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PANEL DISCUSSION

THE ALTERNATE ROUTE

CHAIRMAN PAUL T. ROTTER: In his presidential address in Boston last year, Mr. Milliman gave the background reasons leading to the appointment of the ad hoc committee of the American Academy of Actuaries charged with studying the "Alternate Route." Also at last year's Annual Meeting, Mr. Lancaster gave a report on the work of this committee. Since then, this subject has been discussed by the Education and Examination Committee, the Advisory Committee on Education and Examinations, the Joint Committee on Review of Education and Examinations, and other committees of the several actuarial bodies in Canada and the United States. It has also been discussed in larger forums, such as the Canadian Institute of Actuaries and several actuarial clubs.

I would now like to say a few words about the format of this meeting. We have chosen to adopt some of the elements of a debate, since the first four panelists will speak primarily from either the "pro" side or the "con" side. Messrs. Vogel and Hickman will present the arguments for the alternate route. Messrs. Plumley and Kellison will present the arguments against the alternate route. Mr. Fewster will discuss the differences, as he sees them, in the impact which the alternate route, if adopted, would have in Canada and in the United States.

I would like to review some of the background leading to the proposal of the alternate route. To become a member of the American Academy of Actuaries, an applicant must submit satisfactory evidence that he has met specified requirements in both education and experience. By Board resolution under the Bylaws, at the present time satisfactory evidence regarding the education requirement can be met by passing specified examinations of the Society of Actuaries or of the Casualty Actuarial Society. Under the Academy Bylaws now in effect for candidates for the life and health insurance and pensions major, the equivalent of the first five Society examinations is required in 1970. This requirement is increased by one examination each year, so that the equivalent of the first eight Society examinations will be required for admission to the Academy on and after January 1, 1973.

In 1969 the Board of the Academy authorized the appointment of the Committee on the Alternate Route to consider whether an additional way to meet the education requirement would be appropriate and feasible.

The members of this committee are Harry Garber, Frank Griffin, William Leslie, Walter Miller, Louis Robert, Robert Taylor, and Julius Vogel, who is the chairman. Among the members of this committee are members of all the actuarial organizations in the United States and Canada. This committee feels that the alternate route proposal has substantial merit and is worthy of consideration by the actuarial profession. Even though this committee was established as a result of Academy action, it has recognized from the beginning that it would be an undesirable outcome if the Academy were to have education requirements for admission inconsistent with those of the other actuarial organizations.

The alternate route which the panel will discuss is a proposal that an individual who has a degree from a college or university which has been accredited by an appropriately selected committee of the actuarial profession and who has passed specified courses in actuarial science and related subjects in that college or university be permitted to write a comprehensive examination covering, roughly, the subject matter of Parts 1–5 of the regular Society examinations. The comprehensive examination would be administered annually by the actuarial profession. If the candidate passes this examination, he would be given credit for the first five parts of the regular examinations.

MR. JULIUS VOGEL: As Paul indicated, I am in favor of the alternate route. It seems to me that its adoption would serve the long-term good of of the actuarial profession, and I would like to explain why.

To begin with, it is clear that Parts 1–5 of the life actuarial syllabus are the fundamental mathematical basis of our profession and lend themselves most naturally to being taught in college. What I am concerned about is that on these basic and important subjects our traditional self-study syllabus may fall behind the best modern thinking and instruction that might be found at some particular college or university.

I can illustrate my concern with an example from Part 1, General Mathematics. Within the last year or two, we have introduced matrices in this examination. As you may know, the content of Part 1 is subject to review not only by members of the Society's Education and Examination Committee but also by special consultants who are professors of mathematics and who are supposed to keep the examination in line with what is being taught currently in undergraduate mathematics courses throughout the United States and Canada. It was only recently that these people felt that undergraduate instruction in matrix algebra was sufficiently widespread that a few questions on the subject could reasonably be brought into Part 1. Of course, there are probably actuaries who studied and used

matrices in college twenty or twenty-five years ago, as well as others who graduated perhaps only ten years ago who did not learn anything about matrices. Since Part 1 has to be fair to everybody, it necessarily took a long time before this subject, which is very important and not new at all, was considered to be sufficiently well known that it could be included on the Part 1 examination. To me, this is an example of how the Society's examination syllabus, for perfectly good reasons, inevitably lags behind what is being taught in many colleges.

