DOCUMENT RESUME

ED 064 087 SE 013 658

AUTHOR Withers, John D., Ed.
TITLE American Institute of Biological Sciences News, Volume 1 Number 2.
INSTITUTION American Inst. of Biological Sciences, Washington, D.C.
PUB DATE Apr 72
NOTE 16p.
AVAILABLE FROM AIBS Education Division, 3900 Wisconsin Avenue, N.W., Washington, D.C. (Free Subscription)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Autoinstructional Methods; *Biological Sciences; *Environmental Education; *Evaluation Methods; Instruction; *Newsletters; Program Evaluation; *Research Proposals; Resource Materials
IDENTIFIERS American Institute of Biological Sciences

ABSTRACT

This American Institute of Biological Sciences (AIBS) newsletter contains short articles of interest to biological science education. This issue discusses evaluation of objectives, evaluation of proposals, undergraduate research experiments, educational tips, responses from previous conferences, and other brief news items. (CP)

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AIBS EDUCATION DIVISION NEWS

AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES • EDUCATION DIVISION

Volume 1/Number 2/April 1972

DIALOGUE

Another Attempt at Objective Evaluations

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I would like to respond to Hobart Smith's request that dialogue be established concerning faculty evaluations for merit considerations. As a Department Head I find myself spending much time trying to fit into the present "system" without compromising my own principles and philosophies. Perhaps department heads everywhere are faced with this problem and perhaps this points out the subjectivity of most systems. The controversial nature of faculty evaluations emphasizes the need for an evaluation program that relies less heavily on subjective opinions of individuals or at least that can use the differences in opinion to advantage. This letter will serve to present a proposal for faculty evaluations that incorporates some of Dr. Smith's ideas, but adds some suggestions for arriving at a "relative value factor" for each faculty member.

The evaluation system at many universities, as well as this one, functions essentially as a collection of opinions at each administrative level. The only checks on the system result from the requirement that the faculty member see and comment on the department head's evaluation and that he must simply be informed of the dean's evaluation only if it is "substantially different" from that given by the department head. The opinion rendered at each step is to be an evaluation of the faculty's "full professional life" as detailed in the National Science Foundation Publication 67-15; p. 62-69, "Systems for measuring and reporting the resources and activities of colleges and universities." The categories in which the evaluation is made, supposedly of equal weight, are:

1. Teaching
2. Research
3. Teaching-Research
4. Creative Activity in Art and Scholarship
5. Teaching Through Creative Activity
6. Public Service
7. Administration
8. Formal Personal Education
9. Intra-university Activities
10. Extra-university Activities

Clearly, if <u>all</u> of these categories were analyzed a true and accurate picture of an individual's "full professional life" would be obtained. It is equally clear, however, that even a super-human would be physically unable to excel in even a few of these categories, not to mention all or most of them. Also, from the administrator's point of view, it is not possible to complete this evaluation because of the sheer volume, particularly in large departments. Worse, however, because of the volume and complexity of the task, there is a tendency to over-emphasize one or two categories and, at times, to use questionable criteria (often developed quite arbitrarily) to evaluate within the separate criteria. Naturally, in this kind of system, differences of opinions (value judgments) occur. The result is that, in several instances, a faculty member may not receive full credit because he may excel in an area not deemed important by the person doing the evaluation. In any event, this system is more or less functional with the main difficulties arising from the problems mentioned previously as well as from inadequate communication and the credibility gaps thereby created.

Using some of Dr. Smith's ideas, as well as a few of my own, I tried to develop what I hope would be a somewhat more equitable method of arriving at a "relative value judgment" of each faculty member in the department. This system of evaluation is based on the basic assumption that merit should be judged on the basis of teaching, service and research. The relative value of each area and the overall value of individual faculty was determined according to the format given in Table 1. Once the scores for research, teaching and service are summed, the faculty is ranked and scaled from 0-62 and "relative value" becomes apparent. It is then a relatively simple chore to equate "relative value" to amount of increment to be awarded. Both common merit and individual merit calculations can be made, or alternate schemes can be developed.

Admittedly, there will be disagreement about the relative weight of "teaching" and "research," particularly when "service" carries as much weight as is proposed. However, this method makes the basic assumption that an academic department exists primarily for teaching. It acknowledges the importance of research to teaching, but also acknowledges that those activities that serve to increase the academic impact of a department are also important. Clearly, the relative weight given to any one category reflects the proported objectives of the department. These relative values should and must vary according to circumstances. The numbers are for tabulation only and should be regarded (and therefore changed) as "relativity symbols." Recognition is given to those that excel in one area, but are relatively less outstanding in others and it is possible that an all-around average staff member may not fare as well with this system as a person that excels in only one area. Naturally, depending on the relative values assigned, the reverse may also be true.

As presented, this system is at least as subjective as any other. Perhaps its main value is to approach quantification of "value judgments" in the sense that the administrator must analyze the faculty member more closely and more specifically. Since the educational system must be dynamic, the evaluative system must be similarly dynamic and I anticipate changes to occur frequently.

Certainly any educator that would even consider adopting someone else's methods without review and modification is not worthy of the name educator. Indeed several changes immediately come to mind. What kind of peer input can be developed and where will it fit into the scheme presented here? Should student evaluations have as much weight as they do and will additional input from peers dilute student input sufficiently? Should peers prepare a similar evaluation and average it with the department head's?

As a possible check on this system, the evaluation passed to the next level of administration should be the average of the two previous levels, with both being available for comparison when "significant" differences are noted. Thus the vice president would receive a scale rating that was the average of those prepared by the department head and dean. This averaging would tend to "average out" conflicting value judgments and reinforce judgments that were in agreement.

Admittedly, this proposed evaluation mechanism may be at least as objectionable as some others. It appears to me to be considerably better than several that I know of, but is not as good as it could be. Like all other evaluative proceedings, this one can only function under one of two possible systems; either complete confidence in the integrity and motives of the evaluator or absolute autocracy. Obviously, any system that honestly desires efficacious evaluations must preclude autocracy and strive toward complete (and certainly earned) confidence. "Quantification" should have the effect of narrowing the subjective areas of evaluation to the point of being almost objective!

TABLE 1

GUIDELINES FOR EVALUATION IN ACADEMIC DEPARTMENTS

			Total Possible
1. Teaching Function:	Range o Rating: 0-10		30
a. Quality of Teaching: determined by information available to Department Heads, and apparent progress of students in subsequent courses, GRE results, etc. (form of peer evaluation)		10	
b. Value of Department: "essentialness" to overall departmental program. A form of priority rating. Considers overlap with other staff. Considers quantity.		10	
c. Evaluations: an appropriate score taken from student evaluations and then scaled from 0 to 10 as related to other faculty. Averages used when available.		10	
2. Service	Range of Rating: 0-6		12
a. Academic Service: committee work, contributions at academic meetings, etc.		6	
b. Constructive Value of Service		6	
3. Research and Other Creative Scholarly Work:	Range of Rating: 0-4		20
a. Graduate Student Work		4	
b. Program Viability		4	
c. Productivity		4	
d. Visibility ("publicity" and "reputation value")		4	
e. Grants Funded		4	
	TOTAL POSSIBLE SCORE		62

BIO-STUDENT VOICE

MAN AND HIS ENVIRONMENT OR MAN AGAINST HIS ENVIRONMENT?*

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The threat of pollution has greatly alarmed the American citizen as well as the people around the world. Unchecked dumping of arsenic, mercury, lead, and other toxic substances into our waters drastically destroys vital links in the food web and reduces food production. Large quantities of organic effluence piped into rivers, lakes and other waters result in the eutrophication (buildup of large concentrations of organic matter), senescence (aging), and the ultimate death of these waters. Lake Erie, for example, may be the first large-scale warning that we are now destroying by industrial exploitation the habitability of this earth for humans. There can be no doubt that it is a massive commentary on our loss of environmental quality. Even the oceans are not free from the onslaught of the uncontrolled dumping and spillage of civilization. Oil spillage along the coasts has been commonplace for the last few years where thousands of wildlife creatures are destroyed and miles of shoreline disfigured.

