

MIDWEST BIOSCIENCE



ASSOCIATION OF MIDWESTERN COLLEGE BIOLOGY TEACHERS

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THANK YOU HONORARY LIFE MEMBERS

THE HONORARY LIFE MEMBERS HAVE ESTABLISHED A SPECIAL FUND TO BE USED FOR SPECIAL PROJECTS FOR AMCBT. THE FIRST PROJECT IDENTIFIED IS THE PREPARATION OF A NEW MEMBERSHIP BROCHURE. THANK YOU HONORARY LIFE MEMBERS FOR YOUR GENEROSITY.

A NOTE FROM YOUR 1982 PROGRAM CHAIRMAN

Mark you calendars NOW for the 1982 AMCBT meetings held next year at Central College (Pella, Iowa) on October 8 and 9, 1982. Having recently returned from a weekend planning session for the fall 1982 meetings, the AMCBT steering committee members are very excited about next year's program and we think that you will be too. The theme for the meeting will be "Biological Education=Quality Program." A film festival featuring evolution films will be held Friday morning. Friday afternoon the main focus will be on the use of computers in biology teaching. A "computer fair" will allow representatives from several different companies to show what they can offer. Program possibilities for Saturday include an update on industrial genetic engineering, teacher burnout, recruitment and retention efforts, library acquisitions and services, grant writing, department finances, articulation between community and four year institutions, and an update on the punctuated vs. gradual evolution discussion.

We still have a need for resource people from the organization (or recommendations from members) in the following areas:

1. Someone to lead the session on departmental finances (how to stretch departmental dollars.)
2. Someone to lead the session on articulation between community colleges and four year institutions.
3. Several persons to describe and demonstrate computer (especially micro-computer) programs that have worked well in their teaching to the group interested in the discipline. The four different groups will be physiology, ecology, genetics, and general biology.
4. Persons willing to provide an update-review (latest developments) in their own teaching discipline.
5. Persons willing to report on "labs that work."
6. Persons willing to give brief (15-30 minute) presentations during our "Biological Potpourri" session Friday morning.
7. Volunteers to serve as recorders and/or introducers.

Please contact your program chairman, Neil Baird, at Millikin University in Decatur, Illinois 62522, SOON if you would be able to help in any of the above capacities or if you have other suggestions or ideas. Remember that the success of our meetings depends upon the membership being willing to share ideas and expertise for the benefit of all in the organization. We'll be providing more details on the program in the spring issue of the Bioscene.

A WORD FROM OUR PAST PRESIDENT - AUSTIN BROOKS

Before reflecting upon the present status of our Association as I see it, I would like to take this opportunity to formally and publicly thank all of you for the fine support that you have given to me during my term as your President. Special thanks are in order to Bill Doemel, Program Chairman for the Carroll College meetings and to Ted Michaud, Local Arrangements Chairman at Carroll. Dick Wilson of Rockhurst also must be given accolades for the fine job he has done standing in for our Executive Secretary, Ed Kos, during the latter's Fulbright year. Of course I would be remiss if I did not acknowledge the support of the dedicated group of people that served on the Steering Committee over the past year.

Since my first AMCBT meeting at Hamline in 1966, I have missed only three annual meetings--one of these because I was on sabbatical leave in Germany. What is it that makes me sacrifice the better part of an October weekend, which more often than not is our Homecoming, and at the same time spend often as long as 20 hours trapped in an automobile? I can answer this question without hesitation and with a single word--FRIENDSHIPS. Although I found the program at every AMCBT meeting to be interesting, it is the people that draws me back year after year. Those informal conversations where new ideas surface and old problems are readdressed in creative ways is what AMCBT is to me. In short AMCBT is a diverse group of concerned teachers that face similar problems.

To preserve this great diversity, we should have a large number of members. The relationship is a simple one. More members make for a greater variety of presentations at our meetings. More members produce more articles for the Midwest BioScene. And finally more members generate a larger treasury. In the past few years, perhaps because of the economy, our membership roles have decreased. Since the founding of the AMCBT 25 years ago, the membership has been as high as 340. By comparison we currently have 265 on our present member roster, but only 125 attended the Carroll College meetings last October and less than 2/3 of that number have paid their current dues.

