

THE EDUCATION OF THE ACTUARY IN THE FUTURE

ANNA MARIA RAPPAPORT AND PETER W. PLUMLEY

ABSTRACT

Today the world is changing at an increasingly rapid pace. Many of the changes affect the work of actuaries, and consequently the education which prospective actuaries should receive to prepare them for that work. In response to these changing educational needs, in 1976 a new Fellowship examination syllabus will be implemented, in order to update actuarial education and bring it into line with current practice. The purpose of this paper is to offer proposals that are designed to further improve actuarial education by anticipating educational needs based on future change.

The authors first review the present methods of providing actuarial education. Then they examine actuaries as customers of the educational system, and define some of the expanding areas in which actuaries should become increasingly involved in the future. Finally, they suggest, in addition to changes in the existing syllabus, a significant expansion of the scope of education of actuaries, primarily through the development of a course of study leading to a new professional designation.

FOR the actuarial profession, 1974 seemed to be the year that future shock became a reality. Inflation was widely recognized as the major business and political problem in North America if not the world, only to be replaced by recession as the priority problem. Problems related to environment and natural resources, particularly energy and food, created major upheavals. On the professional level, new pension legislation in the United States not only substantially changed the ground rules in a major area of actuarial practice but also greatly increased the public visibility of actuaries. Although these and other factors brought about an alarming increase in the complexity of the problems facing the enterprises with which actuaries traditionally have been associated, they also suggested opportunities that might exist for persons with actuarial training, in areas not previously viewed as being within the actuarial province.

Thus the scope of the work of actuaries should broaden. To an impor-

tant extent, the Society already has begun to respond. Edward A. Lew, in his 1974 presidential address, spoke of the need to understand and deal with discontinuities. Final plans have been completed for a major restructuring of the Fellowship examinations, and a proposal for a major restructuring of the Associateship examinations is under study. Unity within the profession and a cooperative relationship among actuarial organizations have been recognized as important issues as the actuarial profession seeks to define itself and its role in society.

The many changes affecting actuaries emphasize the need for further updating of their education. The purpose of this paper is to bring together that information which bears on the future education of actuaries and to lay some foundations for updating their educational program.

The paper is divided into three sections: I, "Current and Past Education of Actuaries," a review of the educational system as it now exists, its history and background, and the changes currently in process; II, "Actuaries as Customers for Education," considering actuaries as scientists and professionals, and the expanding areas in which they can become involved; and III, "The Future Educational Needs of Actuaries and How These Needs Might Be Implemented."

This paper represents the personal viewpoints of the authors and is not intended to represent the viewpoint of any committee or actuarial organization.

I. CURRENT AND PAST EDUCATION OF ACTUARIES

A Brief History of the Educational and Examination System

The Society of Actuaries was formed by a merger of the Actuarial Society of America and the American Institute of Actuaries, each of which originally had its own educational and examination system. The systems gradually were combined until, during the 1930's, they became a joint activity of the two organizations. This had the effect of reducing the amount of work required of the student who wished to qualify for both organizations, of reducing the work load of Fellows of the two organizations who served on education and examination committees, and, in addition, of simplifying the work of the office staff administering the system. Thus, even before the Society of Actuaries was founded in 1949, a single examination system had been implemented.

By the late 1950's, when the syllabus consisted of eight examinations, it became apparent that there was need for a thorough review of the educational and examination system. A number of problems had developed, including (1) the undue lengthening of the average time required to achieve Fellowship; (2) the increased amount of educational materia

required to deal with new and broadened fields of professional specialization, which, although a proper basis of education and examination for actuaries whose interests lay in that direction, would nevertheless become unduly burdensome if required of all candidates; (3) the need to provide a more adequate education for pension actuaries in view of the increased importance of pension mathematics and practice; and (4) the growing competition between actuarial and other professions where an increasing number of intellectually and financially rewarding careers were attracting persons with mathematical and administrative abilities. (The May, 1963, syllabus, the last under the eight-examination system, is shown in Appendix I.)

In an effort to correct these problems, a committee under the direction of Gilbert V. Fitzhugh began in September, 1957, to develop the concepts for a new syllabus, which was implemented in November, 1963, and essentially is still in effect in 1975. This syllabus now is being revised extensively at the Fellowship level, and a new syllabus will go into effect in May, 1976.

The November, 1963, syllabus revision was designed to achieve two important goals. First, by permitting candidates to sit for examinations twice a year, the committee hoped to reduce the time required to attain Fellowship. Second, by permitting students to specialize with respect to advanced study material, the Society would be enabled to set examinations on a broader range of actuarial subjects, without burdening the individual candidate with an excessive amount of study material not pertinent to his chosen specialty. The November, 1963, syllabus is shown in Appendix II.

The Fitzhugh committee also examined the question of what subjects properly belonged on the actuarial examination syllabus. It concluded that the language aptitude examination should be discontinued. (This was acted upon prior to 1963, hence the syllabus shown in Appendix I does not include this examination.) In addition, it concluded that such "background" subjects as basic economics or the history of the actuarial profession, while of value to actuaries, could not be included in the formal education and examination system without increasing the amount of study time beyond that which could be justified. (It is interesting to note, however, that basic economics will be included in the 1976 syllabus.)

Other relatively minor changes have since been made in the syllabus. Risk theory has been moved from Part 10I to Part 5, equity products has been added as a topic on Part 10I, and, on Part 3, finite differences has been replaced by numerical analysis, but from 1963 to 1975 there have been no fundamental changes in the approach to the educational requirements for Fellowship in the Society.

The 1976 Restructuring of the Fellowship Examinations

As the 1960's drew to a close, the general officers of the Education and Examination Committee felt that it was time to review the Fellowship examinations to see whether they were accomplishing their stated purposes. In 1970 a committee began to examine such basic questions as, To what extent is the "basic-specialized" split working? Should there be a third specialized branch dealing with such non-product-oriented matters as operations research? What topics should be added to or deleted from the syllabus? To what extent should the United States and Canadian students be allowed to take separate portions of the examinations?

The end product was the revised Fellowship examination syllabus, to become effective in May, 1976 (see Appendix III). This new syllabus consists of four Fellowship examinations, each of which contains both basic and specialized areas of study. For Parts 6-8, the specialized study will relate to either individual insurance- or group insurance-oriented studies. For Part 9 the specialized study will relate to either United States or Canadian study. For each examination, students will be expected to elect one of the two specialized areas of study, but will be allowed to change their specialty from one examination to the next.

The general design for the new Fellowship examination syllabus was first proposed by Charles B. H. Watson in August, 1970. In a letter to the other members of the subcommittee, he proposed a system of four Fellowship examinations: Part A, "Assumption of the Risk" (types of coverage, underwriting the risk, the agency system); Part B, "Paying for the Risk" (gross premiums, valuation, and reinsurance); Part C, "Maintaining the Risk" (dividends and experience-rating, analysis of expense and other experience, nonforfeiture values, changes, and investment of assets); and Part D, "The World Outside" (law, taxation, annual statement, and social insurance). The revised system of Fellowship examinations closely follows his original recommendation.

Probably there is no better way to describe the theory behind Mr. Watson's proposal and the resulting syllabus than to quote excerpts from his letter:

I have endeavored to construct a syllabus for the Fellowship examinations which would meet the following requirements . . . :

1. The syllabus should be structured around *principles* with *illustrations* of these principles drawn from the various types of coverages—life insurance, health insurance, and annuities/retirement plans, both individual and group.

A principle-oriented syllabus could go a long way toward meeting the common complaint about nit-picking questions, as in many respects the type of questions asked reflects the organization of the syllabus (at present an amassing of an abundance of facts, some vital but many not).

2. Any major revision of the syllabus should encourage *specialization* as between individual and group coverages at an earlier date. This would (a) work toward a shortening of the syllabus, (b) encourage cooperation among the various actuarial bodies . . . and hence advance the likelihood of joint sponsorship, and (c) recognize the fact that most actuaries are "switch-hitters," for whom the principles, not the facts, are what *must* be mastered.
A principle-oriented syllabus, drawing illustrations from all coverages but focusing on the particular coverage type elected, could achieve this from the first Fellowship examination, and at the same time avoid the potentialities for repetition we now find in the somewhat blurry distinction between "basic" and "advanced" topics.
3. If at all possible, a revised syllabus should encourage a reduction in the *time* required to achieve Fellowship. . . .
4. The syllabus should follow a logical pattern of *development*. . . .
5. The syllabus should be so constructed that new topics or areas can be *absorbed* without undue strain. I believe that principle-orientation achieves this better than the current structure. (Under the present dispensation we seem to have a great deal of trouble deciding where variable products should go.)

Since the present examinations included too much memorization of detail and too little concentration on principles, one of the major purposes of the restructuring was to improve the content of the course of reading at the Fellowship level. The much improved and updated new course of reading eliminates major areas of study material which represent mere detail. For example, in the investment area, the textbook on money and banking is being discontinued, and such subjects as macroeconomics, security analysis, and portfolio theory are being added. On the subject of social insurance, the syllabus includes fewer details on the history of the various social insurance benefits, while it expands on the theory and principles behind social insurance programs by focusing on current and future problems and issues, including examples from other countries. The subjects of law and accounting are being handled so as to provide students in both the United States and Canada with a set of material that will cover not only general principles but also details required in order to practice in their respective countries. A new study note will coordinate financial reporting principles. A basic study note on taxation will discuss the various special problems faced by governmental bodies in the taxation of life insurance companies, their policyholders and beneficiaries.

Revision and updating of the syllabus accomplished the following objectives:

1. Revision and updating of study material so that it would reflect practice in the mid-1970's.

2. Elimination of division between basic and advanced study which had proved troublesome in practice.
3. Product-line specialization at an earlier point in the examination sequence.
4. Establishment of a system of common core and specialty material on Fellowship examinations, which will demonstrate more clearly how principles may be applied to various product lines and problems.
5. Development of a common core-specialty split on Part 9 that permits better handling of United States and Canadian law, accounting, taxation, and social insurance. This supports the development of adequate national content material as a requirement for qualification to practice.
6. Development of improved study material.

Changes in the Associateship Examinations

In recent years, the Associateship examinations have received a considerable amount of study. In 1967 a study group was established with a directive to review the mathematical content of the examination syllabus and make recommendations that would (1) be consistent with the mathematical background of most new students; (2) give recognition to the mathematical techniques that were in common use at that time in actuarial work; and (3) align the mathematical subjects in such a way that if, as expected, newer and more sophisticated techniques became useful in actuarial practice, they could be incorporated into the syllabus with a minimum of dislocation—either as subjects under one or more existing Parts, or assembled into new Parts 9R and 10R. (The new Parts 9R and 10R would have constituted a third option, oriented toward research, under the system of Fellowship examinations in effect through 1975.)

The study group recommended several significant changes in the syllabus. First, the Part 3 subject of finite differences was to be replaced with the more general topic of numerical analysis. Second, in Part 5 the subject of sources and characteristics was to be reduced greatly in both scope and volume. Third, the reduction in the sources and characteristics material made possible the transfer of the subject of risk theory from Part 10I to Part 5.