Noxious emissions of nitrogen oxides, carbon dioxide, carbon monoxide, organic vapors (SO_2), and hydrocarbons undergo photolysis to form billowing clouds of smog which are now suffocating the large cities around the world. Dust and fumes from heavy industry, refineries, home incinerators and public dumps are major contributors to smog. Automobile exhaust emissions are responsible for the organic vapors found in smog. Such toxic materials ravage delicate lung tissues causing diseases such as lung cancer, emphysema, etc.

DDT and other pesticides are readily concentrated via the ecological cycles and quickly reach toxic levels. Even those animals who are not directly in contact with pesticide drainage from the land, for example, sea lions, penguins, and other creatures inhabiting the Artic regions, show considerable DDT and other pesticide buildup in their fatty tissues.

Low flying aircraft, whose shrill whine of engines shatters the air around cities and their surrounding areas, along with the cacophony of sounds of the city itself (car engines, horns, pneumatic drills, police and ambulance sirens, subway trains, etc.), cause irreversible deterioration of the auditory apparatus and with increasing exposure many city dwellers suffer serious loss to auditory sensitivity by the time they reach middle age. A growing concern arises over the hard rock sound of the teen-age music and the high volume at which it is played due to the effects upon their hearing. Such occurrences have awakened the American people and the people around the world to the fact that the threat of pollution is not fantasy, it is indeed reality.

The most important factor or cause of pollution is frequently overlooked or ignored. Many do not seem to consider or want to consider that the main threat to our environment is not air pollution, water pollution, or even poisoning from harmful pesticides, although these problems do pose a great threat to the health and existence of man, but the single most important threat to our environment is our overpopulation.

It has been estimated that the human population of 6000 B. C. was about five million people, taking perhaps one million years to get there from two and a half million. The population did not reach 500 million until almost 8,000 years later - about 1650 A. D. This means it doubled roughly once every thousand years or so. It reached a billion people around 1850, doubling in some 200 years. It took only 80 years for the next doubling, when the population reached two billion around 1930. It took only 41 years to reach today's 3.7 billion If this progression continues, the world population will reach 4 billion around 1976, 5 billion only 10 years later, and by the year 2000 A. D. the earth's population will be 7 billion people (DeBell 1970).

Overpopulation is the accelerator of all the environmental crises which face us. It is a pressure producer. The more people there are the more pollution being produced. More and more people create more and more wastes and the surroundings cannot absorb what they now have. An extremely serious problem facing the U. S. and other affluent countries is the accumulation of these solid wastes (trash and garbage) in open dumps and inadequate landfills. Open dumps foul the air with the stench of decaying and rotting debris. Even though landfills are quite successful, city disposal companies are finding it increasingly difficult to obtain or purchase areas where they can dump these wastes. Another idea being put to use is the piling and covering of huge mountains of garbage and trash to create recreational areas such as the one at DuPage, Illinois near Chicago (appropriately named Mt. Trashmore).

The treatment and disposal of human excrement (raw sewage) from vast numbers of people has become increasingly difficult since it cannot be effectively returned to the environment where it could normally take its place in ecological cycles (decomposition and use as fertilizer). Many times raw sewage is dumped without treatment into rivers, streams and lakes dangerously polluting these waters and presenting a potential health hazard. This raw sewage problem increases and is becoming worse each day.

More and more people increase the consumption of many goods. The more people there are the more industry arises to fulfill the wants and needs of the population. In the past when huge clouds of smoke arose from factories and darkened the sky, many nodded their heads in satisfaction because at that time this spectacle was a sign of progress, of wealth and prosperity for the nation and the world. Today such spewing forth of black clouds from the chimneys of factories is a sign of pollution, of dumping harmful substances into the air we breathe.

Increasing population increases the demands for greater food production and more land to produce more food. There is a limit to the amount of food that can be produced - regulated by the fertility of the land, amount of rainfall, diseases of the crops, pest control, use and distribution of fertilizer, etc. Only a certain amount of food can be produced each year and no more. It is interesting to note, that in the

* Presented at the Second National Biological Congress Miami Beach, Florida, October 1971.

U. S., which is boasting enormous stores of food from yearly production, approximately 10 million people are starving or malnourished. Also, over 2 billion of the world's 3.7 billion people live lives dominated by extreme shortages of food, water, and resources. Statistically, more, not fewer people suffer from malnutrition each year and this circumstance prevails at a time when agricultural technology has already been making impressive strides (Borgstrom 1970).

More people demand more space for living. The demand for more space leads to the destruction of more natural areas to provide this needed room. Cities and surrounding areas are ever expanding outward, engulfing the land that stands in their path.

Natural resources (forests, mineral deposits, water ways, etc.) also suffer from the effects of overpopulation. Increasing numbers of people place demands upon industry which in turn place demands upon existing resources to fulfill these needs. Mineral deposits are ravaged for fuels and metals. Forests are laid bare for wood products and paper. The U. S., possessing only 6 percent of the world's population, alone uses 40 percent of its natural resources (Time September 1971).

Ever greater production expectations due to the expanding number of people, create not only more gadgetry, but more industry, more filth, more water pollution, more air pollution, more space pressures, more strains, more tensions, and on, and on.

If we continue at the rate we're going in regards to dumping pollutants into the air, water and onto the land, there will undoubtedly be a severe backlash. The city of Tokyo, Japan has already experienced the results of heavy dense smog in the air. The city of Los Angeles is the most perfect example here in the United States. London, England which experienced killer fogs in the past and other cities around the world have reported thousands of deaths due to the presence of harmful substances in the air. Poisons dumped into our waters can eventually affect our populace. It did so in the 1950's when the people of Minamata Bay were taken seriously ill due to the large concentration of mercury found in the fish they consumed. One hundred thousand lakes, rivers and other waterways in the U. S. are reported to be dangerously polluted and restricted from public use (World Almanac and Book of Facts 1971).

Over fertilization of land leads to seepage of dangerous concentrations of these fertilizers into ground waters, which in turn flow into rivers, lakes and other waters.

There is a finite limit to the physical resources of this planet which means that there is a limit to the number of people our world can support. If the breeding of our species continues to go unchecked we may be faced in time with nature's own way of balancing any population. Within nature there are self-limiting mechanisms which see that a population does not breed itself into extinction.