Clearly our greatest priority should be to increase our membership. Your new President, Norm Jensen, plans to reactivate the state membership chairperson plan and thanks to the generosity of our Honorary Life Members a new AMCBT membership brochure is being prepared. These are both significant steps, but ultimately it is up to you and me to attract new members. If each of us would bring only one extra colleague to the annual meeting we could increase our membership dramatically. To maintain AMCBT diversity and viability, make 1982 the year you bring in a new member. If each of us meets this challenge, AMCBT will flourish and continue to provide us with an outlet for innovative ideas in teaching.

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Thanks to all of the presenters and chairpeople who participated in the 25th Annual Meeting of the AMCBT at Carroll College. I especially appreciated the cooperation and effort of the local arrangements committee headed by Ted Michaud. The theme of this year's meeting was Biology in the 80's. Dr. Jane Kahle, Purdue University, gave the keynote address, "Biology in 1984 and Beyond." For her, student population, government support, and science literacy projections imply that college biologists need to reassess their teaching methods and their educational goals. A copy of her talk is included in this issue of the BioScene.

I could not attend all of the presentations, but during coffee breaks and during the evening activities, I heard many positive comments about the quality and interest of the concurrent sessions. Several of the sessions deserve special mention. Ed Cawley, Loras College and John Jungck, Beloit College, brought their microcomputer hard- and soft-ware. During Friday and Saturday, they gave several lecture-demonstrations about the utility of these systems for the biology laboratory. Indeed these systems may enable us to teach biology more effectively at less cost. As you will discover later in this issue of BioScene, next year we hope to focus on the variety of computer hard- and soft-ware that is available.

Sister Julia Van Denack, Silver Lake College, led a discussion concerning the continuing debate about the teaching of evolution in the high school classroom. The interest of our members in this program stimulated the Steering Committee to include a section on evolution in next year's program.

Judith and William Brett talked about the mid-career crisis for the biology teacher. After discussing the evident stages of burn-out, they proceeded to discuss ways for faculty to "reignite" the fires of enthusiasm. Watch for a future article in BioScene.

Bruce MacIntyre, Carroll College, informed many of our members about the hazards posed by formaldehyde vapors in the biology laboratory. He also presented a method to evaluate the levels in the air and means to reduce these levels. It was a useful presentation for many of us regard laboratory chemicals as safe simply because we have worked with them all of our professional lives and have not observed any ill effects. Certainly that perspective, although common, is not scientific nor is it necessarily beneficial to the welfare of our students.

During the final panel discussion, former Presidents of the Association reflected on the beginnings of AMCBT and challenged the membership to revive the excitement, to broaden the colleges represented and to increase the membership of AMCBT. We were pleased to welcome the first and second Presidents of the Association, Leland Johnson and Willis Johnson. Joining them on the panel were Phyllis Kingsbury, 22nd President, and John Carlock, 11th President and former Executive Secretary.

Finally, I thank all of you who attended the meeting and participated in the discussions. I hope to see all of you next year at Central College, Pella, Iowa. Greetings also to those of you who were unable to attend the meeting. I hope to see all of you next year. Let's make the 1982 meeting our biggest ever. You can help next year's program chairperson, Neil Baird, by sending him your ideas now.

William Doemel
Program Chairperson

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Introduction:

The year 1981 began with an editorial in *Science* that stated...*Knowledge of the humanities must be coupled with an understanding of the characteristics of scientific inquiry and technological change. Liberal education must define scientific literacy as no less important a characteristic of the educated person than reading and writing.* (Banner, 1981) In analyzing the past and looking toward the future, it becomes apparent that biology education, indeed all of science education, is at a crossroads. Projections of population demographics, both of potential students and of tenured faculties; of curricular needs; and of fiscal policies indicate drastic changes will occur in 1984. In the 80's and beyond, education in the biological sciences must provide both scientific expertise and scientific literacy at lower cost for declining numbers of less well-prepared students.