With regard to operations research, the study group recommended that, although the specific topic should not be introduced into the syllabus at that time, the techniques of operations research could be incorporated into the existing topics where useful, noting that “it is our feeling that *at the present time* there is neither the breadth of interest among actuarial students nor the availability of personnel to run an expanded examination system to successfully allow the introduction of an ‘R’ research branch similar to the ‘I’ and ‘E’ branches. *We suggest that in a few years this con-*

clusion should be reexamined in the light of new developments, the availability of more personnel to handle the education and examination work, and the interest of more students in this topic. There appears to be no general consensus as to the methods of operations research which are of prime use for actuaries and we feel that expansion in this field will have to await further developments” (emphasis added).

Finally, the study group recommended that, with respect to investments, “reference to the Markowitz article on portfolio selection be considered for inclusion with the reading on Part 6. However, we do not recommend that this inclusion be made immediately.”

In general the proposals of the study group were received favorably, and in due time most of them were implemented. Since then, there has been relatively little change in the Associateship examinations, except that, beginning in 1975, Part 3 has become a joint examination with the Casualty Actuarial Society. A new study of the Associateship examination syllabus which began in 1974 is currently under way.

Joint Sponsorship

The need for unity with respect to education was recognized by the profession many years ago. As a result, the Actuarial Society of America and the American Institute of Actuaries combined their educational systems in the 1930's. The Society of Actuaries was founded in 1949 by the merging of the two organizations, and with the passage of time a need for unity in education has again arisen.

There are six actuarial bodies on the North American continent. Two of them, the Society of Actuaries and the Casualty Actuarial Society, administer examinations. The mathematical foundations of the two branches of actuarial science served by these Societies are essentially the same. Those bodies that do not administer examinations use examinations administered by the Society of Actuaries in setting their membership requirements. Therefore, there is a need for the cooperation of these bodies in managing the educational system. This cooperation was implemented through joint sponsorship. Today, all six actuarial bodies jointly sponsor the Society of Actuaries examinations.

Joint sponsorship means two things. First, the other actuarial organizations have liaison representatives on the Advisory Committee for Education and Examinations. Each organization also has three representatives on a Joint Committee on Education and Examinations. Second, the Society of Actuaries, in recognition of joint sponsorship, consults with the other actuarial bodies on matters of significance that involve the

educational and examination system. For example, the approval procedures for the current restructuring of the Fellowship examination require that expressions of opinion be obtained from the other actuarial organizations.

The trend is toward closer cooperation among the actuarial organizations. There is little doubt that in the future the several North American actuarial organizations will have an increasing voice in the education of actuaries.

Continuing Education

In addition to the basic education which leads to the designation F.S.A., an increasing effort is being made by the Society to offer various opportunities for continuing education. At present, the Committee on Continuing Education and Research has eight active subcommittees that deal with such diverse subjects as computer science, economics and finance, health insurance, life insurance and annuities, life and health corporate affairs, retirement plans, social insurance, and research. These subcommittees have sponsored, in cooperation with the Program Committee, specialized Society meetings on GAAP, pensions, marketing, and health insurance, and have conducted "teaching sessions" at other Society meetings. In addition, the Subcommittee on Research holds an annual seminar, in joint sponsorship with a university, on such subjects as risk theory, decision theory, modeling, and time series analysis. This subcommittee also publishes *ARCH*, which is a collection of informal research-oriented papers. The Committee on Continuing Education and Research has published reading lists, articles in *The Actuary*, and one special paper.

The work of the Committee on Continuing Education and Research has been very well received, as evidenced during the past few years by the large attendance at the specialized Society meetings and at the various seminars. It is clear that there will be a continuing and probably increasing need for these educational efforts in the future.

The universities have not taken an active role in continuing education for actuaries.

Actuarial clubs provide another medium for continuing education. For several years the Actuaries Club of New York has had a program of one-day workshops as well as courses. Topics have included pension funding, investments, taxation of life insurance companies, persistency, and risk theory. In spite of these efforts, a great need still exists for expansion of the continuing education program if the profession is to be properly served.

*The Role of the Society of Actuaries and of the Universities
in the Education of Today's Actuaries*

When the subject of education is discussed, the higher educational institutions naturally must be considered. With respect to actuarial education, a number of North American universities offer actuarial courses. In some cases these courses are quite limited, whereas in others they can lead to a degree in actuarial science. Appendix IV lists all North American universities and colleges that offered actuarial courses in the 1974-75 academic year.

One question that has arisen is whether or not the Society of Actuaries should encourage this form of education by accepting successfully completed actuarial courses at accredited universities as an alternative to some or all of the regular Associateship examinations. The concept of such an "alternate route" to membership in the Society first was presented by Wendell A. Milliman in his November, 1969, presidential address, which dealt with the legal recognition of actuaries and with the role of the American Academy of Actuaries. In his address Mr. Milliman examined the question of what examinations would be required for membership in the Academy, and pointed out that, at least for the present, the Society of Actuaries and the Casualty Actuarial Society examinations were being accepted for membership. He further stated that, although the Fraternal Actuarial Association was willing to accept Society membership as its membership requirement, the Conference of Actuaries in Public Practice was not at that time prepared to do so. He then went on to state:

Out of this background has developed consideration of the possibility of establishing an "alternate route" for qualifying for membership in some or all of our several actuarial organizations. Essentially, this proposal would recognize that the present examinations of the Society and the Casualty Actuarial Society are geared to a self-study educational process. The concept of the alternate route is that somewhat different examinations might be more appropriate for prospective actuaries who have taken courses in specified areas of basic actuarial knowledge from qualified collegiate institutions. In its original form the alternate route proposal would have recognized an individual who had acquired a Master's degree in actuarial science from an "accredited institution" as having obtained such an education. It was proposed that such an individual should be able, by passing a comprehensive examination covering the appropriate subjects, to receive credit in the Academy for the equivalent of the first five examinations of the Society of Actuaries or the Casualty Actuarial Society [TSA, XXI (1969), 337-38].

In the ensuing years, there has been much debate on the advantages and disadvantages of permitting such a path to membership in the Society. Opponents of the alternate route generally have centered their objections in the difficulty of maintaining uniformly high standards for admission to the Society, and of administering a system for examining applicants for admission to the Society. The proponents of the alternate route have stressed the concept that, if university students were not required to study the subjects on Parts 1-5 according to certain constraints set by the Society's examination system (prescribed textbooks and particular topics covered and not covered, for example), the universities would be free to provide more variation in the types of material covered, with the result that there would be a greater diversity of skills and interests among those entering the profession.

A greater degree of participation on the part of universities in providing education for actuaries certainly would be of benefit to the profession and the individuals in it. A Society committee developed a plan for implementation of the alternate route and presented it to the Board of Governors of the Society in 1974. Under the proposed plan, universities would be qualified to participate in the alternate route on the basis of faculty, course requirements for the degree, and adequate library facilities. Minimum grade standards also would be set. Each university would be subject to review of its qualifications on an ongoing basis. Although such a plan was available as of March, 1975, no actuarial bodies had voted to implement the alternate route.

Actuarial Research Foundation

A proposal is now under consideration by the six North American actuarial organizations, calling for the formation of an actuarial research foundation. The Board of Governors of the Society of Actuaries has endorsed the proposal and has agreed to provide up to \$50,000 seed money. It seems unlikely that such a foundation could begin to operate before 1976 or 1977. Once in operation, it could provide a valuable mechanism for the support and encouragement of actuarial education and research.

II. ACTUARIES AS CUSTOMERS FOR EDUCATION

There is ample evidence that since its inception the Society of Actuaries has had a strong educational system—one that has been kept alive and responsive to change by the number of syllabus revisions that have taken place over the years. This section of the paper will look at the actuaries of the future, with the object of defining the customer of the future educational system.

Definition of the Actuary

Actuaries are both scientists and professionals. Their science deals with the mathematics of interest, probabilities, and risk and their application to contingencies. They analyze past experience, and apply their findings to understanding and solving current and future problems. Although at present the areas of their professional practice are largely those of insurance, annuities, and programs related generally to the provision of economic security of the individual, potentially the problems of many other areas and disciplines would benefit from the application of actuarial science.

The report of the Professional Development Committee defined an actuary as follows:

An Actuary is an expert who applies scientific techniques to the evaluation of risks, including the short-term and long-term financial implications of such risks.

He is a professional who is skilled in the design and operation of programs intended to protect against contingencies such as death, sickness, and disablement. He is skilled in the evaluation of these risks, the design of insurance and benefit plans, and the operation and management of such arrangements.

He is a man of business with broad and widespread knowledge, with the ability to use mathematical techniques for the purpose of carrying out business processes and engaging in business management decisions.

The actuary's dual nature—scientist and professional—and the broad role which an actuary can play are recognized in this definition.

The Public Relations Committee has assembled a number of definitions designed to help actuaries explain and discuss their profession:

1. An actuary is an expert professionally trained in the evaluation of risk and the science of mathematical probabilities. As far as North America is concerned, membership in the American Academy of Actuaries or the Canadian Institute of Actuaries is evidence of professional qualification. (This definition of an actuary is listed in the American Institute of Certified Public Accountants publication *Audits of Stock Life Insurance Companies*.)
2. In the field of insurance, the actuary works with the probabilities of events such as death, sickness, disability, retirement, unemployment, property destruction, and so forth. He must combine these probabilities with the principles of finance and administration to determine premiums, reserves, and other financial particulars which provide the basis for the sound and efficient operation of the company and the protection of the policyholder.
3. An actuary is a business executive, professionally trained in the science of mathematical probabilities, who specializes in the evaluation of risk. He

- uses applied mathematical skills to define, analyze, and solve complex business and social problems. He designs insurance and pension programs and is responsible for their financial soundness. He forecasts probabilities and commits his company or client to long-range financial obligations.
4. The actuary possesses a natural aptitude for mathematics, a creative mind, the faculty of personal insight, and the ability to reason logically. He is a diligent researcher, a proficient planner, and a decision maker. Like any successful business executive, he has the human qualities necessary to understand others and to make himself understood. He accepts responsibility, responds to challenge, and works with others to reach worthwhile objectives.
 5. An actuary is someone who is mathematically competent to apply probability theory to quantifiable business or financial problems involving contingencies and risks.

John M. Bragg, in his excellent paper "The Future of the Actuarial Profession as Viewed in A.D. 1974" (*TSA*, XXVI, 335) cites definitions from various sources and then goes on to define the actuary as "a professional who is expert at the design, financing, and operation of insurance plans of all kinds, and of annuity and welfare plans." Mr. Bragg states that this definition is based on his long-time observations of the actual job. From this point of view it is a good definition. In looking toward the future, however, the authors would prefer the adoption of a broader viewpoint, one that would include also the concept of actuaries as scientists, and will look to the mathematical foundations and other areas of application of actuarial science in addition to the traditional areas of actuarial practice.

Professional Maturity

Charles B. H. Watson has defined a professional as: "one who gives advice to clients (perhaps just one client, if he is employed by a company) and, in the giving of such advice, he is bound by the code of conduct of his profession."

The Professional Development Committee answered the question, "What is a profession?" with the following:

A profession is an occupation requiring specialized knowledge, and, often, long and intensive academic preparation. The sphere of interest of a profession includes development, prior to qualification, of educational programs, and maintenance of continuing educational programs after qualification. It includes research, promotional activities, and the representation of the interests of the profession before other groups and the public.

There are certain conditions necessary for a profession:

A body of knowledge, a set of attitudes, a specific technique.

A standard of accomplishment.

A system of control over the education and subsequent practice of its members.

Dedication and objectivity in performance; pursuit of the best interests of the client.