Mass starvation or famine is probably the foremost way in which nature can drastically limit population expansion. Famine, caused by a number of natural catastrophes (drought, pestilence, war, etc.), has in the past effectively checked the expansion of population. History is full of accounts of numerous famines affecting millions of people. For example, the Irish Potato Famine which killed an estimated 1 million people, or the famine striking India in 1946 which accounted for the lives of between 2-4 million Indians. Famine is a very good possibility if one reflects upon the world food situation.

Mass plague or disease, striking swiftly through large and crowded numbers of people, could limit population as the Black Plague did during the Middle Ages.

Warfare has often created conditions in which both pestilence and famine thrived, but it is difficult to estimate what the direct effects of war on population size has been. Over the years it surely has taken the lives of millions.

If we reflect upon nature's limitations - disease, war and famine - it would appear that disease will not now have any significant or immediate effect on population fluctuation, although a highly virulent form of bronchial disease could initially prove uncontrolable. War, if of a nuclear type, would undoubtedly annihilate all human populations. Famine, and its alternative expression malnutrition, remains therefore as the most urgent factor to be considered as a potential cause of major population limitation (Boughey 1971).

Given the threat to our environment and the menace this threat represents to our already failing ability to provide food enough for today's population, it is clear that the human population cannot afford any further growth, and will soon have to decline. Even though the American birth rate has been dropping for most of the past decade, medical advances and victories over death have caused our population increase.

No nation has yet adopted as a goal the reduction of its population growth rate to zero, let alone a reduction in absolute population size. Therefore, it becomes necessary to limit population growth not only here in the U. S. but also through our influence, example, and aid in the other countries of the world.

One way in which the population can be regulated is through family planning. Family planning has been used here and also in other countries with some success. But family planning alone should not be regarded as population control, because it does not include consideration of optimum population size (effective number of people that can be fed and provided for). Family planning only allows for the equal spacing of children by a family, not necessarily limiting the size of the family.

Then what effective measures can be taken in order to assure population control?

(1) Information centers along with mass communication methods, i.e., radio and television, should be set up to educate the people in ways of birth control and birth limitation. Probably the most pressing problem with overpopulation is the general ignorance of many people of the ways and means of birth control. Therefore, setting up information centers where free instruction can be at the disposal of those who wish to use this service would greatly alleviate the problem of ignorance in regards to birth and population control. Educational centers should be set up in poorer areas where high birth rates are common, and equally distributed in other areas since, through various studies that have been made, it has been

found that many so called highly educated people are lacking in some knowledge of birth control and birth limitation (Barnett 1971 and Tienhoven, et. al. 1971).

(2) The teaching of sex education and the need for birth control should be made mandatory for all public schools (primary and secondary) in the U. S. Opposition in various regions of the U. S. to sex education in schools illustrates the kind of difficulty which can be anticipated. There is reason to believe that education, in general, rather than mere instruction in birth control techniques, exercises a strong controlling influence on population size.

(3) In order to reduce the birth rate even more, the birth of unwanted babies must be prevented. Therefore, contraceptives should be made more available and cheaper and should be more widely distributed. Abortion should be legalized and likewise made more available and cheaper. Government run abortion clinics should be set up and staffed with competent personnel whose exclusive purpose would be the performing of the operation and post-operative care. In the U. S. alone the current unofficial estimates put the number of illegal abortions performed at an annual figure of over a million. This is more than one quarter of the actual annual number of live births, and suggests that freely available legalized abortion might assist considerably in stabilizing American population growth.

(4) Clinics should be set up by individual governments for those men and women wishing to be sterilized. Not only should these clinics be free, but also an incentive program should be put into effect where all who are sterilized would receive some sort of benefit or compensation. India, for example, has put this idea into practice and is trying to prevent further rise in their birth rate by paying males for being sterilized.

(5) Legislation should be effected to reverse the present social services principles which favor the production of children in that they either give cash payments in support of children or tax exemptions with respect to child dependents. Rather than encouraging childbearing in this way, tax and welfare benefits would be reversed so as to discourage it. Withdrawal of maternity benefits after the birth of a given number of children would be one way to discourage the present system. Also, the imposition of a tax on births after a determined number. Instead of strongly penalizing the single persons as at present, tax measures should favor the unmarried and the parents of fewer rather than more children. That is to say that those families with more than two children should be taxed rather than be given tax exemptions, and those families who have no children at all should receive even greater benefits than those who limit the size of their family to one or two children.

If the population cannot be effectively restricted in these ways then steps must be taken for compulsory fertility control by the government. These would involve:

(1) A definite number of children per family. The government would set up a specific number of children per family, depending upon existing conditions, and this would be strictly enforced.

(2) Compulsory male sterilization. Men having the required number of children established by the government would be permanently sterilized.

(3) Issuing of child licenses. Each woman would be issued a license to have whatever number of children is established as necessary to maintain a population growth rate at zero.

In summary, when we consider our present technology and patterns of behavior, our planet is grossly overpopulated now. The limits of human capability to produce food by conventional means have very nearly been reached. Attempts to increase food production will tend to accelerate the deterioration of our environment along with the capacity of the earth to produce food. Not only food production but also the products of our increasing population, the wastes and pollution, lead to the increased deterioration of our environment.

Population control is absolutely essential if the environmental problems now facing mankind are to be solved. It is not, however, a panacea. If the population growth were halted immediately, virtually all other human problems - poverty, racial tensions, environmental decay, etc. - would still remain. We have to change our values, our behavior, and rearrange our technology, even if the population growth remains static, in order to solve the many problems facing us.

Not only is the population explosion endangering the existence of the human race, it is also doing considerable damage to our host, Earth. If we do not make an effort to control our population growth and at the same time alleviate the problems of pollution, then Earth, in all probability will do it for us.

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REGIONAL NEWS

GROUP AUDIO-TUTORIAL INSTRUCTION

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INTRODUCTION

The Audio-Tutorial system has met with great success in recent years, primarily in laboratory studies. Various multi-media techniques have been employed since Postlethwait's initial development at Purdue (Postlethwait, 1964). However, the emphasis has remained on individualized instruction.

While it would be incorrect to suggest that "individualized instruction" is of less importance than is generally accepted, there are some difficulties which have been largely ignored in print. The most important problem in developing such a program is that of expense. Hahn (1971) has recently discussed this aspect and while he has shown that the expense per student is not exorbitant, the initial expense of the audio-tutorial equipment might be considered costly at a small college.

Another major disadvantage of individualized instruction involves the loss of student interaction. This problem has been recognized by Postlethwait (1964) and special efforts are made to overcome it.

The major advantage of the audio-tutorial program is that the laboratory can be more efficiently used by having an open lab. The audio-tutorial lab, however, is normally limited by the number of carrels available, since a student is normally given information (via a tape recorder) throughout the laboratory exercise. Although Hahn (1971) has shown that an A-T program can be initiated for under $10 per student per year, few small schools could afford an initial investment of over $10,000 for improvement of instruction in a laboratory. This expense could be drastically reduced by forming small teams of students to receive simultaneous instruction, thus reducing the number of carrels required. Team instruction also allows students to interact with each other during and after the instructional period.