According to the recent National Science Foundation Report to the President... *there are indications that the U.S. higher education system is under considerable strain and is not able to provide as high quality education in science...as many specialists believe it could.* (NSF, 1980, p. 33) Consider the following factors that currently affect undergraduate biology education:

- * Only one-sixth of high school juniors and seniors are currently taking courses in math or science. And only 50% of our undergraduates have had any science or math beyond the 10th grade.
- * Students who take no more mathematics and science after the tenth grade have effectively eliminated, by the age of 16, the possibility of science as a career. The pool from which our future scientific personnel can be drawn is therefore in danger of becoming smaller, even as the need for such personnel is increasing.
- * Average science and mathematics achievement scores on the National Assessments of Science & Math and the Scholastic Aptitude Tests have steadily declined over the past 15 years. Although part of the SAT decline can be accounted for by compositional changes in the population taking the test, other factors have been suggested. These include: diminished seriousness of purpose, grade inflation, lower standards, and lower motivational levels in students.
- * Undergraduate biology enrollments have leveled and are declining.
- * The size of the 18-24 year old age group has peaked and will continue to decrease over the next 20 years.
- * As student populations become more heterogeneous, their preparation, needs, and interests become more diversified. Since education has long been the route by which upward mobility has been achieved by disadvantaged groups, science education must adapt to their needs.
- * Today 11% of biology bachelor degree recipients are unemployed, and 12% think that they are underemployed.
- * Today over 56% of all faculty are tenured. This percentage will increase with loss of faculty and decreasing enrollments.

- * Average faculty salaries, adjusted for inflation, dropped more than \$1000 in the last ten years. This erosion in the economic position of academics is expected to continue, and possibly to worsen, in the 1980's.
- * Costs are outstripping income for virtually all colleges and universities due to: inflation; a leveling off of income from tuition and fees; and, for private universities, decreasing returns on endowment investments.

What has led us to this crossroads has been documented by the National Science Foundation, and the Educational Testing Service, by the Education Commission of the States, by the Department of Education, by the Gallup Poll, and by the National Center for Educational Statistics. These same sources also provide some future projections. However, the turn taken at this crossroads will depend upon choices made by faculties concerned about teaching biology to undergraduate students. We must be cognizant, therefore, of changes in students, in curricula, and in the university as 1984 approaches.

Students:

In the future, undergraduate education in biology must address the needs of two distinct student samples: first, the quantitative and qualitative preparation of future biologists at all degree levels; and second, the provision of scientific and technological literacy for all students, including those who intend to enter business, law, government, etc. The needs of both groups must be addressed in the 1980's; for each composes one base of our society. Our technocratic society is firmly based on the continued education of competent, inventive scientists and engineers who design and build the system.

However, the second set - scientific literate laypeople - provide the second base which consists of the overwhelming portion of our population. This portion has no direct involvement in science and technology, or with the science and engineering community. Instead, they are indirectly involved through their influence on governmental and industrial sources of funding and on regulatory and policy decisions. They reap the benefits of science and technology. Many need some knowledge of science and technology to do their jobs well. However, the current trend toward virtual scientific and technological illiteracy means that beyond 1984 important national decisions involving science and technology will be made increasingly on the basis of ignorance and misunderstanding.

In general, the secondary schools will continue to prepare two distinct pools of students: first, the future scientists and engineers; and second, students who have ended their studies in science and mathematics with 10th grade biology and geometry. Let's look at the characteristics of the 'science' sample first. Their entrance scores on the verbal and quantitative portions of the SAT show that they have average verbal abilities and slightly better than average quantitative ones. However, students

intending to be biologists have significantly lower quantitative scores than future college mathematics and physical science majors. Unlike the general student population, the mean verbal and quantitative scores of these future scientists have not decreased significantly in the last 15 years. Likewise, their advanced achievement test scores, although lower than the ones in physics and chemistry, have not declined. Significantly, however, the numbers taking these advanced tests have declined by 40% in the last ten years. Data indicate that 9% of all college bound high school students take honors biology courses, while 17% and 10% take honors courses in mathematics and physical science. Since honors high school biology is frequently a way to take more, but less quantitative, science, we can assume that the pool of future biologists is from the 10-15% taking honors courses in physical science and math.

