MUST HELPLESS MAN ROLL DARKLING?

An Environmental-education Proposal

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The accelerating expansion of knowledge during the past several decades and the increasing growth in complexity in our society have aggravated both environmental and university problems. Universities must, through multidisciplinary teaching, find ways to focus specialized faculty talent on environmental problems. At Santa Barbara, for example, a program is now flourishing in which faculty contribute to teaching environmental courses but where they remain rooted in their home departments. The departments (discipline oriented) are paid for their contributions to new courses (oriented toward many disciplines). Through such administrative arrangements, existing strengths of university organizations are retained as new attention is brought to bear on complex social issues. Programs in environmental studies may therefore lead the way toward needed university reform as they guide students toward better understanding of the complexities of the environment.

THE PROBLEM

In the mid-Eighteenth century, Samuel Johnson wrote:

"Must helpless man, in ignorance sedate,  
Roll darkling down the torrent of his fate?"

More than 200 years later we are still captured by such thoughts. Humanity is so entangled in war, in population explosion, in pollution, and in the erosion of living values, that pessimism has heightened as to the ultimate fate of mankind. Mother Earth is sick: She is suffering from a sudden explosion in multitudes of men. They are like bacteria in a sick woman, where the sickness is expressed as pollution. We can not unheedingly allow Fate to constrain the throngs of men through the galloping of the Horsemens of the Apocalypse—War, Famine, Anarchy, Pestilence, all leading ultimately to Death.

Certainly we must not willingly stand by "in ignorance sedate" and watch us "roll darkling down the torrent" to such a fate. The intelligence and industry of man have brought us to our present civilization; can not this same intelligence and industry also bring humanity to a high plateau of satisfying cultural equilibrium? Although all of our institutions, and especially governments, must play a role in the search and effort, our universities have a vital part: in striving for understanding, in planning, and in teaching. But most large universities have grown too unwieldy in their organization to study these major problems effectively; part of their energy must now be redirected upon them. As one way to do the job, I here advocate multidisciplinary programs. With attention to the sound aspects of existing university departments and the faculty reward system, such programs can be made to work. The immense strengths of our great universities indeed can be focused upon critical problems, such as those involving the environment, and answer some of the student cries for relevance.

The methods of analysis during this last century have been hugely successful so that now legions of specialists are required to comprehend and work with the information acquired. The capacity of an individual human brain has not increased, but the many brains working individually have brought about the vast bloom in knowledge. Ways must now be found for single brains to cope with this complexity.

A few years ago my university, the University of California, celebrated its centennial and published a record of its growth. It was founded at Berkeley in 1868 and 5 years later had a faculty of 20 to deal with the total breadth of learning then envisioned as useful. Fifteen more were teaching in the medical school at San Francisco. The faculty of 20 at
Berkeley admittedly taught only about 200 students, but it ranged in its coverage through Arts, Letters, Science, Engineering, Agriculture, and Mining. In 1964–65, a faculty of 1595 (professors, lecturers, and instructors, but not including teaching assistants) was needed to impart the spread of learning to a student body of 30,032. It is noteworthy that growth in numbers of students—presumably reflected in population growth and in society’s need for advanced education—was met by the University largely through specialization and fragmentation. Some general classes were split into section after section, but in order to handle the masses of students, these numbers were encouraged to “major” in some “specialty” where the process of selection by the students under a laissez-faire philosophy brought advanced classes down to manageable size. The multi-campus concept (the University now has nine campuses) evolved when it was recognized that the size of campuses could become unwieldy and that even “specialty classes” would grow to be too large and impersonal. Throughout this growth, faculty, students, and administrators have ever been guided by nostalgic memories of how nice it used to be when students and teacher could gather in a tiny group for a lively intellectual dialogue. We learn best through discussion, preferably in small groups. Now the needs for education and the bounds of knowledge have expanded so that the capacity of our machinery to aid the learning process is strained.²