John C. Angle, in "The Actuary as a Professional" (*The Actuary*, January, 1975), commented as follows on professionalism and the meaning it has taken for actuaries: "In the debate over 'Professionalism,' the term 'professional' seems to be defined to emphasize a practitioner's relations with clients and is undoubtedly stimulated by the ethical problems of consulting actuaries. The analogue for this sort of 'professional' seems not to be that of the scientist but of the public accountant."

For purposes of defining the need for education, we must first define the concept of professional maturity and the contribution that education makes toward attainment of that goal.

Professionally mature individuals have a knowledge, both theoretical and practical, of their chosen specialties, and the ability and experience to apply that knowledge. Both their education and their experience assist them in developing sound judgment for solving problems. They have an awareness of professional conduct and a sense of responsibility which moves them to act in accordance with a code of professional conduct.

Professional maturity develops over a period of time as a result of a number of factors: formal education before qualification, work experience, continuing education after qualification, contacts with other professionals, and the personal maturity of the individual.

Qualification to practice and professional maturity are not usually attained at the same time. Most individuals require a period of time after completion of qualification to practice before attaining maturity. Some individuals may never attain professional maturity. Since actuaries usually are employed while they are completing their formal education, they are likely to be more experienced and have a greater degree of maturity at time of qualification than other professionals, such as attorneys, accountants, and so on.

Traditionally, professional education has been thought of as terminal education, or as education that prepares the individual for a lifetime career. This would imply that a syllabus must remain relevant for thirty or forty years after completion of formal education. One of the

implications of future shock and the changing world is that this concept of terminal education will be increasingly open to question—specifically, should qualification to practice be granted on a one-time or on a renewable basis?

Scientific Maturity

Maturity as a scientist is quite different from maturity as a professional, although in each instance there must be a strong foundation in theoretical subjects. The mature scientist should be oriented to inquiry and to the application of his science in a way that will expand knowledge. He may be application-oriented or theory-oriented. As a scientist, he is not concerned primarily with relationships with clients. The profession is concerned about credibility with the public. Accepted standards of practice help gain such credibility, but may make more difficult any innovations and debate over various methods that serve to further knowledge. The scientist working on the leading edge often will disagree with much that is accepted as correct.

The mature scientist may be looking toward new frontiers. It is to the benefit of a science and its continued expansion if at least a small minority of its members seek new horizons and new areas of interest.

What Is the Educational Program of the Society of Actuaries Trying to Accomplish?

We have already stated that mature professionals understand theory and practice, have judgment, act in accordance with a code of conduct, and attain maturity through education, experience, and contact with other professionals. The purpose of this section of the paper is to define the role of education and relate it to the other avenues of professional growth.

Education and experience help actuaries to mature, both as professionals and as scientists. A good educational system must provide a solid background in the theoretical mathematical subjects needed for the solution of problems, both current and future, that actuaries must face. Completeness should be a major objective in setting the requirements for knowledge of the theoretical base. Theoretical background is a key to the actuary both as a professional and as a scientist. In this phase of his education, experience and contact with other professionals should not be expected to contribute much. However, advanced education at a university may be a means of supplementing the basic education needed for qualification.

Education also should help create expectations as to the types of roles

that actuaries may play, as well as provide examples of types of problems they will be expected to solve. It should prepare actuaries as scientists for applications in a broad variety of fields.

At the practice level, the educational system should strive to provide selection of topics that will serve the needs of as many practitioners as possible. It may recognize the different needs of various groups of practitioners by providing alternate courses of study and should provide for some understanding of the business problems in the main area of practice. Above all, it should provide approaches to the solutions of problems. These approaches should be such as to train actuaries in methods of attack that can be extended to other areas and future problems.

Education with respect to practice in product-line areas should deal with both the current environment and the problems of the future and should be aimed at development of the professional. It should put stress on principles and draw examples from the various areas of practice. It should interact substantially with experience in the development of an understanding of practice. It is not and cannot be the function of an educational system to develop actuaries who are mature in all areas of practice.

The educational system should be designed in such a way as to prepare actuaries to act as professionals in cases where clients look to them for their professional evaluation. At the same time, education should be aimed at developing actuaries as scientists. To achieve these dual goals, there is need for a partnership in education that is provided both before and after qualification. Particular attention should be paid to education in areas where actuarial certification is required; however, education after qualification is also valuable, in that it serves to assist actuaries in gaining specialized and advanced knowledge and to keep them up-to-date.

Preparing the professional to be able to make judgments based on the knowledge he has gained can be one of the most difficult and rewarding features of the educational system. Although judgment is not something that can be transferred via formal education, an educational system can prepare actuaries to recognize problems which require judgment. For example, it can present some of the issues that may be involved in making judgments. Experience, however, will always be the most important factor in developing judgment.

Strictly speaking, an educational system cannot "teach" an individual to behave in accordance with a code of conduct. It can, however, make him aware of the existence of a code of conduct and can alert him to the types of problems and issues that must be faced in trying to follow that

code. In addition, contact with other professionals can be of great help in developing a sense of responsible action in accordance with a code of conduct.

Education and examination are the key elements in the early development and qualification of professionals. Together with other aspects of professional growth and development, they should be viewed as a means of developing mature actuaries. Further education after qualification is one of the ways in which professional and scientific maturity can be maintained.

The Actuary Today

Today, most actuaries practice in the fields of insurance and pensions. They may be involved with individual or group coverages, and they may be working for the provider of the benefit, or the purchaser, or a governmental body regulating the coverage. They may be employees of one employer or may be consultants working for a number of clients. Other actuaries are engaged in teaching actuarial science at the college level.

Factors Having an Impact on the Future of the Profession

From John Bragg's paper and from other sources, the authors have selected certain points that are particularly related to educational needs. These points will be developed in order to define the future needs of the practicing actuary, and thereby to answer the question, "Who is the consumer toward whom the educational program must be aimed?"

The future of the profession can be characterized by the following elements:

1. The increased complexity of the world and of the business environment in which the actuary must function.
2. Greater involvement of actuaries in questions that are viewed as "public," and the need to deal with such questions in a unified way.
3. The greater variety of disciplines and organizations in need of methods for dealing systematically with contingencies and of analysis of previous experience as a way of dealing with the future.
4. The broadening of areas of interest, which will bring about an increased need for in-depth specialized knowledge and a corresponding increase in opportunities for actuaries who are properly trained in these areas.

Increased Complexity in the World and in the Business Environment of the Actuary

The period from 1945 to the early 1970's can be described as one of stability and prosperity for the life insurance industry. Life insurance

companies grew and prospered. There were a number of favorable factors:

1. Mortality improved during the earlier years of the period and then leveled off. There were no catastrophic events causing serious fluctuations in mortality. Only a moderate number of additional deaths resulted from the Korean and Vietnam wars.
2. Interest rates generally rose over the period.
3. Data processing equipment became available, and technology was vastly expanded and improved. The cost of equipment relative to the work it could perform dropped drastically; increased operational efficiency became possible; and management was able to introduce new and more complex techniques.

It does not seem likely that the next twenty-five-year period will be as stable as that which we have just experienced. Edward A. Lew, in his presidential address to the Society of Actuaries, pointed out the need to be prepared for more far-reaching changes: "Recent events have given force to the statement that we are living in an age of discontinuity. . . . There is a growing feeling that commonsense expectations of what may follow, particularly with respect to inflation and investment returns, have been increasingly wrong and that it is extremely difficult to foresee the discontinuities arising from political intervention, altered value systems, and major technological breakthroughs."

The world today is faced with an entire complex of potentially explosive situations. It is accepted that the world's food supply and natural resources are adequate to maintain only a limited number of people, and that much of the activity of man is polluting the environment in a way that is a potential threat to life.

Five areas are recognized as being of immediate concern: (1) population size and growth, (2) energy resources and distribution, (3) food resources and distribution, (4) pollution and control of the environment, and (5) inflation and recession. It is further recognized that other, related problems will arise within the next few years. Because of their far-reaching political and economic implications, these problems impact on every individual and business enterprise in existence today. Actuaries as scientists should have a role in the study of these problems and in working out the "most viable solutions." They are trained in population mathematics, in the use of risk and contingencies, in analyzing past experience, and in making calculations that extend over a long period of time.

The Actuary and the Public

During the past few years the public has become increasingly aware of many issues with which actuaries are directly or indirectly involved.

Consumerism has encouraged the public to be more critical and more questioning of all business, and a number of public issues have involved insurance and employee benefits. It appears likely that this trend will continue. Actuaries are faced with the critical question of to what extent the profession can exert leadership in the handling of these issues and to what extent actuaries can deal with them in an organized way.

Some of the important current public issues are listed below:

1. Social security. Many recent changes in the system have substantially increased costs and benefit levels. Major questions have been raised regarding the financial stability and the future of the social security system, and its relationship to private pension plans.
2. National health insurance and the means of delivery of health care.
3. Privacy and the need for government to protect the rights of the individual. This issue is of importance to actuaries, since underwriting and acceptable levels of life insurance mortality depend on the ability of the insurance company to obtain information with regard to the medical history and financial status of the individual.
4. Pensions. In 1974 major new legislation was enacted which substantially increased pension regulation at the federal level. As a result, public awareness of and interest in pensions increased greatly.
5. Cost comparisons, and disclosure with regard to individual life insurance policies.
6. The urban crisis and the resulting inability of certain segments of the public to obtain suitable property and casualty insurance.
7. Women's liberation and the need for equal treatment of women with respect to price and availability of insurance coverages.
8. Solvency. Inflation and stock market performance have interacted in such a way as to cause concern over surplus levels and the possible insolvency of insurance companies—in particular, property and casualty companies.
9. The Equity Funding case, which has brought about public awareness of the possibility of fraud in the management of insurance companies, with resultant insolvency.
10. No-fault auto insurance, medical malpractice insurance, and the system of tort liability, which have focused public attention on such questions as who is liable for certain kinds of damage and how the damages will be assessed.

Expanded Interest in the Concepts of Risk

Traditionally, when one thinks of risk and business, one also thinks of insurance. Insurance can be viewed as a means of risk transfer or pooling. From the insurance company viewpoint, the risk to the company can be evaluated in terms of the degree to which experience deviates from the average. The risk is not that there will be claims but that the claims will vary from the expected. Business and government, however, are faced

with various other kinds of risks, and decisions must be made in situations which involve many uncertainties. Obsolescence is an increasing risk in many fields of endeavor. The widespread use of computers has been accompanied by a growing acceptance of the application of analytical techniques to the solution of business problems. The use of computers to collect data and the capacity of computers have provided opportunities for many other disciplines to apply these techniques.

The expanded interest in the concepts of risk should create many opportunities for actuaries to become members of interdisciplinary teams that are involved in planning or problem-solving.

Broadening of the Areas of Interest

Research of the past few years indicates greatly expanded opportunities for actuaries through a broadening of the areas of interest to the profession.

In his paper, Bragg lists several prescriptions for the actuarial profession. The first is as follows: "Basic and continuing education must be modified to put more stress on economics, the effects of inflation, government programs, expense-handling in a dynamic economy, political aspects of the insurance business, and the needs of consumers."

The future needs for actuaries were surveyed by the Society's Committee to Encourage Interest in Actuarial Careers. The results of their survey, as reported in Exhibit VI of Bragg's paper, show that there was need for 4,157 actuaries in 1973, as compared with 3,665 actuaries employed at that time. The need was expanded to 6,007 in 1978, 6,976 in 1983, and 8,566 in 1993. The educational system, if it is doing its job, will provide actuaries with the knowledge which they will require if they are to capitalize on these opportunities.