Part 3—Finite Differences—provides another illustration. Freeman's book, which is the textbook for Part 3, is largely oriented to the problem of using desk calculators efficiently in making actuarial calculations. But for the last ten or fifteen years most extensive actuarial calculations have been done on computers, so that Freeman is obviously out of date. However, the Education and Examination Committee has so far been unable to substitute a computer-oriented textbook for Freeman. There are good reasons for this. But at least one of the problems in finding a new book is that most computer-oriented textbooks are premised on familiarity with a programming language, such as FORTRAN. We have some students who do not know FORTRAN, as well as others who are full-time programmers in FORTRAN. We have to be fair to all of them, and it is difficult to find a computer-oriented textbook that is substantially fair to all comers.

In general, the primarily self-study education system which the Society of Actuaries has relied upon in the past, and which I agree it will continue to rely upon for the majority of its new members in the foreseeable future, must be administered in a conservative way. We should not introduce changes that will work to the advantage of a small segment of students, in a competitive examination system that is open to everyone. This kind of constraint is natural and necessary when dealing with students who come to the actuarial profession with a wide variety of backgrounds and when most of the students have not, in fact, studied actuarial science in any college. The inevitable result of this constraint, however, is illustrated by the somewhat static character of the content of the early parts of our syllabus for the last twenty or so years.

In my opinion it is artificial and unnecessary to apply similar constraints to what is taught to students of actuarial science at a particular college or university. Here all the students do have the same background. If a knowledge of FORTRAN is a prerequisite for a course in numerical analysis, then all the students will have to learn FORTRAN.

My point is that applications to actuarial science of matrices, or Laplace transforms, or Bayesian probability, or any one of a number of mathematical techniques that I and others of my generation may know

only by name without a clear idea of what they mean, are most likely to be thought of first in the colleges. It seems to me that the alternate route would do much to encourage this kind of development of actuarial science. It would free a teacher to use new approaches in his class without thereby penalizing his students by making it more difficult for them to pass a traditional actuarial examination.

This incentive to diversify the basic mathematical techniques which lie at the heart of actuarial science is my main reason for favoring the alternate route. I would like to see these basic subjects taught in several different ways from several different textbooks or lecture notes. I think our profession would be richer as a result of such diversification.

There are also other reasons that lead me to favor the alternate route.

It seems to me that increased recognition by our profession of formal actuarial education can only increase, over the long run, the amount and quality of such education our students are exposed to. It may be that over a period of time the accreditation process will encourage the consolidation of actuarial training programs into relatively fewer schools, each of which would have a larger number of actuaries on the faculty than is typically the case today. Such a long-run development might prove to be to the advantage of both actuarial science and actuarial education.

For another thing, the actuarial profession now seems to be unique, both in specifying right down to the last page of study notes or textbook what a student must learn in order to enter the profession and in placing so much emphasis on learning while working—the apprenticeship approach. This resembles a phase through which other professions, such as law or medicine, have passed and have now outgrown. There would have to be some very convincing reasons why what was a necessary stage, but still only a stage, in the continuing evolution of other professions is, in fact, a suitable stopping point for us.

Finally, the alternate route, even at the outset, would have appeal to mathematics majors, or others, who do not decide to become actuaries until they have their Bachelor's degrees. They could hope for a quicker entry into the profession by taking the comprehensive examination when they get their Master's degrees than they could by writing the first five regular actuarial examinations. We have assembled statistics on recent graduates of college and university actuarial programs which strongly suggest that the alternate route can cut down considerably on the length of time it takes to become an actuary, without in any way lessening the quality of the people admitted to the profession.

I appreciate, of course, that there are problems in implementing the

alternate route. The most serious ones have to do with the possible lowering of standards for admission into the profession and the difficulties involved in accrediting schools. I would like to speak briefly about the issue of professional standards, because this is the part of the alternate route proposal that gives people the most concern.

It seems to me that the question of standards is essentially whether an alternate route consisting of accredited courses plus a comprehensive examination would bring to the profession new actuaries, either less qualified technically or less self-disciplined, hard-working, and so forth, than the traditional route. I am confident that the technical knowledge of candidates who enter the profession via the alternate route will be as good as, or better than, that of candidates who enter via the traditional route. My confidence is based on my belief in the general superiority of classroom work taught by a qualified instructor over self-study. As to the character of the candidates who come in via the alternate route, I do concede that the alternate route might attract candidates of lesser self-discipline, and so forth, than the traditional route. The alternate route, however, is proposed to be equivalent to only five examinations, while eight are required for admission to the Academy and ten for Fellowship in the Society, and this should prevent any real deterioration of standards resulting from the adoption of the alternate route.