Thoughtful students want to be guided through the mountains of data toward a goal that they can understand and they want to learn how to apply their education and efforts toward benefiting mankind. They observe that much of science, for example, is purloined for Horseman War, and they rightfully object. The inconsistencies between actions by societies as a whole and the moral and ethical and religious teachings applied to individuals perplex them. American universities have arrived at a position where even the enemies of free inquiry and democratic deliberation are exploiting the student’s instinctive discomfort with what and how they are being taught. Moreover, a practical element runs through student thinking which is perhaps a product of our affluent materialism. Students and politicians and the people want and expect the universities to be concerned with real problems and with the training of students so they can graduate into professional jobs and contribute to “making this a better world”. And so students grow impatient with specialist instruction and legislators grow impatient with student protests that are partly their “gut reactions” to impatience. In short, the expansion of knowledge during the last century has led to complexity and the human mind has not expanded concomitantly its capacity to deal with this complexity. And neither have universities themselves evolved satisfactorily to meet this complexity. Not only is Mother Earth sick, but so are our Alma Maters.

Now the hallmark of the environment is also complexity. Ecology, the study of the mutual relations between plants and animals and their environment, teaches us that we as humans are parts of an indivisible earth system. Such a scope implies that not only must we study all aspects of plants and animals separately, but components of the environment in which they live as well. In addition, each of these fragments must be placed in perspective with relation to every other. We are here concerned with both analysis and synthesis—with bringing together parts to make an integrated whole. In fact, study of environmental problems involves repetition of this process several times. We might, for example, profitably analyze a county from the viewpoint of the best use of the land and draw conclusions concerning its optimum development. But these conclusions, to be meaningful, must also include an analysis of many parts, such as traffic patterns and how people move about. Before a sound recommendation for action can be gained the dissection and reassembly of our problem will be repeated many times, and employing many “disciplines”—biology, geology, geography, esthetics, economics, sociology, engineering, etc. This process of looking at systems analytically from the viewpoint of component systems, and putting them back together again, represents a flowering of a time-honored study: systems analysis.

When undertaken wisely and quantitatively, using computers and memory banks to handle the data and computations, it is both a powerful and feasible technique. It will be increasingly important in the future.

To make a point, I am here arguing that “systems analysis and synthesis” should be more broadly applied in scholarship. Basic research is concerned mainly with analysis and less so with broad synthesis and our universities are structured around disciplines where this analysis can be carried on successfully. Research on practical problems, on the other hand, may draw upon techniques from several disciplines, and in looking at the environment we need to involve many. So we naturally
TOWARD SOLUTIONS

In the first place, the organization of universities into departments based on disciplines is largely a sound one. Research and teaching are human activities and flourish best where small groups of compatible men can communicate around the focus of that which interests them. In addition, effective administration requires that universities be broken into units so that budgets and expenditures and personnel matters can be managed. Department members usually have similar building or laboratory requirements. Moreover, the success of scholarship and science during the last century has largely been the direct result of discipline research. This implies that we must not weaken most university departments: these natural and human units.

At the same time we must enlarge our attention upon significant societal problems requiring an interdisciplinary and multidisciplinary effort. These efforts should not be thrown into competition with departments, but made a part of their activities. In struggles for the budget dollar, university administrators have to make hard decisions in dividing up the money. Here I am suggesting that departments be lured into playing a multidisciplinary game, especially in regard to some of their teaching responsibilities.

In some ways unfortunately, department chairmen by assignment are special pleaders for their own faculties. They automatically react against any suggestion which they sense will restrict the purview of their department. Their assigned responsibility is to do their best for department and discipline, and not necessarily for university and society. Deans, in contrast, are expected to be dedicated to sound and long-term development of their institutions, and guided by an awareness of society’s needs. These days, however, many have been reduced to bookkeepers without sufficient opportunity for leadership. We need more of those rare men who can grow to be strong and enlightened deans able to adjudicate wisely between competing university factions, and place the university dollar on lively new programs rather than on morbid old ones.

And so we ask, how can multidisciplinary programs in teaching and research, such as Environmental Studies, be made to thrive within our complex universities and at the same time subtract very little from the effectiveness of existing departments? Can such programs even strengthen them? How can Environmental Studies be organized to avoid conflict with departments and instead grow upon their strengths and receive their blessings?