Over the next ten years, some of these areas of future opportunity are likely to be the following:

1. Government service. Many opportunities for actuaries exist today in various government departments. Expansion in the regulation of insurance companies and pension plans will increase governmental needs.

Actuaries should be involved in developing benefit cost implications and in projecting future costs of social legislation. With anticipated changes in the birthrate and further increases in life expectancy, the need for actuarial participation will become particularly acute.

Actuaries are needed in the management of social security and other government insurance and retirement programs, such as public employee systems, veterans programs, and the like.

Governments and international bodies will become increasingly concerned with the evaluation of trends in population growth, the availability

of natural resources, and the effects of pollution. Actuaries, with their skills and techniques which may be applied to a wide variety of problems, may well be needed as team members for such evaluations.

2. Life and health insurance companies. Actuaries not only will fill their traditional roles but also will become more involved in other areas of insurance operations. Marketing will change and become more complex; there will be an increase in experimental marketing programs; and more analysis as well as quantitative measurement of results will be required. The pricing process will involve costs that are based on the particular form of marketing used. If insurance becomes more cost-competitive, sophisticated pricing techniques reflecting price and marketing costs that vary per unit on the basis of volume sold will become necessary. Thus actuaries will have the opportunity to increase their partnership role in the marketing process.

The current inflationary economic climate adds another element of uncertainty that actuaries must take into account in pricing, long-range planning, and so on. There is increased concern over solvency and levels of surplus. It is now recognized that actuaries must take into consideration the risks and uncertainties inherent in the investment portfolio if they are to evaluate properly the financial condition of the concern.

The work of actuaries is increased by other complexities. For instance, some companies plan to offer variable life insurance or vary dividend scales by policy loan interest rate. Disclosure requirements add new work, and pension legislation has increased the complexity of the pension actuary's work.

Finally, actuaries will discover increasingly that their analytical techniques, concepts of risk, and analysis of experience can be applied to problems historically considered to be outside their domain.

3. Nonlife insurance companies. Many life insurance companies are entering the property and casualty fields. Furthermore, life and nonlife coverages are becoming more closely related as no-fault auto insurance develops and as health coverages tend to be related to casualty coverages. The development of true group property and casualty insurance also will bring the life and nonlife coverages closer together, and, as they converge, so will the work of life and casualty actuaries.
4. Analysis of investment strategies, portfolios, and rates of return. Actuaries are not necessarily expected to become investment experts, but they will be expected to judge the suitability of a portfolio when it is evaluated together with a pattern of liabilities, and to apply the principles of risk theory to alternative investment strategies.
5. Planning and modeling. Planning will become both more important and more difficult in the future, and more uncertainties will be involved. Actuaries, as experts in dealing with the mathematics of risk and analysis of past experience, will have a role to play in interdisciplinary teams planning in the business, economic, social, and political areas.

6. Taxation of life insurance companies and management of the tax function. At the present time, the management organizations of relatively few life insurance companies reflect the vastly increased burden placed upon them by the complexity of modern tax laws. Actuaries are particularly well trained to serve those companies that are willing to recognize, through sound and aggressive tax management, the potential impact of taxes on profits.
7. Financial services. More noninsurance enterprises will offer financial services, and more insurance companies will offer other noninsurance services or products. This will create opportunities for actuaries in administration, in planning for cross-marketing of products, in tax planning, and in similar areas. There will be more multinational corporations. Such trends will bring about greater administrative, marketing, and management complexities and will make corporate planning more difficult. As the skills of actuaries become known to noninsurance people, opportunities for actuaries may arise in other business areas.
8. Pension consulting. The increasing regulation resulting from the 1974 pension legislation will cause the work in this area to increase substantially.
9. Health maintenance organizations and research into health care systems and financing.
10. Human resources accounting. This provides, for example, another approach to the problems of agent and manpower values and profitability.

III. ACTUARIAL EDUCATION IN THE FUTURE

It is the contention of the authors that the Society of Actuaries is at a crossroad, not because of any internal situation within the Society but because of the external influences which are forcing basic changes in today's society. As an important step in meeting this challenge, the authors suggest a major addition to the program of study available to actuaries.

Before these suggestions are discussed, let us review the Professional Development Committee's definition of an actuary. First, it is stated that "an Actuary is an expert who applies scientific techniques to the evaluation of risks, including the short-term and long-term financial implications of such risks." The last part states that "he is a man of business with broad and widespread knowledge, with the ability to use mathematical techniques for the purpose of carrying out business processes and engaging in business management decisions." Only the second part refers to matters which relate directly to the insurance and pension business, training for which is the purpose of the present Fellowship examinations.

The purpose of this third section is to present what the authors hope will be a path by means of which the Society of Actuaries and its sister organizations can provide the educational services that will be needed

to an increasing extent during the next decade and possibly beyond. If the suggestions are implemented, the end result should be greater knowledge of and respect for the actuarial profession by the general public, and broadened career opportunities for actuaries.

Alvin Töffler in *Future Shock* includes a chapter entitled "Education in the Future Tense." The following quotations from that chapter seem to relate to problems which the actuarial profession must face:

Education must shift into the future tense [p. 427].

Finally, unless we capture control of the accelerative thrust—and there are few signs yet that we will—tomorrow's individual will have to cope with even more hectic change than we do today. For education the lesson is clear: its prime objective must be to increase the individual's "cope-ability"—the speed and economy with which he can adapt to continual change. And the faster the rate of change, the more attention must be devoted to discerning the pattern of future events.

It is no longer sufficient for Johnny to understand the past. It is not even enough for him to understand the present, for the here-and-now environment will soon vanish. Johnny must learn to anticipate the directions and rate of change. He must, to put it technically, learn to make repeated, probabilistic, increasingly long-range assumptions about the future. And so must Johnny's teachers.

To create a super-industrial education, therefore, we shall first need to generate successive alternative images of the future—assumptions about the kinds of jobs, professions, and vocations that may be needed twenty to fifty years in the future; assumptions about the kind of family forms and human relationships that will prevail; the kinds of ethical and moral problems that will arise; the kind of technology that will surround us and the organizational structures with which we must mesh [p. 403].

Super-industrial education must, therefore, make provision for life-long education on a plug-in/plug-out basis [p. 407].

It is clear that both society and the individual are now undergoing crisis on a more or less continuing basis. The traditional concept of a lifelong career, chosen at a young age and not subject to change, is rapidly being modified, and an increasing number of persons are "shifting gears" in midstream. The move may be forced on them because of the obsolescence of their original careers, or because of changes in their business environment. Or, in many cases, the shift may be the result of a basic change in their personal goals—the career that seemed to be rewarding at a younger age may, by middle age, seem to be little more than an obstacle to other kinds of fulfillment.

In view of changing life patterns, self-study professional education combined with work may be looked upon as having certain advantages.

First, students have a great deal of flexibility with respect to both the exact point, or points, in their lives at which they will enter studies and the number of years over which the program may be spaced. The program is not fixed as x years in time, and "sabbaticals" between examination parts cause no problem. Commencement of studies long after formal college education has been completed presents no difficulties. Second, students have contact with practicing professionals (usually qualified actuaries) during the course of study. Although this is not looked upon as an "apprenticeship" in any literal sense, students do gain a combination of experience and theoretical knowledge at the same time. Third, the practicing professionals with whom the students associate are involved directly in the educational process, and those who prepare the courses of reading are in direct contact with what is happening in the real business world. Fourth, to the extent that they can make arrangements with their employers, students have a choice as to how their work/study program will be combined.

There are, of course, certain disadvantages that are inherent in our educational system. The administration of the program is on an essentially volunteer basis, and it becomes increasingly difficult to have new study material developed. (However, the amount of new material being prepared in connection with the current restructuring of the Fellowship examinations is extremely encouraging.)

Another disadvantage arises from the fact that, since actuaries essentially maintain their own educational system, they tend to become somewhat "inbred." In recent years the Program Committee, among others, has worked hard to correct this situation; but the tendency still exists, and it is one that, over the years, can cause critical damage to the profession. The authors are hopeful that the Society will look on the emerging problems outlined in this paper as an opportunity to make a major move away from this tendency.

Future Structure of the Educational System

The present educational system for actuaries consists of two modules: (1) Associateship studies—the theoretical scientific base of actuarial practice—and (2) Fellowship studies—the product-oriented, practical base of actuarial practice. With the exception of some relatively minor evolutionary changes such as those which were incorporated in the 1963 syllabus during the period from 1963 to 1975, it is expected that the present modules would continue in their present form.

In this paper, the authors propose a third module, which is designed to broaden the horizons of the actuarial profession and enable actuaries to

cope better with the many problems they will face in the future. The resultant educational system would lead to the following designations:

Associate.—Based on a set of examinations with a fixed syllabus covering actuarial science in a rigorous fashion and designed to provide the mathematical and scientific foundations of the work of the actuary. This set of examinations should be suitable to all types of application of actuarial science and should be substantially common to life and casualty actuaries and also appropriate for those actuaries electing to apply actuarial science in other ways.

Fellow.—Based on a set of examinations with a fixed syllabus covering in-depth information about a particular product line and how it is priced, marketed, administered, and so on. Basic information about other product lines would be included in the common-core material on the Fellowship examinations. There would be various product lines specialties, including (1) individual life and health insurance and annuities and (2) group insurance and annuities and other employee benefit plans.

The overall content, type of study material, and method of education and examination for the designations of A.S.A. and F.S.A. would be similar to the present system. Emphasis would be on principles, the product lines being used to provide examples of the application of principles. The authors suggest that the following modifications to the present course of study should be considered:

1. At the Associateship examination level, there would be more cross-studying of contingencies, discount, and other theoretical material and how it applies to life insurance and pensions, casualty insurance, and other problems. Both deterministic and probabilistic models should be used to develop solutions to a variety of problems.
2. Eventually there might be more options in the Fellowship examinations. Casualty insurance might be included as a product line. If new forms of coverage such as prepaid legal expense and variable life insurance become accepted, then they would be added to the syllabus. The actuarial science portions of the program would be set up so as to prepare the student for the application of his knowledge to a wider variety of the problems that are faced by insurance companies, consulting firms, and other "traditional" actuarial employers.
3. At both the Associateship and Fellowship levels there would be some new short study notes which would relate areas of study to current issues in society. For example, the study of demography would be related to world problems of population, food, energy, etc. The student would thus be provided with a perspective as to the practical application of his studies.
4. The basic concept of relating topics based on principles which underlies the 1976 restructuring of examinations would be carried forward so that concepts of risk would be handled in a more general way.

New professional designation for actuaries.—Based on a third path of study which would lead to a different kind of degree at its completion. This idea can be viewed as an extension and expansion of the “R” branch idea which was considered by the Society several years ago. This path of study would be similar to that which leads to a Ph.D. degree, in that it would be characterized by independent study, a less rigid syllabus, more original work on the part of a student, and a thesis requirement as well as examinations. This new course of study would be available on a variety of topics but is not intended to replace the current Fellowship studies and would not be required for attainment of Fellowship.

The new course of study would be available to either Associates or Fellows who might wish to specialize in any of the areas covered. These areas would differ from those offered in the current Fellowship examinations, in that they would not be product line-oriented but instead would be designed to prepare the actuary for working in one or more of the emerging disciplines for which the actuarial studies at the Associateship level would be useful. The actuary trained in this program would specialize in a particular theoretical area and would be well qualified to do advanced work and new research in his field. Many of these actuaries essentially would be in interdisciplinary fields.

