

Part I Classroom Careers in Biological Education

The Outlook for High School Biology Teaching

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Presented here are some facts on the role of the secondary school biology teacher and his profession.

The Demand for Teachers

In 1955 there were 459,000 classroom teachers in secondary schools. This number increased to 823,000 by 1965 and is expected to exceed one million by 1975 (1). High school biology enrollments increased from 1.3 million in 1955 to 2.6 million in 1965 and are expected to reach 3.3 million by 1975.

Although there are no precise estimates of the expected number of biology teachers by 1975, obviously there will be a parallel increase. In addition, each year there will be a demand for teacher replacements. For example, if a school system has 50 biology teachers one year and 60 the next, it probably hired 16 new teachers, 10 for the new positions and 6 to replace teachers leaving because of retirement, resignations, and reas-

signment. In 1966 nearly 3000 *new* biology teachers were required to fill vacancies caused by increased enrollments and for replacements (2). Thus numerous employment opportunities for biology teachers will doubtless continue for the coming decade.

The Professional Biology Teacher

While there may be enough teachers to fill the jobs that will exist a decade hence, the significant question is, "Will there be a sufficient supply of *professional* teachers available?"

What constitutes a professional biology teacher? Peterson (3) has pointed out that such a teacher thoroughly understands *what a teacher does* and also understands *what biology is about*. As Yager's study (4) indi-

cates, some teachers are more effective than others in stimulating learning of basic content information, in affecting the growth of specific skills such as critical thinking, in causing students to understand the nature of the scientific enterprise, and in making a course interesting.

The professional biology teacher continues his education by personal study, summer school, inservice programs, institutes, seminars, and similar opportunities; he continues to keep his subject matter knowledge up-to-date. He belongs to several educational and scientific societies and takes an active role in society programs, attends meetings and conferences, and reads journal articles. He never teaches his biology classes from one year to another in exactly the same manner, and he enjoys the opportunity of attempting new approaches to teaching. Undoubtedly there are other features that characterize the professional teacher but these provide some focus on that key individual.

To prepare for biology teaching, the Commission on Undergraduate Education in the Biological Sciences (5) suggests a five-year teacher training program resulting in a master's degree. Such a program involves a 2 to 3 year core in biological science, including evolution, cell theory, transmission genetics, meiosis-mitosis, metabolic systems involved in photosynthesis and respiration, cell organization, development, integrating and coordinating mechanisms, the nature of the gene and its coding properties, gene action, population biology, behavior, and structure-function studies. This program should include field and laboratory work, and should use both plant and animal material, with the presentation directed toward developing an integrated whole.

Teaching methods courses and science education courses should provide opportunities for the student to investigate new curricula, new laboratory techniques, and other innovative approaches to teaching. In addition to intern teaching (student teaching), experience gained as a laboratory assistant for the college first-year course may prove beneficial. Summer employment opportunities in areas such as pest control, parks, conservation, forestry, and medical laboratories can also be useful.

Many professional biology teachers come to teaching directly from college with a bachelor's or master's degree; others come later in their professional lives, seeing biology as a more interesting activity than their earlier employment. Some come to biology teaching from related biological pursuits in industry, government, or the armed forces. Many women have taught biology a few years, left the teaching profession for marriage and raising a family, and then returned to active teaching. Some who have come to biology teaching from other jobs or from a few years out of the labor market make the transition to teaching through the intermediate step of the paraprofessional, the part time or full-time technical assistant used in an increasing number of school systems to assist in laboratory maintenance and operation.

Regardless of the avenue through which the individual has come to a biology teaching career, to teach competently he must keep learning. Biology is changing daily and the biology of the 1960's and 1970's will not suffice for a teacher of the 1980's and 1990's. Thus not only does the teacher have the responsibility for teaching students how to learn but he himself must be a master of the art of learning. The bachelor's and master's degrees are only the beginning of his education; both formal and informal continuing education are requisites for the professional teacher.

Fortunately the opportunities for such continuing education are expanding, both for the person returning to teaching and the one continuing in the field. There are university-sponsored courses, institutes and workshops, often with scholarships available. School systems may provide workshops and institutes and sabbatical leaves (with part or full pay) for educational activities. Professional societies also offer assistance; e.g., the National Association of Biology Teachers sponsors a series of ten regional seminars specifically for the purpose of assisting teachers to keep current in subjects undergoing rapid change. Societies also keep members informed about training opportunities and scholarship programs. Thus, for those who plan to teach biology, student membership in one of the professional societies during his

years in college and regular membership upon graduation can provide a useful medium of information on developments in biology and education and also provide information on training opportunities. Addresses for several professional organizations are listed at the end of this article.

Working Conditions

Every biology class is unique and relatively few classes are academically homogeneous. Teachers generally have several "regular" sections and possibly an academically accelerated section and/or one of academically slow students. In some schools, teachers select their own textbooks; in others, the books are chosen by the administration. In some, the texts are the same for all sections; in others, different teachers use different books for all or for some of their students, the difference in books reflecting the level of student ability and/or the teacher's interests.

Although in most schools general biology classes meet five days a week for one period a day, many schools are initiating combinations of single and double periods or various flexible scheduling arrangements which may mean more than five periods a week or meeting for longer periods but fewer times a week.

The general biology teacher often teaches other courses too. For example, one out of four large secondary schools offers at least one biological science course in addition to general biology. Some schools offer as many as four additional courses—advanced (or second-level) biology, human physiology, anatomy, and some form of a field or laboratory techniques course. The biology teacher may also teach a section of earth science, chemistry, or physics.

Teacher salary scales have improved in recent years but many people feel they are still too low in comparison to the salaries in nonacademic fields. There is considerable pressure for further up-grading of teacher salaries, and it seems probable that there will be further improvement in the next few years. In 1965, in large school systems, the mean scheduled salary for a beginning teacher with a bachelor's degree was \$5258 (6); this is somewhat below the median annual salary for beginning biological scientists, which was \$6000 in 1962 (7). The mean for

teachers having the highest preparation level was \$9775; for biological scientists having 10 years experience, the 1962 median annual salary was \$10,000. These annual teacher salaries are also considerably below the National Education Association salary goal of \$8000 for beginning teachers with bachelor's degrees and \$16,000 for those with 10 years experience and a master's degree (8).

In summary, those who wish to be truly professional teachers of biology will find themselves facing a more thorough program of pre-professional training, increased emphasis on continual up-dating and in-service training after employment, wide variation in the classes they teach, and good prospects for many employment opportunities in the future.

Organizations

- American Association for the Advancement of Science
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005
- American Institute of Biological Sciences
3900 Wisconsin Avenue, N.W.
Washington, D.C. 20016
- National Association of Biology Teachers
1420 N Street, N.W.
Washington, D.C. 20005
- National Association for Research in Science Teaching
Stone Hall, Cornell University
Ithaca, New York 14850
- National Science Teachers Association
1201 Sixteenth Street, N.W.
Washington, D.C. 20036

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