Most successful departments are organized around the analytical study of a relatively unified part of natural knowledge, although this statement is too simplistic. The subject under treatment provides the unifying core, such as physics, biology, English, history, economics, sociology, etc. Environmental Studies does not really meet this test, nor does engineering, agriculture, and others. Departments organized on the basis of approach or methodology instead of subject are often in for trouble. For example, for the last quarter-century, there has been strife within the earth sciences—geologists, using one set of approaches, have tangled with geophysicists and geochemists, using other sets of approaches and analytical techniques. In many universities these factions have been set up in different departments. They have all been studying the same thing, however, the solid earth and its long history. Now these subdisciplines of approach are being drawn together as the realization grows that all are studying the earth and that, in true scholarly scrutiny, any method of study is valid if sound knowledge results. Some geography departments have lost their vitality because they have spread themselves superficially wider and wider in an attempt to encompass and integrate all that is implied by the phrase “study of the earth and its relation to man”. When geographers analyze earth features in detail, they often fall short of standards traditional in other departments. Their strengths lie in the integrative approach, in synthesis. Environmental Studies in many ways is similar.

Much ink is flowing these days on the ideal role of problem-oriented or mission-oriented studies in universities. Engineering departments have long been concerned with such undertakings, in applying knowledge from “basic disciplines” to solving technical and social problems. Such groups commonly contain both specialists and generalists who focus upon problems in their research and in educating students in their methods. Again, they constitute a coherent “department” because of their common interest in approaching a complex problem. Very often such scholars, in digging deeply into vexing enigmas, enter upon “basic research” and make discoveries that are the envy
of their cross-campus colleagues working in the sanctity of their pure laboratories. Such scholars are invaluable and authentic components of our university mels. Perhaps Environmental Studies therefore might find cohesionness around management or engineering or land-use planning.

Departments of Environmental Management are surely needed to educate for careers of the future where the focus, as in architecture and engineering and urban planning, is upon a mixture of basic disciplines and applied studies and integrative methods. The approaches are both analytic and synthetic. Many geography departments belong in this group. They are often weak when they contain integrative geographers alone and strong when their faculty is composed in part of specialists in hydrology, climatology, demography, for example. Many geography departments would be much stronger if they could cooperate jointly with faculties from more basic disciplines, such as geology, for specific offerings tailored to their needs. At the same time they should concentrate their own talents on the integrative and synthetic aspects of their field.

So an organizational structure for Environmental Studies should be one that draws heavily upon traditional departments and then focuses attention upon environmental problems. On every campus these days is a group of people—faculty and students—interested in the environment and interested in doing something about it. They should be encouraged by giving them funds to work with and should sit down and plan multidisciplinary teaching and research but with some precepts before them. First, the reward structure in terms of recognition, advancement, and salary must be arranged so that participation in the multidepartmental effort is regularized, and not supported by the altruism of dedicated individuals. Second, the program must be organized as part of the activities of existing departments, so they should be involved in planning from the beginning.

When the program prospectus is adopted and underwritten by a budget, professors can be paid on a released-time basis for services rendered to Environmental Studies, but their department would receive the recharge money and they would not receive it themselves. If a chemistry professor, for example, is interested in teaching a course in the Chemistry of Air Pollution under the auspices of the Environmental Program, his department receives payment for the proportion of his services rendered. The course is sponsored jointly by the Department of Chemistry and the Environmental Program. These recharge funds are then available for the department to use, as it sees fit, to carry on its own program. The watchwords are: Environmental Studies always pays for services rendered and does not expect altruism, and all professors involved have homes rooted in their own departments. The program works because Environmental Studies is given currency in the form of academic positions and budget dollars. These are traded off or spent in getting multidisciplinary courses taught. Research and specialist teaching remain largely rooted in the departments. Significantly, as universities feel the dollar squeeze and are unable to add full new faculty positions to all departments pleading for them, here is a budget device to spread funds usefully and widely. Funds for quarter-, third-, or half-time positions can be used by departments for temporary appointments, graduate student support, or for adding to their own sources and needs to justify new full positions.