A shortened version of the new course of study might be made available as continuing education for practicing actuaries. This course would be designed so that either the full or the shortened version would be available at many stages during the career. Thus, following Töffler’s concept of plug-in/plug-out lifelong education, these courses could be used as part of initial professional education, or they could be used later in order to change fields, expand horizons, and add depth. It should be emphasized that actuaries who complete the new course of study would be more than well-trained accountants or statisticians. Instead, having completed an educational program that combines the mathematics of actuarial science with other disciplines whenever substantive interfacing is possible, they will be persons who can provide new insights into the emerging problems of the day.

It is expected that this program would be relatively open-ended and that it would grow and change with the times and as the needs for various kinds of knowledge change.

Some of the areas of study might include the following:

1. Problems of the environmental and social sciences. Actuaries could apply advanced actuarial techniques involving analysis of data and the application of probability, interest, and risk theory to the problems encountered in this area.

2. Economics. There is an increasing need for improvement in the assumptions used in the work of economists. Actuaries, with the appropriate cross-training in basic actuarial mathematics and in economics, could be of significant value in this field of endeavor.
3. Investments. Actuaries should be able to apply advanced techniques to such problems as matching the investment portfolio to liabilities and determining the most appropriate types of investments.
4. Government and business. Actuaries, with their knowledge of the application of interest and probabilities to costing problems, are needed in both government and business to develop improved data relating to such items as long-term projections of costs.
5. Advanced statistics. Actuaries could develop new types of models that might be applied in many new ways to a wide variety of other disciplines described elsewhere in this paper.
6. Accounting and reporting of financial results. Improved and more meaningful methods are needed in reporting the financial results of an enterprise. Some examples of areas in need of further study are treatment of asset gains and losses, taxes, and investments in development of an agency force.

In each of these areas emphasis would be placed on the collection of data and the analysis of those data so that the experience gained could be applied to the solution of further problems.

In summary, the actuary's expertise could be utilized in a wide variety of areas and disciplines not presently thought of as requiring the services of an actuary in the traditional sense. The suggested new course of study would provide both Fellows and Associates the opportunity to move into new but related fields.

Role of the University in Actuarial Education in the Future

At the present time, a number of universities offer various courses in actuarial education, including traditional courses as preparation for some of the examinations, particularly those involving mathematics, and undergraduate and graduate programs in actuarial science. Some universities that offer a broad program of actuarial courses grant degrees in actuarial science. In the future, if some type of alternate route to Associateship is adopted, approved universities will offer courses that will enable actuaries to qualify for some or all of the present Associateship examinations. It is hoped that the alternate route will allow for more curriculum variations in actuarial programs at the university level.

The development of the new module of study described by the authors should increase greatly the opportunity for universities to participate in the education and training of actuarial personnel. Participating universities might include not only those presently offering programs in actuarial

education but also many which in the future may develop courses of study in the areas described above. Universities should be encouraged to work in partnership with the various actuarial bodies in the development of new educational programs. Both the universities and the profession would benefit greatly from such cooperation.

Furthermore, since one of the objectives of the new module is to expand the actuary's horizons beyond the insurance and pension fields, encouragement of greater participation of the universities at the Associateship level would help attain this objective by creating a significant body of actuaries who have completed their Associateship courses without having already become associated with insurance companies or pension consulting firms.

Unity of the Profession

Earlier in this paper, reference was made to inclusion of casualty insurance material at the Fellowship level. Such action eventually might make possible a single educational system for life and casualty actuaries. Closer cooperation among all six professional actuarial organizations seems increasingly likely in the future. The development of the programs outlined in this paper should provide for an educational system that is well suited to the actuarial profession regardless of the way the profession is structured.

Summary of Reasons for Expanding the Concept of the Actuary

In this paper the authors have tried to present the outline of a plan for the broadening of the very concept of the term "actuary" as presently understood. They believe that, although the traditional definition of the actuary has been inextricably interwoven into the insurance and pension business, now is the time to re-examine this fundamental concept. The reasons for expanding the concept of the actuary have been described in detail and may be summarized as follows:

1. Many of the skills acquired by actuaries at the Associateship level could be of immense value in various emerging disciplines, businesses, and governmental areas, particularly if the curriculum changes suggested were to be adopted.
2. There is a growing need for the employers of actuaries to have political and social developments reflected in their planning and forecasting. This could be accomplished more effectively if actuaries with training in these new areas were available.
3. The need for an expanded concept of opportunities for actuaries has never been greater. The stability of the past does not guarantee that the future of the insurance industry will not be marked by severe dislocations and significant unemployment problems for actuaries. It might well be that the

recognition by business and government of the value of actuarial training in areas presently thought of as outside the province of actuaries will eventually be essential for the continued satisfactory employment of many members of the profession. Although a recent study shows an expansion in future needs for actuaries, the projection does not make allowance for discontinuities. The authors believe that such discontinuities are possible, and that the situation could reverse itself.

4. Similarly, many of those who, in increasingly large numbers, reach the Associateship level may discover that there are far fewer opportunities within the insurance and pension businesses than was previously believed. Today, the recently enacted pension legislation presents increased opportunities to actuaries; tomorrow, however, new Associates may need to pursue a different route if they are to maximize their potential.
5. Actuarial science is one that can be applied in many different areas and to many types of problems. The profession must expand its view as to potential applications of this science.
6. Finally, actuaries must be given the chance to "shift gears," so that, if they decide somewhere along in their careers to devote their skills to a related but, to them at least, more rewarding career, they will have the professional versatility to do so.

Implementation of Program

In this paper the authors have attempted to establish a concept that can be developed into a long-range educational program that will be of benefit to the profession. It seems appropriate that the paper conclude with a recommendation as to the means by which this program might be implemented. Therefore, the authors propose the establishment of a Study Committee, comprised not only of members of the Society of Actuaries but also of members of other actuarial organizations and non-actuarial persons qualified to make a significant contribution to the study and evaluation of the program and concepts presented herein. This Study Committee would be charged with the following responsibilities:

1. The Committee should examine the extent of the need for persons who complete the new course of study described herein. The need for education is related to the demand for practicing professionals, and any expansion of the educational system must go hand in hand with a broadening of the areas of practice. The Committee might find that the first to make use of personnel with these new and broader skills might well be insurance companies and consulting firms. Other areas in which a need might exist might be government agencies, think tanks, noninsurance consulting firms, and foundations. Newly emerging industries also might eventually become substantial users.

The potential market would have to be established from two viewpoints, so that, in addition to determining the need for people who have completed

the course of study, the Committee would also have to determine whether or not actuaries would be interested in accepting such jobs. To date, expansion of the occupational activities of the profession may have been limited by a reluctance on the part of its members to leave the "mainstream" of actuarial practice. This creates a problem of timing. Expansion normally involves venturing into new areas, and, although to begin with these areas are out of the mainstream, they gradually become part of it as more people become interested in them.

2. The Committee should pursue ways in which those persons who successfully complete the courses of study might properly be recognized. If universities are involved in the program, recognition might be handled through the granting of a doctorate. Initially, it might well be that the suggested additional courses of study would not involve any type of examination; however, the ultimate objective would be to develop a study path whereby a meaningful new professional designation may be achieved.
3. The Committee should expand on the authors' basic outline of areas of study which would be offered. It has been neither possible nor desirable to do so in this paper; indeed, the entire concept of flexible "plug-in/plug-out" education would have negated much of any such effort.
4. The Committee should give consideration to the various organizations that might be designated as vehicles for the implementation of the program. The authors see three possible organizations that might be used separately or in combination: the universities, the Actuarial Research Foundation, and a Society committee parallel in concept to the current Parts committees which function under the Education and Examination Committees.
5. The Committee should develop
 - a) A list of subject areas.
 - b) An outline of the course of reading. This might be a combination of required and elective reading material. Part of the feasibility study should be a determination of to what extent the course of reading needs to be defined.
 - c) A definition of what constitutes an acceptable project for independent research and study.
 - d) An outline for a mechanism to evaluate research proposals in order to determine whether or not they qualify.
 - e) An outline for a mechanism to review research projects and the papers in which the results are presented.
 - f) An outline of a mechanism for advisers or tutors to work with researchers. If the university is the implementing organization, this would be the function of a faculty member.
 - g) An outline of a suitable mechanism for the publication of the results of the research. The following possibilities should be considered:
 - (1) Publish as a paper in the *Transactions*, if accepted by the Committee on Papers.
 - (2) Publish in *ARCH* or a similar publication.
 - (3) Leave it to the university to handle.

(4) Have the Actuarial Research Foundation establish a new publication.

(5) Do not publish, but make a list of the results available.

The Committee should work with the Publications Board to develop the best proposal.

6. The Committee should investigate the possibility of developing a list of specific topics suitable for research projects and independent study at the present time.
7. The Committee should investigate the problems involved in designing an examination suitable for the program. Evaluation of the research paper might provide part of the solution, and credit for university course work might also be considered. In addition, special examinations may be needed.
8. The Committee should investigate the financial implications of such a program.
9. Discussion should be held with universities to determine the extent to which they might be able and willing to work with the Society to develop the types of educational opportunities outlined herein.
10. The Committee should determine the extent to which the new course of study might open up new opportunities for consulting firms. Insurance companies also might find the possibility of such new services attractive to them.
11. The Committee should survey the extent to which the present program fails to meet the need for continuing education. The programs being developed should be evaluated to see whether they will better meet those needs.
12. The Committee should review the concepts of continuing education and how it relates to the three basic modules. Educational needs of practitioners should be studied to see how they relate to needs of new actuaries.
13. The Committee should determine how the value of actuarial training in noninsurance areas could be brought to the attention of the public.
14. The Committee should provide the opportunity for actuaries to comment on the impact that they think such a program might have on their opportunities for growth at both the business and personal levels.

The Committee should, of course, maintain liaison with the present Society committees concerned with educational matters; however, it should be remembered that the purpose of this Committee is not to maintain and improve the existing insurance- and pension-oriented programs of study that are under the existing committees but rather to create an educational program which will expand the definition of "actuary" so that it will have application to emerging areas of study not now generally recognized as being within the scope of the profession. For this it will need imaginative thinking and much work. However, the final result should benefit all members of the Society of Actuaries and the other actuarial bodies.