General high school graduates, on the other hand, have shown a steady decline in general scientific knowledge. Over the past 15 years average math and science achievement scores, according to the National Assessment of Educational Progress, have declined. Although the decline has leveled in biology for 9 and 13 year olds, it continues to be significant in the physical sciences. In mathematics, the declines have been more pronounced on exercises involving problem-solving and the application of concepts, rather than on those requiring computational skills. It is no surprise that scores are declining when you consider the current state of secondary science education. For example, although 3/4 of school districts require more than one year of social studies for graduation, barely 1/3 require more than one year each of math and science. Fewer teachers are available to teach these courses, as serious shortages in mathematics and physical science teachers continue to grow.

These shortages indicate that the secondary schools may lack the capacity to prepare students to pursue college majors in science and engineering. Perhaps more seriously, teacher shortages hamper the ability of schools to provide suitable instruction in science and mathematics for those who are not likely to pursue science and engineering careers. (NSF/DOE, 1980, p. 18)

However, students particularly minority students, think that science is important and that science ought to be required (even though many respondents did not plan to take additional courses). These data indicate that general students might be motivated to take additional science and mathematics in high school and in college. The future pool of undergraduates, therefore, will be divided between well-prepared majors and minimally-prepared general students. Yet both groups will need education in biology for life in a technocracy.

Other data concerning the undergraduates in 1984 and beyond indicate that they will be older and predominantly female. Many will attend part-time. And there will be fewer of them. The number of high school graduates peaked in 1977 and will decrease steadily in the 1980's. The median age in the United States changed from

27 years to 29 years between 1970 and 1975; it is projected to reach 33 years by 1990. Specifically, we are concerned with the size of the 18-24 age group. The decline in numbers of 18-24 year olds will begin in 1982. Currently, there are 29.5 million in that group; it will decrease to 27.9 million (a decrease of 6%) by 1985; and by 1990 it will decline by 15% to approximately 25.1 million. The impact of this decline has varied ramifications for higher education. It has been summarized in the following way:

Recent issues in higher education have centered on the effects of the coming decline in the size of the traditional college-age population. These issues include the lowering of admission standards, tenure, salaries, and employment status of faculty, financial problems of institutions, and developing new markets for higher education. (NSF/DOE, 1980, p. 96)

Enrollment in colleges and universities will peak in 1981. The worst enrollment declines will occur in four year institutions. However, it is anticipated that the declines will not reflect the severe decrease in numbers of 18-24 year olds. The impact will be ameliorated by increased numbers of women, older students, and part-time students - samples which historically have not demonstrated high levels of interest and/or achievement in science.

It is anticipated that universities will continue to educate many able graduates who will join the sciences and engineering labor force in 1984 and beyond. One indicator is the stability of the Graduate Record scores, and there is no reason to anticipate a sudden decrease in these scores. In addition, projections of bachelor degrees in the life sciences indicate a slight increase throughout the 1980's. The number of master's and doctoral degrees in biology will continue to decline. This fact, coupled with the increased number of Ph.D.'s awarded to non-resident aliens, may threaten our supply of scientific personnel beyond 1984. Undergraduate biology education is expected to meet the needs of the well-prepared high school graduate who is planning a career in a science-related field. If it is advantageous to populate nonscientific professions such as business, law, and journalism with scientifically knowledgeable people, we must, in 1984, begin to address the needs of the second group of undergraduates. As the National Science Foundation reports,

...there is little evidence to suggest that this is happening, either at four-year-colleges or universities. Indeed, undergraduate science education has been criticized as being too theoretical and esoteric for most students, and still oriented toward those who are intent on graduate study. Neither the needs of those who intend to enter the labor force directly after graduation nor those who intend to pursue nonscientific careers appear to have been adequately addressed. (NSF/DOE, 1980, p. 39-49)

And last, the needs of a new type of undergraduate, the older woman, who is attending part-time, will need attention in 1984.