PROGRAM DESCRIPTION

The following program has been found to be successful and inexpensive in a general biology laboratory. We, however, do not suggest that this program is perfect or complete. Also, we have not attempted to describe our complete program, since much of what we do was inspired by Postlethwait (1964) and is more than adequately described by him.

The desirability of an A-T laboratory was based upon our need to establish an "open" lab which would not have a specific schedule and to allow students to work at their own speed. As in many community colleges, a high percentage of our students work off campus. Many of these students are required to leave school in the early afternoon which necessitates morning schedules. A scheduled three-hour laboratory creates grave problems for these students. Also, scheduled laboratories created problems in faculty scheduling with a small faculty and no advanced students to assist in the laboratory. Due to our location in a large metropolitan area, we discovered that our students come from widely varied high school programs and had different capabilities in a laboratory situation. Therefore, it was thought that an open laboratory would be of great convenience for students of both greater and lesser ability in laboratory skills. Based upon the suggestion of Ehrle (1970), before establishing the A-T laboratory, desirable objectives were established as follows:

1. Students should be able to achieve as much or more than from the traditionally scheduled laboratory.

2. Students should be able to work at their own rate.

3. The laboratory should decrease both student and faculty scheduling difficulties.

4. The exercises should be experimental and when possible, "open-ended."

5. The results of experiments should not be available to the students until after the laboratory is completed but the "correct" answers should be provided for testing and academic purposes.

6. Students should be graded on their efforts and not their ability to determine "appropriate" results.

7. Attendance should be controlled.

8. Techniques should be understandable.

9. Students should be able to interact with each other and faculty concerning the "meaning" of their experiments.

10. The program must be inexpensive but effective.

It had been our experience that the instructor's major function in the scheduled laboratory was to explain techniques. Only a minimum of time was available for discussing the experiment with students. Thus, we felt we were not teaching much biology. If the instructor could be relieved of the repetitious function of teaching techniques, the emphasis on discussing biology could be increased.

By using audio-tutorial techniques the instructor can be relieved of the initial explanation of the techniques required. By having students work together, instructors can further shift away from technical instruction by allowing students to teach among themselves. Thus, we devised the "group instructional" concept.

Laboratory teams of four students were formed. The team was required to meet together for their first hour of laboratory work each week. This time was established by the team with the following limitations: the first visit must be on either Tuesday or Wednesday and several alternate hours were necessary to allow for scheduling so that overcrowding could be eliminated. By forcing students into lab early, a common complaint, procrastination, of A-T lab programs was eliminated. The number of students scheduled was not allowed to exceed 50 percent capacity of the lab facilities. This allowed for students to remain in lab beyond their first hour if they so desired.

By having small teams come in during scheduled periods for their initial instruction we could get maximum benefit from our audio-tutorial equipment during its time of greatest usage.

A single 3-M "Sound-on-slide" machine served as our primary teaching instrument for all students in both quarters of General Biology.

The 3-M "Sound-on-slide" projector utilizes a plastic mount for 2 x 2 slides with a recording disc so that each slide can have its own narrative. The slide mounts fit into a tray which can be automatically advanced by an inaudible signal. A listening station (Rheem-Califone Model HP105B) is married with the 3-M projector so that 8 students can view the program together. The teams were scheduled so that two teams received these basic instructions together. By having two trays appropriately labeled, one machine was utilized by two different laboratory groups - the first and second quarter students. The cost of this equipment is approximately $1000.

In order to grade the students on their weekly work in the laboratory, report forms were handed out on their first visit to the lab. These forms contained pertinent questions which were based on the objectives of each exercise. Times were recorded on the report forms by the lab instructor in order to monitor attendance. It was found that the average student attended lab from 2 to 2 1/2 hours per week which was also the average time spent during the conventional laboratory. When the student had finished his laboratory exercise he turned the report form in for grading. This allowed the instructor to begin grading report forms early in the week. The week following each laboratory exercise, graded report forms were returned during the lecture period and the exercise was discussed. "Correct" results were given, generally by compilation of the class results. "Incorrect" results were explained if possible.

The laboratory was open from 9:00 A.M. to 4:00 P.M. from Tuesday - Friday. This schedule increased the teaching load by only 4 hours a week yet, greatly increased the availability of the laboratory and its equipment.

SUMMARY

The audio-tutorial laboratory has proven to be popular and useful. However, it has been limited to large schools due to the expense involved. By forming small teams of students the number of A-T carrels can be drastically reduced. Further, by limiting the A-T program to the techniques involved and relying on a laboratory manual for describing the experiment, the needs for carrels is further reduced. With the above changes to the normal A-T laboratory, a single 3-M "Sound-on-slide" projector was used for approximately 300 students. The initial expense of this A-T lab program was approximately $1,000.

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CROSS-FERTILIZATION

UNDERGRADUATE RESEARCH AT NORTHERN MICHIGAN UNIVERSITY

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In recent years we have seen determined efforts to incorporate investigative work into biological training at both high school and undergraduate levels. Taylor (1971) described a short research program for first-year, university-level biology classes and referred to the contributions of the Biological Sciences Curriculum Study (BSCS) and the Commission on Undergraduate Education in the Biological Sciences (CUEBS) in promoting such activity. The Undergraduate Research Participation Program (URPP) of the National Science Foundation has given direct financial support to undergraduate research at many colleges and universities. The Department of Biology of Northern Michigan University has a program of undergraduate research participation which received substantial assistance from NSF-URPP funds, but which operated independently both prior to and following this support. A brief description of our program may be of interest to departments at other universities[1].

[1] It is possible for our students to carry out research without going through this program. Some pursue projects in fulfilling requirements of conventional courses or by arrangement with a faculty member on an individual basis.

Undergraduate research by students majoring in biology at Northern Michigan University got its start in 1939 under the leadership of Dr. Luther S. West, who inaugurated a one-semester course which according to the catalog provided "an opportunity for the advanced [undergraduate] student to investigate selected problems under supervision of staff and thus acquire familiarity with the basic principles of research" (see West, 1956). Until the early 1960's all students majoring in biology were required to take this course. At this time the number of students outgrew the ability of space and staff to accommodate them. The research activity was then made optional, but remained in the form of a course which normally was taken during the senior year.

The attempt to offer a realistic research experience in one semester had obvious shortcomings. (1) Students often failed to give thought to a possible project prior to enrolling; thus either the decision was hasty or a considerable part of the semester passed before the choice was made. (2) The time-lag involved in locating and procuring references and supplies not available locally sometimes hindered progress. (3) One semester often proved insufficient for gathering meaningful data or at least limited the choice of projects. (4) Because the student was formally committed to a course, and university regulations restricted the privilege of dropping courses or postponing credit, the problems imposed by incompatibility between the student and his project (or his faculty advisor) were magnified.

During the 1960's our plan moved away from the concept of the one-semester research course. This move was stimulated partly by the independence afforded us by NSF-URPP grants and partly by changing policies of the university regarding students, courses, and the use of facilities and staff time. The present plan attempts to correct shortcomings of the earlier research course and to provide the student with independence and opportunity not generally available to the undergraduate. We purposely de-emphasize the matter of course credit and grades, although credit is available to those who complete the program. Our hope is that the activity will be looked upon by students as truly voluntary, enjoyable, stimulating and helpful in the development of professional competence.