APPENDIX I

SYLLABUS OF EXAMINATIONS—MAY, 1963

ASSOCIATESHIP EXAMINATIONS

Part	Time Allowed	Subjects
2	3 hours	General mathematics
3	3 hours	Probability and statistics
4A	2 hours	a) Finite differences b) Compound interest and annuities-certain
4B	4 hours	Life contingencies
5	6 hours	a) Construction of mortality and disability tables, including the elements of graduation b) The sources and characteristics of the principal mortality and disability tables c) Selection of risks

FELLOWSHIP EXAMINATIONS

Part	Time Allowed	Subjects
6	6 hours	a) Gross premiums for insurance, annuities, disability, and other benefits b) Valuation of liabilities c) Nonforfeiture values and changes of life insurance contracts d) Life insurance law e) Actuarial phases of agency problems
7	6 hours	a) Analysis and distribution of surplus b) Life insurance accounting c) Investment of life insurance funds and valuation of assets
8	6 hours	a) Group insurance b) Employee retirement plans c) Individual accident and sickness insurance d) Social insurance and allied programs

APPENDIX II

SYLLABUS OF EXAMINATIONS—NOVEMBER, 1963

ASSOCIATESHIP EXAMINATIONS

Part	Time Allowed	Subjects
1.....	3 hours	General mathematics
2.....	3 hours	Probability and statistics
3.....	2 hours	a) Finite differences b) Compound interest
4.....	5 hours	Life contingencies
5.....	5 hours	a) Demography b) Principles underlying the construction of mortality and other tables c) Elements of graduation of mortality tables and other series d) The sources and characteristics of the principal mortality and disability tables

BASIC FELLOWSHIP EXAMINATIONS

Part	Time Allowed	Subjects
6.....	5 hours	a) Actuarial aspects of life insurance accounting b) Valuation of liabilities c) Investment of life insurance funds
7.....	5 hours	a) Selection of risks for individual life insurance b) Gross premiums for individual life insurance and annuities c) Expense analysis d) Analysis and distribution of surplus for individual life insurance and annuities
8.....	5 hours	a) Group insurance b) Employee retirement plans c) Individual health insurance d) Social insurance

SPECIALIZED FELLOWSHIP EXAMINATIONS

EMPLOYEE BENEFIT PLANS

Part	Time Allowed	Subjects
9E	5 hours	a) Group insurance b) Employee retirement plans
10E	5 hours	a) Life insurance law b) Welfare plan disclosure laws c) Life insurance company federal income taxation d) Social insurance e) Investment of pension funds and other special topics applicable to employee benefit plans

INDIVIDUAL INSURANCE

Part	Time Allowed	Subjects
9I	5 hours	a) Gross premiums for individual insurance and supplementary benefits b) Valuation of liabilities c) Nonforfeiture values and changes of life insurance contracts d) Analysis and distribution of surplus for individual insurance e) Special topics applicable to individual life insurance
10I	5 hours	a) Life insurance law b) Life insurance company federal income taxation c) Actuarial phases of agency problems d) Reinsurance and risk theory e) Individual health insurance

APPENDIX III

SYLLABUS OF EXAMINATIONS—MAY, 1976

ASSOCIATESHIP EXAMINATIONS

Part	Time Allowed	Subjects
1.....	3 hours	General mathematics
2.....	3 hours	Probability and statistics
3.....	3 hours	a) Numerical analysis b) Theory of interest
4.....	5 hours	Life contingencies
5.....	5 hours	a) Demography b) Principles underlying the construction of mortality and other tables c) Elements of graduation of mortality tables and other series d) The sources and characteristics of the principal mortality and disability tables e) Risk theory

FELLOWSHIP EXAMINATIONS

Part	Time Allowed	Subjects
6.....	6 hours	a) Life, health, and pension coverages b) Marketing of insurance products c) Selection of risks
7.....	6 hours	a) Investments of life insurance and pension funds and valuation of assets b) Valuation of liabilities
8.....	6 hours	a) Gross premiums, distribution of surplus, and pension funding b) Contract values and changes c) Expense analysis
9.....	6 hours	a) Social insurance b) Life and health insurance accounting c) Life insurance law d) Life insurance taxation

APPENDIX IV

NORTH AMERICAN UNIVERSITIES AND COLLEGES OFFERING
ACTUARIAL COURSES AND/OR DEGREES IN 1974

College or University	Courses Offered for Parts	Type of Program Degree
Ball State University Muncie, Ind. 47306	1-5	Full-time B.A., M.A., M.S.
College of Insurance 150 William Street New York, N.Y. 10038	1-4, 5 (part); some courses cover parts of later exams	Work-study B.S.
Drake University Des Moines, Iowa 50311	1-5	Full-time B.S.
Georgia State University Atlanta, Ga. 30303	1-5; some courses cover parts of later exams	Full-time B.B.A., M.A.S., Ph.D.
Laval University Quebec 10, Canada	1-5	Full-time B.A.S.
Lebanon Valley College Annville, Pa. 17003	1-4 (4 offered every other year)	Full-time B.S.
New York University Graduate School of Business 100 Trinity Place New York, N.Y. 10006	1-4	Full-time or part-time M.S., M.B.A.
Northeastern University 360 Huntington Avenue Boston, Mass. 02115	3-6; special 4- and 5- week seminars for 7- 10	Work-study M.S.
Queen's University Kingston, Ontario, Canada	1-4	Full-time B.A.
Temple University Philadelphia, Pa. 19122	1-5; some courses cover parts of later exams	Work-study, full-time, part-time B.A., B.B.A., M.B.A.
University of Connecticut School of Insurance Hartford, Conn. 06105	1-10	Part-time None to date
University of Illinois Urbana, Ill. 61801	1-4 (4 not offered every year)	Full-time A.B.
University of Iowa Iowa City, Iowa 52240	1-5; reading and semi- nars for 6-10	Full-time B.A., M.S.
University of Manitoba Winnipeg, Manitoba, Canada R35 2N2	1-5	Full-time B.A., B.Sc., B.Com., M.A., M.Sc.
University of Michigan Ann Arbor, Mich. 48104	1-5; some courses cover parts of later exams	Full-time B.A., B.B.A., M.A., M.A.S., Ph.D.
University of Minnesota Minneapolis, Minn. 55455	1-4	Full-time B.S., M.S.
University of Montreal Montreal, Quebec, Canada	1-4	Full-time B.Sc.
University of Nebraska Lincoln, Neb. 68508	1-5	Full-time B.A., M.S.
Wharton School University of Pennsylvania Philadelphia, Pa. 19104	1-4; some courses cover some parts of later exams	Full-time B.S., M.B.A.
University of Texas at Austin Austin, Tex. 78712	1-5, 6 (part)	Full-time B.A., B.B.A., M.B.A.
University of Toronto Toronto, Ontario, Canada	1-4, 5 (part)	Full-time B.A., B.Sc., B.Com.
University of Waterloo Waterloo, Ontario, Canada	1-5	Full-time or work-study B.Math.
University of Western Ontario London, Ontario, Canada	1-5	Full-time B.A., B.Sc., M.A.
University of Wisconsin Madison, Wis. 53706	1-5; some courses cover parts of later exams	Full-time B.A., M.S.A.S., Ph.D., B.B.A.

DISCUSSION OF PRECEDING PAPER

MICHAEL J. COWELL:

In their excellent documentation of the history and the current status of actuarial education in North America, and the outlook for its future, Mrs. Rappaport and Mr. Plumley have rendered a most valuable service to the Society and to the actuarial profession. Even if the Society had commissioned such a paper, we could not have selected two more eminently qualified authors, both of whom are so closely identified with the education and examination work of the Society, and particularly with the restructuring of the Fellowship examinations.

The title of their paper is modest, and the authors go well beyond the topic of actuarial education, into issues of professionalism and the relationships of actuaries with other professionals. Their paper further explores the expanding role of actuaries into new areas of activity that traditionally have not been recognized as falling within the scope of our profession.

It would be presumptuous of me to attempt to improve on the authors' version of the status of actuarial education or to challenge their recommendations for broadening the scope of actuarial work. Rather, this discussion is being submitted to elaborate on a number of areas covered by the authors and to add some perspective to other aspects that have developed from recent discussions on actuarial education and professionalism.

In commenting on what the Society's educational program is trying to accomplish, the authors take the position that the emphasis should be on principles, with examples drawn from various areas of practice. They go on to assert that "it is not and cannot be the function of an educational system to develop actuaries who are mature in all areas of practice." Certainly, with respect to the formal system leading to Fellowship in the Society, most of us would probably agree to their assertion.

I would like to go even further than the authors, and suggest not only that this system cannot be expected to develop fully mature practicing actuaries but also that any formal system which purported to do so would be self-defeating. An essential part of the education of the professional actuary would seem to be the development of an appreciation for the value of independent inquiry outside the fixed bounds of the course of study at any given time. Admittedly, this may seem idealistic and somewhat impractical from the standpoint of actuarial students, for

whom the immediacy of the examination process tends to overshadow the importance of the educational process.

Actuaries, perhaps even more than scientists, tend to be intensely practical people, and this quite naturally leads actuarial students to want to "get through the exams" in order to spend their full time on the problems of the "real world." Implicit in this desire to be practical are temptations to let education for tomorrow's world take second place behind training for the world of today. For the most part, the examination syllabus has attempted to resist these temptations and the restructuring of the Fellowship examinations along functional lines—rather than by product—should be a significant further step in this direction.

Ideally, the process of actuarial education should be heuristic. It should impart to each student a sincere appreciation of how much more there is to be learned and the confidence that the preparation leading to Fellowship has equipped him with the tools to acquire that further knowledge. Given such a background, every member of our profession should come to recognize the circumstances in which his knowledge as a professional is applicable, should understand how to apply that knowledge, and, it is hoped, will take appropriate action if he finds his knowledge inapplicable or insufficient to the situation. In reality, it is probably the exceptional actuary who has already reached this stage of professional maturity at the moment of achieving Fellowship; I would suggest, however, that one's actuarial education is not really complete until this stage is reached. I believe that this is the distinction the authors are making between "qualification to practice" and "professional maturity." It is a distinction that applies equally as well to actuaries as to other professionals, even allowing the authors' contention that actuaries are likely to be more experienced and to have a greater degree of maturity at the time of qualification than such professionals as attorneys and accountants.

In discussing the nature of professionalism, the authors cite the Professional Development Committee as well as a number of individual contributors to this topic. The central point of most of these definitions of professionalism is that the professional relies on a body of knowledge and a set of methodologies to apply this knowledge in order to solve his client's specific problems. As the authors point out, the professionally mature individual combines the theoretical and practical knowledge of his chosen specialty with the ability and experience to apply that knowledge. However, except in the most trivial of cases, or where the problem is reducible to mathematics—and this is quite unlike the situation that more typically prevails for the physical scientist—there is usually ample

room within the mature professional's scope of judgment for more than one "right" answer. This, perhaps, is another key distinction between the work of the scientist and that of the professional.

For an appreciation of the meaning of professional maturity, I believe this distinction is significant, and it represents the only key point of the paper that I would challenge. The primary orientation of the scientist is analysis. Individual scientists typically go into increasingly greater detail in their subject matter, often with ever narrower applications to the real world. The actuary, by contrast, is essentially a synthesist, who draws together information from a variety of disciplines in order to develop an integrated approach to the problem. This contrasting viewpoint does not, of course, preclude the authors' concept of actuaries as scientists but hopefully does explain why the actuary as a scientist wears a different hat from the actuary as a professional, even though an individual may be perfectly capable of alternating hats. It may also help to explain why, as John Angle points out with apparent dissatisfaction, in his article on professionalism cited by the authors, the emphasis on the practitioner's relationship with clients has been related more closely to that of the public accountant than to that of the scientist.¹

In expanding on this "professional versus scientist" debate, the authors suggest that in defining the need for education we must first define the concept of professional maturity. To this I would add that the issue of maturity may be one of the critical links between our own professionalism and that of other disciplines to which the authors would like to see our horizons expanded, and I would like to suggest one further viewpoint that seems to sum up the concept quite succinctly.

On these same matters of actuarial education and professionalism, Mr. James Pegler, in his 1968 presidential address to the Institute of Actuaries, proposed that the following three stages could be distinguished in the education of a professional: "The first is when he is learning the meaning of the technical terms in order to be initiated into the mysteries of his profession. The second is when he has learned to use these freely and can thus freely exchange ideas with his professional colleagues. The third is when he has learned *not* to use them and can thus communicate freely with the layman. Only at the third stage can he claim to be a professional."² (Actually, Pegler's reference was to the "professional man." It is to be hoped that the distance of more than seven years and one culture will serve to mitigate any charges of male chauvinism that might be brought against him!)