Faculty:

Concurrent with changes in the general undergraduate population will be changes in the faculties of universities and colleges. Between 1969 and 1975, the number of mathematics and physical science faculty as a percentage of total college teaching staff decreased by 50%; at the same time, the number of biological sciences faculty increased by 50%. Indeed, during the latter part of the 1970's, the situation became more complex as faculties continued to increase by 38%, while enrollments grew by only 28%. We approach 1984 heavily over-staffed. As a consequence, the number of faculty will begin to decrease by 1982 and continue to 1988 with a loss of 50,000 positions. Obviously, cuts will be made among younger, non-tenured faculty, the status of most women and minorities. Women, for example, account for one in four of all full-time faculty in public and private institutions, but for less than one in five among tenured faculty.

The decrease of students necessitates fewer faculty. Any decline in total faculty number concomitantly projects an increase in numbers of tenured faculty. Today 56% of all faculty, and 62% of full-time faculty, have tenure and this percentage is rising. Flexibility in staffing and the influx of new ideas, techniques, and methodologies, both in teaching and in research, may decline as 1984 approaches.

Fiscal:

The National Center for Educational Statistics describes the current state of undergraduate education in the following way:

In the 1980's, higher education is expected to undergo changes that may seriously affect its financial character and possibly threaten the economic viability of some institutions. Throughout the 1970's, concern was expressed over the consequences of falling enrollments. Now, at the beginning of the 1980's, projected enrollment declines are joined by double digit inflation in an unprecedented combination that may produce an extended period of lower revenues and higher expenditures...No sector of higher education will be unaffected. (NCES, 1980, p. 142)

As enrollments decrease from 11.3 million in 1978 to 9.5 million in 1990, expenditures in higher education will increase from 49 billion to 58 billion. The problem is that the per-student or unit cost of instruction may continue to increase. Normally, unit cost of instruction is decreased by an increase in student/faculty ratio. However, with a largely tenured faculty, this ratio may actually fall, resulting in higher unit costs.

Increased costs will continue to plague universities beyond 1984 and to contribute to changes within them. For example, in addition to unit costs, only minor adjustments are possible to meet skyrocketing utilities costs. These include conservation, system

conversion, and adjustments in the academic calendar. In addition, labor costs account for more than 80% of the total college and university expenditures. Two factors limit flexibility in this area, the number of tenured faculty and the rising cost of living. Since 1970 expenditures at public institutions have more than tripled.

Couple inflation with lowered revenues from fewer tuitions and the pattern beyond 1984 emerges. Public institutions have two possible remedies. First, tuition increase and, second, increased governmental support. The first one will decrease participation unless it is accompanied by increased financial aid, which does not seem probable. The second remedy would give public institutions an unfair competitive edge over private ones, increasing their rate of demise.

In the 1980's, therefore, financial difficulties will present both state and federal governments with political questions that will necessitate a fundamental reconsideration of their commitment to low cost, public, higher education. Since most of the support for higher education *derives from state monies, each state* will solve this problem differently. With the rising cost of scientific research equipment (it is estimated that it costs about \$100,000 to initially set up a laboratory for a new assistant professor) and with increased unit cost of instruction, it is imperative that the state level of support be sustained beyond 1984.

Curriculum:

For instructors of undergraduate biology, the task for 1984 and beyond is to redesign the curriculum in light of new biological knowledge, cognizant of the changes described concerning undergraduates, faculties, and financial support. Recently, the National Science Foundation has completed two comprehensive studies, one of which delineates scientific frontiers; the second of which suggests specific curricular changes needed in the next five years. (NSF, 1980a; NSF/DOE, 1980)

A remarkable burst of biological advances as well as powerful new technical tools are generating insights which will substantially change the content of the biology taught beyond 1984. In several areas - molecular genetics, cell biology, immunology, neuroscience, and plant science - there are profound changes.

In molecular genetics, the basic mechanisms elucidated in bacteria and viruses are now being studied in higher organisms. In the next ten years the following breakthroughs are anticipated in molecular genetics alone.