Our program operates as follows: early in the fall semester the undergraduate research program is publicized by announcements in classes and on bulletin boards. Faculty members attempt to identify and encourage students who seem particularly suited to the program. These announcements and recruitment efforts are directed principally at juniors, although sophomores and freshmen are not excluded. A meeting is held for all interested students, at which time details of the program are explained and there is the opportunity to ask questions. Factors to be considered in the selection of a suitable student research project are explained. Until recently we next had meetings to allow faculty members to give brief resumes of their research interests and some possibilities for undergraduate projects, but because of the increasing size of our staff, we now give the students a printed summary of this information. At this point the students are invited to visit individually with faculty members with whom they might wish to work. We encourage students to select a problem which is related to some larger research effort going on in the department. Although no firm deadline is set for selecting a research problem, we suggest that a decision be made before the end of the fall semester.

The rate at which the student progresses in his project is governed by his own initiative, the time he has available and the nature of the problem itself. When most have selected projects, usually by the start of the spring semester, we bring the group of new research participants together for about five meetings, at which we discuss things that should be understood by all biological researchers, regardless of their specialized interests. Topics include bibliographic resources and methods, design of experiments, procurement of supplies and equipment, selection and use of experimental organisms, and special equipment available to the biological researcher.

During the following summer the involvement of the student again depends on the time available and the nature of the research. Often a student will continue his work "on his own" during the summer, but sometimes he is able to receive some degree of financial support, especially if a faculty co-worker has a funded research program. Normally the projects are planned so that by the end of the summer preceding the senior year the "data-gathering" phase of the work is completed or nearly so.

When the student and faculty advisor agree that data are ready for organization and presentation, the student may enroll for credit (up to eight semester hours) in biological research. Early in the semester all who are at this phase of their work meet as a group once or twice a week. Discussions center on methods for analyzing and presenting research results. Advice is given on the preparation of oral and written reports, which leads to a discussion of professional organizations, meetings, and publications. Normally these group sessions are concluded by mid-semester, and the student now devotes his effort to getting his final reports in order.

Before the end of the final semester the student must: (1) submit a written report acceptable to both the project advisor and the director of the undergraduate research program; (2) present an acceptable oral report at a session open to all faculty and students; and (3) meet with a group of at least three faculty members for what might be termed an "oral examination" over his research. We believe that these requirements are valuable preparation for graduate work, and those who have continued their involvement to this point usually encounter little or no difficulty. For the oral report the student may be given a full hour at one of the Department's seminar sessions, or several students may be scheduled to give shorter reports comparable to papers presented at professional meetings.

In addition to other benefits that may come to a student from this program, he gains much simply by having an intimate association with faculty and graduate students who share his research interests. Each undergraduate research participant is normally given work space in the Department, so that he spends his time there much as a graduate student might.

Most students who complete our program would probably be judged "successful" in terms of later performance in graduate school or professional employment.

This could be because only undergraduates with certain favorable characteristics tend to get involved and to persevere to completion of a project. However, these students are not always those who have compiled outstanding academic records in their formal courses.

The present status of the 23 persons who completed this program during the 5-year period 1966-1970 is summarized below. Students from 1971-1972 are not included because all are either still completing their undergraduate work or are just beginning graduate study.

Enrolled in graduate programs in science	9
Enrolled in medical school	1
Employed in research positions	
Private industry	3
Government agencies	1
Employed in fish and game management	2
Employed in x-ray technology	1
Teaching at high school level	2
Teaching at college level	1
Employed in nonscience-related positions	2
Serving in armed forces	1

Of the 23 students, 7 were authors or co-authors of papers (based on their undergraduate research) presented at meetings of professional societies. Six were authors or co-authors of published papers.

A disappointing aspect of our program is that the students who show interest each year (usually 10-20 out of approximately 300 biology majors) and those who complete their research each year (usually 3-6) are less than half the number that could be comfortably accommodated by the Department of Biology. Although I have no data to support my belief, I suspect that the program would attract and retain more students if there were, right from the start, a formal commitment to a course and if the faculty went further in telling the student exactly what he should do. I suspect this despite demands for more programs where students can investigate freely without the stifling effect of faculty dictated work done according to a prearranged schedule and without the threat imposed by mandatory grades. Whatever changes might be made in our program, I hope that we will retain a scheme wherein the student's own initiative is the springboard which determines how far and how fast he will progress in acquiring knowledge and experience in the area of his choice.

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Silver Anniversary Year Meeting

Minnesota is COOL in August - and we think some of the attractions being planned by the Education Division for the Silver Anniversary Year Meeting are pretty COOL, too! Like the two sessions on Biology in the Year 2000 - like the Education Division Lounge which will be open 10-5 daily - like the special topics for students, departmental chairmen, anybody interested in biological education. More about the meeting in future issues - for now, please note the dates of August 27-September 1 and the place-University of Minnesota, Minneapolis.

VIEWPOINTS

More on Continuous Progress

Greg R. Foster
Lac La Hacke, British Columbia
Canada

The continuous progress approach to learning is not a fad in education. It is rather, a process of learning and demanding, through rewarding, teaching techniques. Eventually it may very well become a popular alternative to the traditional way of teaching. If we as teachers or administrators consider the education of children a priority, then the study and possible implementation of continuous progress or a variant of it would be worthwhile. The approach offers benefits to student and teacher beyond those in a lock-step curriculum.

Teachers are faced with the most difficult problem of adapting instruction to individual differences among children and are partially successful. Bracketing children according to age, year, and prescribed curriculum often leaves us with the problem we were attempting to solve: that of matching the pupil's stage of intellectual development with the curriculum. Unified class progression adjusted to that of the middle of the class, grade-wide tests on content, and annual promotions or repetitions of grades quite frequently do not do the job of matching. It also appears that too many children are continually being defeated by material beyond their present level of understanding. They are promoted, told to repeat or, if discipline problems compound the issue, told to drop out of school.

Dropping out of school may be a reasonable alternative to failure for some students. Dropping out, in many cases, allows the student to become exposed to the working day world and often gives him an opportunity to decide what he will make of his life.

Discouragement to the point of dropping out of school can be avoided in most cases with the use of continuous progress. Here, individua[illegible] not groups are of central importance. Each student progresses at his own rate, learning according to his own unique pattern without fear of failure. He studies small units containing any number of sequences (modules or mini-units [illegible] be suitable here). He selects sequences according to his interests and with teacher guidance. Progress to new sequences and units occurs only after mastering the skills, concepts or principles of the previous ones. His learning may occur in temporary multiaged heterogeneous groups or it may occur alone.

Individualized continuous progress suits spiralling limitless learning. Getting students to progress, however, calls for teaching guidance. At first, the learner must decide what is to be learned within the general area of study (units) provided by the teacher. When the initial choice is made, a sequence of work with definite behavioral objectives is followed. Open-ended studies grow out of previous sequences of completed work. Previous concepts and principles are continually being reintroducted in a different way at various stages defined by the teacher. This takes into consideration the fact that concept understanding grows as the student's intellectual maturity grows. It also allows for the possibility that "students learn what they need to know when they need to know it."