¹ John C. Angle, "The Actuary as a Professional," *The Actuary*, January, 1975.

² *JIA*, XCV (1969), 2.

The point that Pegler was emphasizing is that "actuaries are not always innocent of the charge laid against scientists generally, of using jargon in communication with the layman." He felt that this often left an impression of obscurity and intellectual arrogance and resulted in actuaries' advice not being sought in certain situations where it could be of value. This, Pegler maintained, caused the public interest, as well as our profession, to suffer, an argument that has been proposed in a number of recent discussions on this subject.

Pegler's "third stage" of education may, in fact, represent the "professional maturity" that Mrs. Rappaport and Mr. Plumley have sought to to define; semantics aside, this reversion to free communication with the layman certainly seems to underscore a subtle but essential difference between professional and scientific maturity. As the authors suggest, the mark of the professionally mature scientist is that he feels free to disagree with much that is accepted as correct. I would add, however, that the maturity of the scientist will not necessarily be expressed in terms that are intelligible to the layman. The mature actuarial professional, on the other hand, is dealing with people-oriented issues; as a scientist, the actuary is first and foremost a social scientist. And as such, if he is to be credible, he must deal in terms and reach solutions that are both understood by and acceptable to the public he purports to serve. By way of elaborating on the authors' discussion of professional maturity, I would further suggest that if we expect to earn the credibility among the public and among other professions that will enable us to expand our role and to broaden the scope of actuarial work, we should strive to reach Pegler's "third stage" of professional development.

These concepts of professional maturity are not exactly new, as previous historical research by Mr. Angle and others has indicated. Without in any way challenging the excellent definitions of the actuary cited in the authors' paper, I would like to quote once more from our British colleagues, again from a president of the Institute, Mr. Arthur Bailey, in his opening address to that body in 1881 (and again with apologies to our female members): "An actuary should be a man of general culture, with a knowledge both of books and men, and the more he has of both the better. He comes in contact with various classes of the community, and will be of little use unless he can understand and sympathize with the different objects for which he is consulted, and can adapt himself to the different habits of thought or his clients."³

In many respects, this description almost a century ago seems remarkably apt to the current debate. That we have grown and prospered as a

³ *JIA*, XXIII (1882), 159.

profession is evidence of our capacity to adapt; our further growth and expansion into the areas suggested by the authors will depend on our maturity as professionals as well as our technical ability as scientists.

On this final point, the findings of the Society's Committee to Encourage Interest in Actuarial Careers are most helpful; they suggest more than a doubling of the need for actuaries over the next twenty years. Some of this growth will almost certainly be in areas not yet considered to be the domain of the actuary. Clearly, while the educational process can do much in this regard, it is more likely to be the actuary who has attained professional maturity—the actuary who is talking to the laymen and to other professionals in their terms rather than his, the actuary who “can adapt himself to the different habits of thought of his clients”—who will be in the best position to capitalize on such growth. One current example from which we might take a lesson is the teaching profession, which continued to encourage its own growth when the demographics of the situation were clearly pointing in a different direction. It would indeed be ironic if our own profession, with its basic orientation toward future events, were to find itself underemployed twenty years hence as a result of assuming that the growth in demand for our services would come entirely from existing actuarial responsibilities. Perhaps some of the current surplus of teachers could have been alleviated if, ten or fifteen years ago when the changing trend in the demand for their services was already beginning to emerge, they had faced up to the same questions that Mrs. Rappaport and Mr. Plumley are challenging us with today.

We are indebted to the authors for bringing these critical and timely issues to our attention.

CECIL J. NESBITT:

I welcome this paper for its exposition of various matters relating to actuarial education and research, such as the role of actuaries as scientists, broader opportunities for actuaries for public and private service, the alternate route, formalizing a third module of actuarial education, the activities of the Committee on Continuing Education and Research, the potential role of the Actuarial Education and Research Fund, and the participation of universities. In this discussion I shall comment briefly on these matters in turn.

Human knowledge has increased by leaps and bounds, and research has become a substantial industry. These efforts have brought us to frightening limits in the physical and biological sciences, while our social and political institutions are at an earlier stage of development. For the world to achieve a peaceful, cooperative, healthy environment, much

long-range planning is needed, and actuaries can contribute to it. In order to do so effectively, actuaries must have the scientific urge to examine, remold, and extend the basic concepts and applications that are our intellectual stock in trade. A commitment in this direction will help to attract the minds and the resources that are needed to produce the actuarial science of the future. But it must be recognized that a strong effort is needed if actuarial science is to achieve the development that has come about in other areas of science.

Problems in the development of our insurance, pension, and social security institutions offer many opportunities for public and private service by actuaries. In particular, we need to develop our knowledge and expertise regarding the investment side of benefit programs so that we can offer a more balanced guidance of their operation. A second possibility is the development of simplified, flexible and less costly life insurance policies as outlined recently by J. C. H. Anderson in the November issue of *Emphasis* (published by Tillinghast and Company). Another possibility is the wider participation by actuaries in special mortality or survivorship studies in relation to diseases or other factors bearing on mortality.

The alternate route, if adopted, should be a healthy stimulus to actuarial education in the universities, since it places more of the responsibility for basic actuarial education in the hands of university teachers and gives actuarial students an option in lieu of the standard examinations.

With some regret I have come to the conclusion that it is no longer sufficient to leave continuing education and research on an informal and amateur basis (in the best sense), and that they must be formalized and be suitably recognized or professionalized. The proposed third module for actuarial education is a step in this direction. In order for universities to contribute effectively to this third module, it will be necessary for them to have a strong group of actuarial educators and students. This suggests the need for focusing such efforts in a few universities. Both faculty and students might well include actuaries who are taking a period of study and research to refine and advance their actuarial knowledge. A mixed faculty and student group (with both academic and practitioner members) might well form the basis for university efforts in continuing education. As the paper notes, such efforts have not been made (other than through the annual Actuarial Research Conferences sponsored by the Subcommittee on Research and cooperating universities).

The paper recounts various activities of the Committee on Continuing Education and Research that are providing opportunities for the enlargement of our professional and scientific knowledge. These activities should be encouraged and strengthened.

Representatives of the six actuarial organizations have been meeting to define research projects that might be sponsored by an Actuarial Education and Research Fund. A number of the ideas the authors suggest for the consideration of a study committee to implement their long-range education program have come up in the discussions by these representatives. Examples are the definition of what constitutes a suitable project, lists of specific research topics, and consideration of the mechanisms that should be used to solicit, evaluate, and review research projects. The group of representatives is now outlining in some detail selected projects that may be appropriate for initial sponsorship by the fund.

Some comment has been made already on the role of the universities in actuarial education and research. There would be much to gain if it were possible for able young actuaries to spend one to five years in academic research and teaching and for senior actuaries to visit institutions of higher learning during a sabbatical year. Likewise, junior actuarial faculty could gain by spending one to five years in actuarial practice in a nonacademic setting, and senior faculty could profit by sabbatical visits to insurance, consulting, or governmental actuarial organizations that deal with problems of interest to such members. However, many universities are facing stringent budgetary restrictions and have limited flexibility for making staff additions or developing new programs. Also, it may be difficult for a practicing actuary to interrupt his career and responsibilities for an academic interval. Some exchanges offering mutual advantage to both the universities and professional actuaries should be possible, and exploration is warranted. The Actuarial Education and Research Fund could stimulate such exchanges.

The authors have served us well in reviewing past developments in actuarial education and in projecting future possibilities for actuarial research, education, and service. Ultimately the question of promoting these possibilities comes down to the emergence, both within and outside the profession, of interest in them and the will to commit resources to their development. The value and quality of actuarial service to meet human needs will be determining factors.

CECIL D. BYKERK:

I first want to thank the authors for their timely paper on a subject which will require a great deal of thought in the future. Their treatment of the historical aspects of the examination system is excellent and of great interest and value of actuaries, both present and future, who, although not involved in the systems described by the authors, will be involved in the structuring of future systems.

I agree wholeheartedly with the authors in their statements concerning

the training of individuals (actuaries) in the use of actuarial methods on heretofore nonactuarial problems. I believe that such training could best be handled in an academic environment. Actuaries have much expertise to apply to the world around them, but they must be the ones to initiate such applications. The academic environment would seem to be the most obvious interface between actuaries and these other areas.

I agree basically with the authors' major proposal, but they really did not state enough about the proposal and the solutions to its implementation problems for me to obtain a very good understanding of exactly what they were proposing. I realize that this paper is merely the beginning of an idea, but, to be an effective beginning, it should have covered the proposal in more depth.

The authors fail to say who would run the proposed third module. One gets the feeling that they propose that the academic community should supply the individuals to run the program. Perhaps it might be better to help subsidize the present graduate actuarial programs by offering a Ph.D. in actuarial science. Such a step would not come cheap in either time or money—items that most universities have very little of. If the actuarial profession desires the help of the academic community in educating its membership, then the profession had better be more helpful to the academic community and more understanding of its monetary and time problems.

I would take some exception to the second item of the study committee's responsibilities. If the idea of a third module is to allow individuals to go their own way in research, it would seem impossible and undesirable to prescribe any type of examination process as a requirement for qualification.

MICHAEL FRANK:

Mrs. Rappaport and Mr. Plumley have written a paper that is both informative and interesting.

As the actuarial profession becomes more visible, college students may begin to think of an actuarial career earlier in life. This would be consistent with the authors' proposal that students be encouraged to get as much as possible of the basic Associateship material out of the way while they are still in college.

When I was in college, it was customary to attempt to pass the first two actuarial examinations before graduating and then to try to enter the field. My college offered no formal actuarial courses, but I had passed Parts 1 and 2 when, during the course of a job interview in January of my senior year, it was suggested to me that I could go further. I then arranged to attend Part 3 classes at the local actuarial club. Looking

back, I regret that I had not done this the previous year so that I could have made my first attempt at Part 4 that spring. (About that time I also learned from a dean that I could write a paper outlining the study material and receive three math honors credits, without waiting for the results of the examination.)

College students who pass Parts 1 and 2 should be kept informed about actuarial classes and the possibility of obtaining college credits through them; instructors should be ready to make available to the college the student's attendance record and an evaluation of his work.

A little cooperation and coordination between the profession and academia could prove very helpful to young people preparing to enter the field.

DONALD R. SONDERGELD:

One of the points developed in this fine paper is that an actuary is both a scientist and a professional. The paper also mentions two needs: unity of education and unity of profession. I would like to offer some comments on these items.

An educational system and a standard of accomplishment are admittedly necessary ingredients in the development of an actuary as a scientist. The paper points out that the need for "unity with respect to education" was recognized many years ago, and goes on to note that two actuarial bodies in North America combined their educational systems prior to their merger into the Society of Actuaries in 1949. Currently there is cooperation among six of the actuarial organizations in North America through joint sponsorship of the examinations.

The paper, however, contains only one short paragraph under the heading "Unity of the Profession" and states that the development of the programs outlined in the paper should provide for an educational system that is well suited to the actuarial profession regardless of the way the profession is structured. Although I agree that education is the key to the development of the actuary as a scientist, I feel that a major factor that contributes to the effectiveness of the actuary as a professional is the manner in which the profession is organized.