1. The function of intervening, nonactive sequences in the codes for the synthesis of specific proteins in higher organisms will be elucidated.
2. Mutations in genes are under intense study. By 1984, defective hemoglobin synthesis will be understood, and beyond 1984, diseases of cellular malfunction such as cancer or auto-immune disorders will be discerned.
3. It is anticipated that the treatment of genetic diseases by replacing defective genes with normal ones will begin with a replacement of defective blood cells.

Rapid advances in cell biology will also change the content of introductory biology, cytology, and cell courses in the 1980's. Some of the most fruitful research areas are:

1. Efforts trained on the intricate mechanisms that integrate the complex interactions of genes and enzymes. Such knowledge is pivotal for understanding not only normal cell reproduction and differentiation, and presumably the conversion of a normal cell into a cancerous one, but also the process by which cells age.
2. Cell membranes and their regulation of the vital balance of fluids are the objects of intense study. Critical to new understanding are studies of the newly discovered specific receptor proteins in cell membranes. These will be topics for the curriculum in 1984 and beyond.
3. Other curricular topics will be elucidated from studies which are probing the molecular basis for the cytoskeleton's dynamic nature, seeking to understand the motility that allows white blood cells to mobilize to fight infection, or cancer cells to invade nearby organs.

Enriched by the new tools and understanding of biochemistry, molecular genetics, and cell biology, immunological research has gained new sophistication and has become a powerful source of new insights, which will need to be integrated into the curriculum of undergraduate biology courses. Some of the breakthroughs anticipated in the next decade are:

1. New vaccines for several infectious diseases, including serum hepatitis and malaria. Interferon, a powerful antiviral protein manufactured by the body, is promising to be therapeutically effective; its current scarcity may be remedied through the use of recombinant DNA technology in a few years.
2. New discoveries about the types of white blood cells that influence allergic reactions.

3. New findings regarding mechanisms of tolerance promise to lead, realtively soon, to improved methods for controlling several autoimmune diseases.
4. And, finally, advances in tumor immunology will eventually make it possible to eliminate cancer cells that remain after chemotherapy.

All of these discoveries will lead to profound changes in the content of undergraduate biology courses.

Turning to the area of neuroscience, one can anticipate a decade of innovative and exciting advances. As research continues to examine the remarkable workings of the human brain, a genuine understanding of the human condition may be illuminated. Work which will contribute to curricular changes is progressing in the following areas;

1. Analysis of the structural organization of the nervous system - the wiring diagram - is proceeding at a rapid rate, and a detailed topography of the functional anatomy of the brain is imminent. That the brain also produces its own hormones, most of them polypeptides, has just been recognized. The study of hormones and their actions, both those produced in the brain and elsewhere, is also advancing rapidly. Hormones, now believed to act on the brain in a manner analogous to synaptic transmitters, underlie such important phenomena as sexual development and basic motivations like thirst and response to stress, and may modulate higher order processes such as learning and memory.
2. It seems likely that in a decade or so researchers will know how developing nerves seek their targets and may even be able to improve regrowth of damaged neural tissue.
3. Much new information will be gained in the next 5-10 years about how the brain codes and integrates sensory information.
4. In addition, much will be learned about the neural substrates of basic motivations, and more effective treatments may become available for such important and intractable behavioral disorders as drug addiction and obesity.
5. Finally, with the rapid growth in knowledge of synaptic transmissions, neuroscientists seem on the threshold of major improvements in the understanding and treatment of schizophrenia, the most severe and widespread form of mental illness.

As world population continues to climb, basic research in plant science and agriculture must escalate also. Several areas indicate that remarkable new advances are in the offing.

1. Research will be directed to develop crop plants that utilize light more efficiently, while other work will focus on altering key enzymes so that they are less easily diverted to unproductive activity during the dark reactions of photosynthesis.