Utilization of specific staff talents as a team to plan the broad framework of study choices is encouraged. Besides planning, team teaching and evaluation should also be encouraged. Whether singly or in teams, each teacher involved in continuous progress clearly becomes a creative professional in an experimental situation. With the assumption that a student can make intelligent decisions, the teacher attempts to make the student aware of decision possibilities, evaluates the decisions, and encourages self-direction for the bright as well as for the slow learners.

Continuous progress forces re-evaluation of educational practices and objectives at any given moment. It makes the teacher think about fundamental concepts, principles and ways of thinking. Since there is no predetermined sequence of subject matter to be covered but only a broad framework of units to work within, each pupil has his own self-selected program of studies. The bulk of time is spent in individual or group discussions in an effort to guide the student or group through various learning stages of the selected studies.

Although the emphasis in continuous progress is on the individual, a student of any age may work in temporary, specific purpose groups where other abilities are compatible with his. A readiness or pretest may serve as an initial grouping device. For the most part, the student is free to join performance groups according to his needs or interests. He might join to assist a slow learner to review past work, to be tutored by a more advanced student, or be helped by the teacher. The groups are not labelled in any way. They meet needs and then dissolve. Their size should be appropriate to their purpose. The group structure rests with teacher direction and control after the student has made his choice of sequences within units.

Frequent pretesting should be done to find out the skills acquired by the student so that he can successfully function in the next sequence of objectives. Post-testing would measure progress since the time of the pretest. The testing should emphasize skills in classifying and interpreting information and ideas as well as for content.

Records on completed objectives and tests are kept by student and teacher. The student evaluates himself against levels of mastery of students who have completed the course. The continuous evaluation of progress is based on the skills, objectives and principles that should be mastered in selected sequences. Ideally, the quality of work is cooperatively determined by two teachers, a counselor or an administrator. Parent-teacher conferences may be included. Since there is no grade encapsulation, all reports are narrative comments. There should be no competitive devices leading to grade standards if we wish to stay within the framework of vertical and horizontal school organization. If grades are to be given, they should be based on quality of work and on objectives completed.

Under the present organization of some school systems, the teacher typically fits his plans into those provided. Since the reverse would be ideal for genuine continuous progress, exemplified by its individualized programs and no grades, modifications have to be made.

One modification might take the form of a levels organization with some individualized programming. A student, for example, would go through a defined curriculum (basic option) at his own pace and be graded for his work at the end of each marking period. Anecdotal records could suffice in the interim should the teacher wish only a single final grade recorded. Upon completion of the work, a student may select an honors option which would entail work of a more sophisticated nature based on concepts and principles learned in the basic option. An election to do work at both the basic and honors level might be made simultaneously.

Such modifications of the continuous progress allow teachers to work within the present systems of school organization without major administrative adjustments. Since school-wide adoption of the process should not be hurried, perhaps modified approaches are initially appropriate until there is a clear knowledge of all goals involved and the school philosophy towards it has been modified.

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GRANTSMAN'S PAGE

How Proposals are Evaluated

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Staff Biologist
AIBS Education Division

In today's climate of intense competition for funds, a knowledge of the proposal evaluation mechanism may improve one's chances of obtaining funds and, at the same time, ease the burdens of scientists who serve on evaluation panels. In this issue we will review the procedure used by the Division of Research Grants of the National Institutes of Health and those used by the Environmental Education Program of the U. S. Office of Education. Subsequent issues will deal with procedures used by other government agencies and by selected private foundations.

When proposals are not funded, the investigators often wonder why. It is quite acceptable to call or write the office to which the proposal was submitted and ask for the reasons the proposal was not funded. Also, the references listed below describe some of the do's and don't's of proposal writing.

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NATIONAL INSTITUTES OF HEALTH

Proposal goes to the Division of Research Grants, which is independent of the institutes.

Staff reviews proposal and assigns to study section and appropriate NIH unit. (Proposal may be assigned to two units if project overlaps the mission of two units.

Evaluation by Study Section for scientific merit of proposal.

Study Section is composed of executive secretary and ten to fifteen scientists recognized as competent researchers.

Meet 3 times per year to review 50 to 100 proposals and score each on scientific merit.

Recommend approval or disapproval

or

Vote for deferral

Deferred proposal will be re-evaluated at next meeting after site visit or more information is obtained.

Evaluation by National Advisory Council of the assigned NIH unit(s) for appropriateness to NIH mission.

Advisory Council consists of 6 scientists and 6 laymen active in health prollems.

Staff member of specific institute will notify investigator of fate of proposal a few weeks after Advisory Committee Meeting.

ENVIRONMENTAL EDUCATION PROGRAM

Proposal is logged in,

Checked for compliance with guidelines

Assigned to a category and distributed to reviewers

Specialists selected from outside Office of Education for their knowledge of subject.

Specialist reads proposal and prepares evaluation sheets and checklists

Second specialist evaluates proposal independently of first.

Third specialist evaluates proposal if the first two do not agree.

Each selected proposal is evaluated by Office of Education Senior Staff.

From above, 150 proposals are selected for further consideration.

By final staff review, proposals are eliminated until the number is consistent with funds available.

Final list of proposals recommended to the Commissioner who approves the awards.

FUTURISTICS

QUOTES AND QUESTIONS FROM THE FOURTH CONFERENCE ON EDUCATION IN BIOLOGY*

Education Division Staff

In the relaxed atmosphere of Hilton Head Island, South Carolina in mid-February fifteen concerned biologists looked at the question of what biology will be like in the year 2000. One participant noted that his institution had appointed a task force to look at the same kind of question - the task force reported that, "we'd be doing the same thing only more of it." This prompted the following dialogue which we present for your enjoyment.

"Let's imagine 28 years from now, there won't be any biology departments."

"That's a fair hypothesis to make!"

"Then how does biology fit into the academic community?"

"Some colleges...Governor's State, Hampshire... have done away with departments."

"Oh, but they don't have any influence on biology: real biologists don't acknowledge them. They don't exist yet. There is a strong element in biology that won't recognize teaching as a legitimate way to do biology. ...I would look to students to see where biology is going to be in the year 2000. Many students know what they want by the time they're 19 or 20. They don't like the standard programs offered now where everybody does the same tricks at the same rate. Teaching will come to be as demanded by the students."

. . .

"There is another interesting trend as indicated by an advertisement in the ...News. The employer announced that he was interested in interviewing applicants who could do the job and not be much concerned about credentials. This will change the direction education takes. Another thing, there is a big movement now in development of free universities where students don't have to go through all this rigamarole called required curriculum. This will bring additional pressure on the traditional programs."

. . .

"The whole idea of curriculum will be obsolete by the year 2000-really it's an obsolete thing right now."

"You have to have a curriculum of some kind."

"No, you just have to have offerings from which students can make choices."

"Right!"

"What persists will be what students choose. At ...University, the students petitioned that freshman biology be the opportunity to find out what directions you can go in biology. Students want to find out by talking to advanced biology students, practicing biologists - in a low-key way. Students are rejecting paternalism - having decisions made for them. When you talk about no curriculum, just offerings and use introductory biology to provide the opportunity to find out what directions one can take in biology, then students must have background from secondary schools to understand what they find out."