In addition, many departments include professors who are qualified to teach environmental courses, but whose present teaching is needed so that they cannot wisely add new courses. The recharge system allows the department to hire someone to teach some of his old courses, and to release him for the new environmental courses. In fact, if a full new position is made available to a department in exchange for teaching several environmental courses, the department ought to spread the environmental commitment through its present members if feasible and hire a new man according to their own requirements. They may wish, for example, to add a person in a promising new area in order to keep up with progress in their discipline. Departments may therefore find it attractive to cooperate with Environmental Studies, and administrators may appreciate a sound basis for spreading around small amounts of new money.

Our group at Santa Barbara concluded that the breadth of Environmental Studies requires innovation in teaching: the very indivisibility of the environment necessitates a multidisciplinary attack and a focus on problems. Through team-teaching, expertise can be gathered to deal with the difficult problems of the environment in a careful and scholarly manner. Moreover, the problems are so great and student interest currently runs so high that, with a focus on trying to understand what we should about the environment, the students buckle down to learn difficult subject matter. Basic material is mastered, and much that is included in
conventional beginning classes can be conveyed palatably to the enthusiastic students. Further, it is not enough to gather together a group of existing courses from many departments and label them as a curriculum in Environmental Studies. Such a common solution to the demand for environmental programs fails to focus on skillful analysis and synthesis and therefore fails to come to grips with the central problems: complexity and interrelationships. The students want to hear experts expounding on real environmental problems. These experts are likely to be specialists with homes in many departments.

At the University of California, Santa Barbara we have, therefore, organized a new program around the concept of interlocking new courses that are team-taught by professors from a wide range of departments. These unconventional courses, six in number to be taken in sequence, are designed to look at the whole environment with a focus on environmental problems through an alternate interplay of analysis and synthesis. They form a sequential unit for freshmen and sophomores. Under the quarter system, they are: (1) The Physical Environment; (2) The Biological Environment; (3) The Social Environment; and at the second-year level, 4, 5 and 6 with similar titles but at more advanced levels and drawing upon the experiences of all previous courses. The first, the Physical Environment, was taught last year by a chemist, a physicist, a geologist, and a geographer, but under the supervision and guiding influence of the chemist. He was responsible for the course, its day-to-day running, examinations etc., and the others gave blocks of lectures appropriate to their specialties, but dovetailed with the theme of the whole course.

To understand what ought to be done about smog, for example, the group had to get across some atomic and molecular chemistry so that photochemical reactions can be appreciated, to deal with radiation spectra and heat budgets, and to introduce some fairly rigorous meteorology and climatology to treat inversions satisfactorily. Our students have had no university science or mathematics prerequisites so we have had to lead them carefully through these intricacies, but by isolating those that were clearly pertinent. We are impressed with the students' eagerness to understand, and just when their interest showed signs of flagging we tried to introduce some environmental examples to bring them back to life. Such a course could not be taught satisfactorily by a single ordinary faculty member—it is not re-launched popularized science but science taught by those who know their specialties. Our efforts in organizing the class went largely toward finding scientific explanations needed to attack environmental problems and new ways to express them lucidly. As professors we are keen that if possible the students' understanding be fundamental and not superficial. We are teaching basic science using the environment as a vehicle.

The second course, the Biological Environment, is concerned with basic biology and ecology by focusing on population problems and pesticides. The students were prepared through their course the previous quarter in the Physical Environment. The Social Environment course took up fundamental economics, sociology, history, political science etc., but drew examples from and worked with the environment. By repeating the sequence at more advanced levels during the second year we hope to bring out inter-relationships even more successfully. The courses are envisioned as resources upon which the students can draw for activism later, but hopefully enlightened action.