2. Because improvements in biological nitrogen fixation could translate into better nutrition for millions, scientists will be working to develop more effective bacteria, more responsive plants, and more productive associations between the two. Since cereals feed much of the world's population, there will be continuing efforts to develop plant-bacteria symbioses that could fix nitrogen for cereal plants. Similarly, a variety of approaches is being explored to improve the natural fixation that blue-green algae provide in rice cultivation.
3. Continuing efforts will be directed toward discovering new and improved plant substances.
4. Chemical substances will be analyzed for use in manipulating a plant's responses to periods of light and dark or for regulating the opening and closing of its stomata.
5. New, highly nutritious crops will be developed, and previously untapped sources of nutrition such as leaves, which are usually discarded but which contain a limited amount of high quality protein, will be exploited.

All of these advances are projected for the next five years by the National Science Foundation. They describe the reality which we will be teaching.

What kinds of courses and what types of curricula are needed to bring new information to the undergraduates of 1984? The demographic and financial factors described earlier will continue to add stress to the system. Those of us who combine teaching and research will be hardpressed to keep up with our fields and to develop a variety of courses. However, that is the task.

One can assume that new knowledge can be incorporated into the core courses that are already successfully teaching undergraduate majors. In these courses, updating equipment, faced with tight budgets, may be the critical problem. However, the needs of the second base of our society, the undergraduate non-major, have not been addressed. These students currently fall into two subgroups: those who take biology courses and those who do not. I maintain that in the future a basic understanding of biology is as necessary as reading and writing for citizenship.

There is no consensus about the best content of biology courses for nonmajors. Many departments offer special courses which are usually less rigorous and more descriptive than their major courses. However, such courses may not satisfy the requirements of students who need a reasonable familiarity with science for occupational reasons. Although there are numerous college students who take no science or mathematics, it does not follow that they are not interested in the relationships of science, technology, and society. On the contrary, a recent survey conducted by

American Association for the Advancement of Science identified over 500 American colleges and universities that offer at least one course in this area. Almost 120 different programs were identified. Many of them are interdisciplinary undertakings between science, or engineering, and social science and/or humanities departments, and student enrollments in most of them appear to be reasonably good.

Interdisciplinary courses in science, technology, and society address concerns likely to be of importance to students regardless of their future occupation. Therefore, their apparent relative popularity is a positive development. However, few such courses lead to familiarity or competence with the concepts and processes of science and technology themselves. Since this knowledge and these skills are critical for scientific literacy, additional efforts must be made. One answer may be to incorporate electronics which are transforming the ways in which business and industry are conducted into science courses. Computers, calculators, and video systems could be used to stimulate nonscientists toward a greater interest in science and alleviate problems many students face because of inadequate preparation in mathematics.

SUMMARY

In summary, I would like to quote from Bentley Glass, who in 1970 wrote:

The greatest challenge which education must face in our time is that of coping with the rapidity of change in science, in technology, in human power, in the conditions of [human] life. The crux of education lies precisely here: that the education [person] of yesterday is the maladjusted, uneducated [one] of today and the culturally illiterate misfit of tomorrow. Education must clearly become a continuing process of renewal. (Glass, 1981, p. 11)

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FOR THOSE WHO HAVE NOT HAD A CHANCE TO SEND IN THEIR MEMBERSHIP DUES FOR THIS YEAR, PLEASE FILL OUT AND RETURN THE ATTACHED APPLICATION.

Application for Membership

ASSOCIATION OF MIDWESTERN COLLEGE BIOLOGY TEACHERS

- () Regular Membership July 1, 1981 to December 31, 1982 (\$10.00)
- () Regular Membership July 1, 1982 to December 31, 1982 (\$ 4.00)
Dues Payable January 1 (Starting January, 1983, dues will be \$10.00)
- () Retired Member (\$3.00)
- () New
- () Renewal

Name _____ Date _____

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Institution _____

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Address preferred for mailing:

Return to: AMCBT Central Office
Rockhurst College
5225 Troost Avenue
Kansas City, MO 64110



Next year we will be electing a President-elect, a Secretary and two members for the Steering Committee. If you or someone you know would like to participate more actively in AMCBT, please forward names and addresses to me, William N. Doemel, Wabash College, Crawfordsville, Indiana 47933.