"This requires a different philosophy of education-not filling heads with information but students choosing to fill or not to fill their heads themselves. The questions you raise are good - you're getting down to teaching methodology. How are these students going to come by the ability to decide what information is important."

"It's a shame we don't do that now. Rather than courses and curriculum we could define a population of learning opportunities. One thing that bugs me: so we allow students to make their own programs, how can we make sure a student knows about the citric acid cycle and electron transport, for example?"

"We can't and I don't see why we should! Education is the only practice in our society which is done for itself alone...with no bearing on when the person himself feels need for the education. It's not like seeing a lawyer when we need one."

"Yes, but this can be taken to an extreme. A kid says he wants to be a brain surgeon and gets his first skull open and finds out he doesn't know enough, what then?"

"This is why I posed the question about the citric acid cycle. Most of what we teach is only important when a student has a need for it. That we have conventionally given a series of lectures and we told him, doesn't mean he learned it. He could still discover after he got his first skull opened that he didn't learn what we told him."

. . .

"How then do you teach an introductory course? Are you suggesting that various professors gather unto themselves groups of students interested in learning about life? And when a student raises a question, you refer him to other profs or other references? "

"Well I don't see it quite as structured as that. There has to be a place that is the center of where a biologist practices biology. The real question is how do you get students asking questions. You might say Prof. _________ is going out to a bog. Any of you who are interested are welcome to go with him."

"And they will say, 'What the hell is a bog?' They don't know the significnnce of studying a bog."

"Many students, if their structure was taken from them, would just fold up and die. What we're thinking about is a long-term weaning process. At the center of the University is a gigantic computer and anybody in town can tap the computer. Scholars, bookwriters, researchers supply the computer - keep it up-to-date. This would occupy many people who are now teachers. They are teachers now because that's the only place they can get a job. Then remaining teachers could be real teachers-could do whatever it is that good teachers do - which is quite apart from imparting information."

* Excerpts from one session at the Fourth Conference on Education in Biology at Hilton Head Island, South Carolina, February 14, 1972.

"Teaching versus information input is the couplet we really should be dealing with."

"The idea of transition is important. To set up the system you describe on our campus tomorrow would be absolutely disasterous!"

"Closely associated with that idea is that education is a lifetime process; you dont' just go and get educated and have it for the rest of your life. You go and get information when you need it or interact with teachers when you need it."

"Yes, let's let the employers certify for the job. The university has gotten into the certification business. It was a stupid thing for us to do."

"Then how do we know who the biologists are and who the teachers are?"

"The most biology I've ever taught was to a woman's lib group who needed to know. They generated the interest and read widely. They wanted my intrepretation of these things. I never had so damned much fun in my life!"

"They recognized the problem?"

"Yes, but many students recognize the problems today. You see, to be a good teacher is to recognize what the student already knows."

"Ah, very good!"

"We come to a very important point. This movement to separate teaching from information transmission. The spirit of teaching requires that the teacher recognize what students already know. That doesn't mean he has to know all of what every student knows."

"A frequent student complaint is that teachers don't treat us as if we had ever had a thought. Teachers preach when we already understand the problem."

. . .

And so you have the spirit of the discussions as well as several important points that were raised. Some quotable quotes from similar discussions are:

"The role of a teacher is not to be concerned about the mind being a repository of knowledge. Teaching is not to disseminate knowledge but to motivate students - to show them why certain things are important - how to plug into the sources of knowledge."

"The problem I worry about is that the specialist has also been considered an expert in what to do with the information. We must make distinctions between collection of information and the use of information for social action. We have no mechanism for distinguishing among people as to which of these they can do well."

Having considered some ideas about what biology education might be like in the year 2000, the discussion turned toward strategies for dealing with the anticipated conditions in the year 2000. The diversity of the one-room school house may have had its advantages and students certainly learned from each other. Perhaps in the year 2000 education will resemble a very sophisticated one-room schoolhouse. Other strategies include: teacher hanging out shingle, students buying tickets to classes they wish to attend, develop techniques for increasing the diversity of our student body.

"We're not sampling potential talent of our population, we screen out too many. Lots who go through and are obedient and follow all the rituals end up as dean or college president."

Other suggestions for modifying the conditions of education: teach so that no one need be "busted out," use the "grocery store" approach.

"When you go into a grocery store, you are not penalized for not buying. When you go into a course, you're supposed to get something out of it. If you don't get anything from it, you are penalized for not getting anything. This is like throwing you out of the store after you have paid because you didn't get anything for your money!"

. . .

"There is nothing so unequal as treating unequals as equals. Treating all the freshmen in the course exactly the same way - nothing is so unequal as that."

. . .

"Since the quality of scientific research is determined by the quality of the questions the scientist asks, perhaps we ought to encourage students to ask questions instead of providing 'right answers.' Education is possible where a student wants to answer a particular question. We need to capitalize on the natural curiosity of people."

. . .

"How do you go about generating acceptance of change? I view that as one of the most critical things."

In answer to the question, "What can the AIBS Education Division do?"

"The idea that many biologists, especially teaching biologists feel that AIBS does not speak to them. So we need to bring to AIBS the things being said about teaching where ever they are from, Carl Rogers, for example."

"We need to raise our sights. We need to publish in the AIBS Education Division News articles that take a scholarly approach to education. We will gain prestige, get people to listen to us. We can give people courage to be different - to try new things - to be responsive to the needs of students. Teaching is a respectable profession; scientists are only willing to say that after they've won the Nobel Prize. AIBS must say it now."

"We need a newsletter that is as important to teachers as a specialized research journal is to the researcher. It would become important to keep up with what's in the newsletter. We've never created the same level of importance for keeping up with the literature on teaching as we have for research. There is information available on how learning takes place."

"Yes, for example, recent research shows that infants 12 to 18 months old have their own mechanism for hypothesizing. They get an internal reward for rationalizing discrepancies they see in their world. Damn, that really turns me on! It shows that whatever natural tendency we have to solve problems and understand things, the school system comes along and nips it in the bud - emasculates it. That's very important to know. If we can get some kind of community going that actually frowns upon emasculation of natural curiosity and natural hypothesis making, then we've got strength and we've got an important publication people will want to keep up on."

"Okay, but how are you going to give the publication status?"

"We have to publish the kinds of works we need as biological educators but with the necessary rigor that you have to apply to a problem - the critical kind of thinking that goes into the solution of a problem. Papers that are well substantiated with data and that have valid conclusions."

"But on the problem we're talking about there's so damned little highly documented, hard research that its almost nonexistent. You will find lots of good logically supported opinions but when it comes to 'these data show that...;' it's scarce as hen's teeth."

"I don't think that is the problem. We've got to back up and speak from a position of strength. As long as there are only 14,000 members out of a potential membership of 100,000, we're not dealing from a position of strength; politicians are going to ignore us."