Obviously anything as complex as the environment cannot be understood after taking only six quarter-courses, and much more is needed. We are requiring each major in Environmental Studies to select a minor in any department of his choosing, such as economics, geology, government, sociology, biology, or chemistry. In meeting this minor requirement the student will take courses in sequence and build up a minor specialty. In most cases we anticipate that with very little additional work he will be admissible to graduate schools in these departments even though he holds a Bachelor's Degree in Environmental Studies. In addition to this minor, required upper division courses in Environmental Studies beyond the six basic courses mentioned above will be organized by the departments concerned, but taught for the major in Environmental Studies. For example, Environmental Geology at the junior level, with prerequisites consisting of either the six Environmental Studies courses or a year of introductory geology will be launched this year. In time graduate seminars will be added and hopefully melded with departmental activities. Such graduate courses in Environmental Studies will largely be generalistic in approach, and aimed upon problems. They will be designed to bring together graduate students from many disciplines to concentrate upon the environment.

Such multidisciplinary undertakings and team-
taught courses are not as easy to administer and organize as conventional courses taught within the neat confines of a single department by a single professor. The needs of students and the complexity of both the environment and the university seem to force this administrative inconvenience, however. These complexities, and the fragmentation of our university organization, now requires that we bring the scattered parts back together again. At the start more administrators of a new kind are demanded. For Environmental Studies the administrator should be a man empowered, with the concurrence of an advisory committee, to coordinate all environmental activities across the campus and to arrange for courses, curricula, symposia, research projects, and other matters, and their staffing and funding. With a budget designated for Environmental Studies he should work out faculty appointments with cooperating departments, but all faculty appointments must be rooted primarily in home departments and meet their standards. Such a Coordinator of Environmental Studies would work through a system of joint appointments and released-time arrangements. These are the payments offered for teaching environmental courses. We, therefore, need "Coordinator Deans" empowered with budgets and specific charges in addition to existing "College Deans" with whom they must work closely. Whether such a system thrives will obviously depend on whether funds are provided to make it work, to make it attractive for departments to enter into such arrangements. Some Departments may balk because they will feel that attention to the environment will dilute their efforts in a direction of growth they have chosen. They can, however, appoint new faculty within the confines of their chosen specialties provided the department as a whole finds a way to teach the environmental courses needed. The gains to the whole system through service must be shown to outweigh the disadvantages. Universities exist to undertake sound teaching and significant research; we may need to sacrifice simplicity of administrative organization in order to achieve these ends.

Probably the best arrangement would be to grow into a College or Division of Environmental Studies, but a different kind of college from that usually associated with the name. It should spread over the whole campus and involve faculty interested in environmental problems wherever they make their home. Such an environmental college would be visible to students and fund-granting agencies and could be headed by an energetic dean of stature, dedicated to making the college thrive. Although all members of the college would also be members of appropriate departments, their degree of involvement through teaching or research in Environmental Studies would be reflected in the degree to which recharge payment to departments for their services was made. Even some departments as a whole might be so environmentally oriented that they would belong within the College of Environmental Studies. A Department of Environmental Management might be an example, or Geography, or Geology. It is essential, however, that the College be so structured that it can draw upon the services of individuals and of departments anywhere on campus, for it must be completely multidisciplinary—a College of Environmental Studies and not a College of Environmental Sciences. The problems are by no means only scientific and technical; they are also social, political, and economic. Bridges between the so-called "two cultures" need to be built, between the scientists and the humanists.

In summary, Environmental Studies, with a timely focus on the total complexity of the physical, biological, and social habitats of man, may provide us with a way to benefit both the universities and our approach to environmental planning. Without weakening our present departmental structure, we must organize teaching and research that draws together dispersed talent from all parts of our campuses and that concentrates its expertise on perplexing problems. A Coordinator or Dean of Environmental Studies, for example, can arrange joint classes, joint degree curricula, and joint faculty appointments with existing departments. New faculty members, brought to the campus because of increased teaching loads in environmental subjects, must meet the standards of strong existing departments, must be appointed by them, and must make their homes within them. Perhaps in time we will see many multidisciplinary curricula on our campuses; curricula that have great appeal to students because their subject matter is concerned with the basic needs of humankind.

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