It is my belief that today unity of profession probably is more important than unity of education. However, it is possible to have both. This could be accomplished by restructuring all the actuarial organizations in North America into two national bodies: the Canadian Institute of Actuaries and the American Academy of Actuaries. For example, in the AAA there could be three classes of membership: Associate (if the candidate is an Associate of one of the other existing organizations), Member (if currently a member of the AAA), and Fellow (if currently a member of

the AAA and a Fellow by examination of one of the other existing organizations). I am sure that a transitional approach along these lines could be worked out. There also could be something similar to the "affiliate" class of membership currently under consideration, consisting of "enrolled actuaries." This should be preferred over forming still another professional actuarial organization—or another actuarial profession.

There would be examination requirements to become an A.A.A.A., an experience requirement would be added to become an M.A.A.A., and to become an F.A.A.A. one would need additional examinations, plus an experience requirement at least equal to that required for M.A.A.A. status. Alternatively, the exam-only class could be eliminated, and there could be two classes each of which would require both examinations and experience. In the latter case, I would use the designations Associate and Fellow, since I believe confusion has occurred in distinguishing between "Member" member and just plain member in the Conference of Actuaries in Public Practice.

The examinations could be sponsored jointly and administered jointly by the AAA and the CIA, with joint examination committees for all examinations. A possible examination structure would be the following: Common Core, Risk Specialties (choice of Casualty, Employee Benefit Plans, or Individual Insurance), and National Specialties (choice of Canada or United States). The only "joint" work then would be between the AAA and CIA. Most of the liaison work and the redundancy of effort now being expended by actuarial organizations in the United States could be eliminated. Furthermore, the local actuarial clubs might be reorganized to become an integral part of the AAA. Current issues could be discussed at the local organizational level and comments furnished to the AAA.

The two actuarial organizations could have joint meetings, perhaps once a year. The problem of adequate Canadian representation in the Society of Actuaries would disappear. There might be concern that the needs of actuaries with special interests—for example, those working for an insurance company, in consulting firms, with casualty companies, in the health care field, or in pension work—would not be satisfied. One solution to this would be to organize the slate of the board of directors of each organization so that candidates would be elected as vice-presidents of one or more special interests, with specific responsibilities in those fields. This organizational theme could be carried into the standing committees and especially into the examination committees. In the United States there might be five meetings of the Academy per year, with some of those meetings devoted to only one or two fields of special

interest. Alternatively, the needs of the special interests could be met by means of concurrent sessions and workshops at four meetings per year.

One handicap of the Society of Actuaries and the Casualty Actuarial Society is that they are international United States-dominated bodies. In my opinion, present and future actuarial problems are going to be associated with the public needs that are on a national and statutory basis. It is essential, therefore, that there be a strong, single, unified national actuarial organization to represent the actuarial profession in the United States. This can be accomplished best if all actuaries who practice in the United States have only one organization to identify with and to support. If this were the case, the actuarial profession in the United States would gain strength through numbers and, more important, through unity.

Although many actuaries in North America might continue to be members of both national organizations, a united actuarial profession in the United States (and also in Canada) would improve greatly the effectiveness of the actuary as a professional.

AARON TENENBEIN:

The authors have presented a comprehensive review of past education for actuaries and of possible future directions in that education. One of the problems that the authors discuss is that of the actuary's keeping his knowledge and skills up to date, and they give consideration to the possible contributions that universities can make to meet this challenge.

Professionals and business executives in other fields face the same problem of the need for additional education so that they will be better able to meet the demands made on them by new opportunities and responsibilities and by changes in the business environment. The New York University Graduate School of Business Administration has responded to these needs by providing a special postgraduate program designed for practicing professionals and business executives who already have an M.B.A. or a Master's degree in any other field. The Advanced Professional Certificate (APC) Program became effective in 1972. In this program the business executive takes a module of five or six related graduate courses in business administration. These courses are selected after consultation with a faculty adviser. Modules are available in such fields as economic forecasting, marketing for financial institutions, management, applied statistics, computer applications, and operations research. All courses have at least one section which meets during the evening hours. The program can be completed on a part-time basis over a period of one and a half to three years. For example, an M.B.A. who

goes into corporate planning and finds that he needs information on economic forecasting can take an APC module on this subject. Another example would be an M.B.A. who earns a degree in finance and later becomes interested in marketing.

The actuarial executive who is a Fellow of the Society of Actuaries or of another actuarial society may have the same needs as the M.B.A. In most cases, a Fellow of the Society will not have an M.B.A. or other graduate degree. However, since study toward actuarial examinations does represent advanced study *similar* to that of a graduate student, effective February, 1976, entrance into the Advanced Professional Certificate Program has been made available to Fellows of the Society and members of the American Academy of Actuaries. Actuaries might consider taking an APC module in investment management, in finance, or in economics; actuaries doing corporate planning might be interested in the economic forecasting module.

F. ALLEN SPOONER:

Mrs. Rappaport and Mr. Plumley have provided a valuable service by tracing the evolution of actuarial education and suggesting new approaches that should be adopted. The area of continuing education is one in particular in which there are many opportunities for new activities. For example, there might be a continuing education service for each broad area of interest. An actuary working regularly on individual life products could subscribe to an individual life product service that would provide him with periodic bulletins on new-product developments, regulatory changes, and the like. He would also receive copies of new study notes covering life product topics.

Another possibility is to expand the areas of study suggested by Mrs. Rappaport and Mr. Plumley to include advanced study of subjects more closely associated with the day-to-day work of the actuary, such as group insurance, group pensions, individual life products, field compensation, and so forth. As suggested by the authors, universities could play an important role in this type of education.

Other professional associations have been active in the area of continuing education. Lawyers and doctors, with substantially greater manpower and a much wider structure of formal education to draw on, naturally can undertake more ambitious programs than we can. Although their needs are different from ours, a summary of the activities of these two groups may be helpful.

The continuing education of the lawyer is accomplished primarily through the Practicing Law Institute. This organization is a private

institute accredited by the American Bar Association. It offers a wide range of courses on current topics, with about three hundred seminars and workshops a year. In addition to setting up the courses and providing instructors, the PLI publishes about a hundred and fifty soft-cover texts to be used with or without courses and about twenty hard-cover texts that are unrelated to courses. The PLI has a mailing list of lawyers that is broken down by geographical location and areas of interest (corporate law, real estate law, and tax law) and is used to direct its mailings. The work of the PLI is supplemented by the work of local bar associations just as the work of the Society or the Academy is supplemented by local actuarial clubs. Of course, formal instruction at universities also is available.

Physicians have several programs of continuing education. When a physician has completed medical school and internship and becomes licensed to practice medicine, he may specialize in a particular area of medicine and take specialty board examinations in order to demonstrate his proficiency. Thereafter, a very elaborate continuing education program is available. The *Journal of the American Medical Association* publishes as an annual supplement a list of continuing education courses that are available to physicians in the United States. The latest supplement includes almost 5,000 courses. It also describes the requirements for the 1975 Physician's Recognition Award (PRA) of the AMA. This award recognizes continuing medical education (CME) activities between July 1, 1972, and June 30, 1975, in six categories:

Category	Description	Credit-Hour Limit
1	CME activities with accredited sponsorship	No limit
2	CME activities with nonaccredited sponsorship	45 hours
3	Medical teaching	45 hours
4	Books, papers, publications, and exhibits	40 hours
5	Nonsupervised individual CME activities:	
	A—Self-learning	45 hours
	B—Consultation	and no
	C—Patient care review	more than
	D—Self assessment	22 hours in
	E—Specialty board preparation	any one
		subcategory
6	Other meritorious learning experiences	45 hours

A total of 150 credit hours is required in order to qualify for the 1975 PRA, of which at least 60 credit hours must be in category 1.

Doctors also have become increasingly concerned about the need to keep abreast of recent medical developments. These developments have

come at a rapid pace, and the doctor who does not follow them not only loses self-esteem but also faces possible malpractice action. In addition, there is always the threat of legislation which would require some sort of periodic recertification of doctors. As an experiment, one of the specialty boards has started a voluntary recertification program. The following description of this program appeared in the *Annals of Internal Medicine*, April, 1975.

On 26 October 1974, 3,356 diplomates of the American Board of Internal Medicine (ABIM) took a 1-day written examination for recertification consisting of multiple-choice, matching, and true-false questions. . . . The passing score was set by using a normative standard applied to a reference group of internists practicing general internal medicine who had had 2 or more years of residency training completed between the years 1949 and 1958. . . . This examination was the first recertification examination to be given by a specialty board. . . . It presages the announced intention of most of the other 21 specialty boards to develop some method of periodic reevaluation of their diplomates.

The physicians who successfully passed the recertification examination are receiving a certificate that attests to their "Continued Scholarship in Internal Medicine." In addition, a notation that they are recertified will appear in their listing in the next edition of the *Directory of Medical Specialists*. . . . The results of those physicians who took the examination and were unsuccessful will *not* be released to anyone other than the individual candidate. No hospital, society, or organization will know who took the examination and failed it. . . . Although the number of internists who were eligible is not known precisely, it was estimated to be about 15,000.

Continuing education is an area in which we must all remain interested. In their paper Mrs. Rappaport and Mr. Plumley have made a worthwhile contribution by focusing our attention on it.

(AUTHORS' REVIEW OF DISCUSSION)

ANNA MARIA RAPPAPORT AND PETER W. PLUMLEY:

The authors appreciate the interest that has been shown in their paper and the additional ideas that have been contributed through the discussions.

Michael Cowell has expanded on the subject of professionalism and professional maturity. He makes the point that part of the role of the educational process is to equip the student with the tools to acquire knowledge. This is of particular importance in today's world. He also points out that a mature professional is able to deal with people outside the profession in language which is familiar to the person with whom he is dealing.

Cecil Nesbitt explores further the possible role of the university and suggests the use of sabbaticals. He also suggests "exchanges" whereby both academic and business actuaries would have the chance to experience their counterpart's way of life. He also comments on the future role of the Actuarial Education and Research Fund.

Cecil D. Bykerk also explores the relationship between the universities and the profession and points out the need for the profession to give more support to the universities. He challenges the role that examinations should play in a new program aimed at development of a research-oriented professional.

Michael Frank discusses the need for college students to be informed earlier in their academic lives about actuarial science careers and the need for them to do career planning. His comments relate to the need for more cooperation and liaison between the profession and universities.

Donald Sondergeld mentions the unity of the profession and makes a proposal as to how the profession might be restructured. Although the ideas presented go beyond the scope of the paper, they are interesting and should form the basis for much discussion in the future. The issues he raises are certainly timely and of importance.

Aaron Tenenbein and Al Spooner relate the problems presented in the paper to those currently being faced by other professions. They go on to present solutions which have been implemented in other fields. Both these discussions are valuable additions to the paper, because they provide some ideas and models as to what might be done.

Mr. Tenenbein's discussion explains how a graduate business school has met the needs for continuing education through an Advanced Professional Certificate Program. This program is particularly interesting to the authors, since recently it has been made available to actuaries.

Mr. Spooner explains how the law and the medical professions are meeting continuing education needs. He also discusses the concept of recertification as it applies to physicians.

The authors again wish to thank the discussants, and to express the hope that the paper is a beginning and that the ideas presented in it will receive widespread discussion. We hope that an expanded system of education that will help the profession to meet the challenges of the future can be implemented.