EDUCATION DIVISION PROGRAMS

THE 1972 ASIA FOUNDATION GRANTS

The Asia Foundation is continuing its support of biologists who are pursuing pre- or postdoctoral study in the United States and who intend to return to their home country upon completion of their work. Nationals from the following countries are eligible for awards under the program: Afghanistan, Burma, Cambodia, Ceylon, Hong Kong, India, Indonesia, Japan, Korea, Laos, Malaysia, Nepal, Pakistan, The Philippines, The Republic of China (Taiwan), The Ryukyus, Singapore, Thailand, and Vietnam.

Those qualifying on the above criteria are eligible to apply for the following:

Grants-In-Aid. The Asia Foundation has authorized the AIBS to offer four grants-in-aid of up to $200 each to qualified Asian biologists or scientists in closely related fields for the purpose of assisting them to complete research projects. The grants may be used to purchase materials, literature, or to obtain clerical service for the preparation of a thesis or final report.

Travel Awards. The Asia Foundation has authorized the AIBS to offer four grants of $150 each for travel or per diem expenses to enable Asian biologists who are visiting the United States to conduct research or pursue graduate studies to attend the 1972 Annual AIBS Meeting at Minneapolis, Minnesota, 27 August - 1 September.

Asia Foundation Award. The Asia Foundation has established the Asia Foundation Award for outstanding research published during the period 1 January - 31 December 1971. Papers may be submitted by the author, his mentor, or any co-worker in the fields of biology, agriculture, natural resources and basic (nonclinical) medical science. The Award, to be presented at the AIBS Annual meeting, carries an honorarium of $500, plus $100 to cover travel expenses. In the event the recipient has already returned to his home country, the Award will be made in absentia.

PROCEDURES

Grants-in-Aid and Travel Awards. Application forms are available from: AIBS Asia Foundation Program, 3900 Wisconsin Avenue, N.W., 20016. If the applicant is a student, the need for such a grant must be established by the student's major professor or department head. All applicants must explain the limitations of their present financial aid and must state an intent and expected date of return to Asia in the near future. The university or organization affiliation in the home country, an explanation of source of present financial support, and a brief paragraph explaining present research should be included in the application. Deadline for receipt of applications is 1 June; notification of action will be made on 15 June.

Asia Foundation Award. No application form is required. Five (5) copies of the paper should be submitted to AIBS Asia Foundation Program at the address given above. The paper should be accompanied by a brief statement indicating the (1) author's U. S. address; (2) university or organization affiliation in his home country; (3) social security number; and (4) expected date of return to Asia. Final date for recepit of papers is 1 June; the recipient will be notified on or about 1 August.

HODGEPODGE

THE JOB MARKET IS TIGHT, BUT HERE'S ONE SOURCE OF HELP

Scientific, Engineering, Technical Manpower Comments is a monthly news digest of current developments affecting the recruitment, training and utilization of scientific, engineering and technical manpower. Special sections include current information on supply and demand, the military draft, education, pending legislation and new publications of interest to the producers and users of technical manpower. Occasionally an issue is devoted to a single topic such as the job market for scientists and engineers.

Annual subscriptions are available for $7 from the Scientific Manpower Commission, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

Also available from the Commission are a number of specialized publications on the Salaries of Scientists, Engineers and Technicians, the rules for the military draft, an excellent bibliography of science guidance materials, and a unique career interest booklet called *Test Yourself for Science*. A complete publication list is available on request.

...ON BEATING THE SYSTEM

Frequently this space will contain questions we would like to raise in the biological community. Sometimes we will ask for information needed to answer inquiries made to the AIBS Education Division. If you have questions which might be answered through this medium, please submit them. Responses to all questions will be tabulated and reported as rapidly as possible. May we have your cooperation?

Many individuals would like to adopt some of the innovative teaching methods or in some way improve or upgrade teaching in their institution. Their excuse for inaction is that institution regulations and constraints as controlled by registrars, deans, etc. prevent them from doing "their thing."

The question we are concerned with in this issue is:

HOW DO YOU BEAT THE SYSTEM?

___ by altering the grading system

___ by offering self-paced, self-instructional learning packages

___ by allowing students to register and/or complete courses at other than regularly scheduled times

___ by using variable credit courses

___ by eliminating "required" courses

___ by departing from the formal class schedule to create small group situations at other than regularly scheduled times

___ by operating an "open" laboratory

___ by making use of community resources and volunteers

___ by apparently honoring tradition while altering courses, schedules, grading systems, registration practices, etc. for the convenience of <u>your</u> students

PLEASE EXPLAIN THE RESPONSES YOU CHECK ON A SEPARATE PAGE. Also, we would like to know the following information:

Type of college: __2-year __4-year __graduate

Total college enrollment ______

Control: __public __private

Number of biology majors _____

Number of students in non-major courses _____

Region: __east __south __midwest __west __other

Type of courses in which you "beat the system:" __non-major biology __introductory majors __other undergraduates __graduate courses.

BULLETIN BOARD

Dr. Cynthia F. Norton of the University of Maine is interested in corresponding with persons using "take-home labs" in their instructional program. Those interested should write directly to Dr. Norton at University Heights, University of Maine, Augusta, Maine 04330.

* * * * * * * *

Two Teachers Needed. The February 25, 1972 issue of *Audubon Leader* advertises for "a botanist and an animal life instructor...needed to fill out this summer's (June 12-August 27) teaching staff at the Audubon Ecology Workshop in Greenwich, Connecticut. Qualified applicants should write promptly to Miss Martha F. Sykes, National Audubon, 613 Riversville Road, Greenwich, Connecticut 06830

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Congratulations to Drs. Earl L. Core and Lloyd R. Gribble of West Virginia University upon their retirement at the end of this semester.

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A premeeting conference on "Contemporary Problems in Chloroplast Structure and Function," cosponsored by the Committee on Education of the Botanical Society of America and the AIBS Education Division, will be held on 27 August, prior to the Annual AIBS Meeting at the University of Minnesota in Minneapolis. The topics to be discussed are:

Chloroplast Development. Lawrence Bogorad, Biology Department, Harvard University, Cambridge, Massachusetts.

Chloroplast Evolution. Harvard Lyman, Biology Department, State University of New York, Stony Brook.

Light Energy in Photosynthesis. Govindjee, Department of Botany, University of Illinois, Urbana.

Carbon Fixation. Martin Gibbs, Department of Biology, Brandeis University, Waltham, Massachusetts.

Advance registration forms for the premeeting conference and the Annual AIBS Meeting will be published in the June issue of this newsletter and in future issues of *BioScience.*

MANUSCRIPTION INSTRUCTIONS

Potential authors please note. While it is not mandatory, it would certainly facilitate the retyping of your manuscript if it is done in 52 character space lines (with a 3 character indention at the beginning of each paragraph). We will continue to limit the length of the papers accepted to a maximum of 3000 words (see page 1, Volume 1, Number 1).

So as to provide as much diversity in this publication as possible, the one exception will be the Symposium Issue following the Annual Meeting. In this issue, we will attempt to provide some of the flavor of the Annual Meeting for those of our colleagues that did not find it possible to attend.

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AIBS Education Division News
Volume 1/Number 2/April 1972
Subscription Free Upon Request
Published in February, April, June, August, October and December
Editor: John D. Withers

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AIBS Education Division
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April 1972

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