are being set a year at a time. Since this is the first year the program has been in operation, we will be concerned with evaluation of our courses and field programs. Development of new job oppor-

tunities for students is high on the list of priorities. Since students will be selecting a variety of career objectives, training jobs will be required in a wide range of fields involving both public and government organizations. We also hope to cooperate with other colleges and universities having Environmental Science Programs.

In a day when colleges are pressed to justify the relevance of their courses to the real world, Environmental Science Programs such as ours can challenge the intellectual capacity of a student, while providing him with a humanitarian vehicle for his creative energies.

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