I might say that we have done a survey of the progress through the regular actuarial examinations of graduates of schools of actuarial science. The results are that, by and large, these students have shown themselves to be more capable of passing the actuarial exams than our other students. This reinforces me in my view that if some proportion of these students is permitted to take courses in actuarial science which are not directly geared to the traditional examinations, without thereby being penalized or delayed in their entry into the actuarial profession—in other words, if some proportion of these students is permitted to follow the alternate route—no serious damage but rather some real potential good can come to the actuarial profession. The real good, as I see it, is that these students who come in via the alternate route will have had an opportunity to be exposed to different ways of looking at the foundations of actuarial science, and some of them will put these new ideas to work in their professional lives and bring them to the attention of other actuaries.

One final word about the question of standards. Right now the standards of our actuarial examinations are, I believe, remarkably high in their fairness, their objectivity, their uniformity, and in the personal characteristics, such as ambition and self-discipline, of the people they admit to the profession. On the other hand, I am somewhat concerned with the

standards of actuarial education as formulated in our syllabus. I explained a few minutes ago why it seems inevitable that the subject matter in our syllabus lags advances in actuarial science by a period of many years. Accordingly, I am willing to experiment in the direction of improving our education even at the risk of lowering examination standards, particularly when only a relatively small proportion of students is involved in this experiment and when these students are at least as capable as the others.

I want to mention briefly the comprehensive examination. Actually, those of us on the alternate route committee do not really consider the comprehensive examination to be nearly as important as the matter of accreditation. We expect students with, say, a *B* average from accredited institutions to be able to pass the comprehensive examination. We have a first draft of a comprehensive examination which is undergoing review at this time.

Finally, I view any decision to adopt the alternate route as tentative. We can try it, and, if there is a consensus that it is not working, we can abandon it. Certainly trying it will cause dislocations, and abandoning it would be even worse. But it seems to me that we need to experiment, even in the important area of education, in fact, particularly in that area because it is so important, if we are to keep the actuarial profession as vital as possible.

MR. PETER W. PLUMLEY: Julius has presented his case well for the alternate route. Certainly there is much to be said in favor of this proposal. There are, however, also some troublesome questions which need to be raised.

I think all of us would agree that it is highly desirable to encourage the colleges to play a greater role in the education of the actuary. If our profession is to continue to thrive, it must do so by attracting new members and by supplying them with the best possible actuarial education.

Let us carefully distinguish this, however, from the problem of determining whether a person is qualified to be admitted to membership in the Society of Actuaries. We and those who have preceded us have earned a justifiably high reputation. A reputation is more easily lost than regained, however. It is not sufficient to say that most actuaries have learned their skills; we must be able to say that all have. Therefore, it is only through the maintenance of uniformly high standards of admission that we are going to be able to continue to maintain our reputation.

The problem we face, then, is how to encourage increased college participation in the training of the actuary without either substantially low-

ering our standards or applying widely inconsistent standards. It is my contention that the alternate route as presently proposed is not the answer.

First let us consider the question of maintenance of uniform standards. Under the alternate route a number of colleges throughout the United States and Canada would be accredited. The passing standards presently applied in these colleges vary, both from course to course and from college to college. Julius has already stated that the comprehensive examination will not apply the severe standards normally used by the Society in its regular examination system but instead will be a relatively mild screening device designed to weed out only a relatively few students. Therefore, as a practical matter, there is apt to be considerable variation in the ability of students successfully completing the alternate route, depending on which college they attended.

This would be satisfactory if we could be reasonably confident that all these students could be as well trained in actuarial science as the average new Associate of today. A more likely result, in my opinion, is that some of them would not measure up to today's new Associate. Thus there would be a reduction in standards of admission for at least a portion of the future members of the Society.

I understand that in some foreign countries procedures similar to the alternate route have been tried with some degree of success. For example, the Institute of Actuaries in England may grant exemption for portions of its examinations to graduates of certain universities. At present, six universities in England and three in Australia so qualify. Actuarial societies in Australia and New Zealand also grant similar exemptions. However, in those countries the number of accredited schools is very limited, so the maintenance of uniform standards presents much less of a problem. By contrast, the educational system in the United States is far less uniform in its standards, and there are far more colleges involved in the educational process. Thus what works abroad will not necessarily work here.

I have talked about uniform standards; now I would like to say a few words about the somewhat related problem of maintaining sufficiently high standards. It is a fact of life that a college professor simply is not going to apply the same level of standards to his students that the Society of Actuaries applies through its system of examinations.

Even more disturbing is the fact that last spring, for many colleges, passing grades were not based on a final examination or even on a complete year's work. The prospect of further student unrest and consequent deterioration of academic discipline raises doubts in my mind as to wheth-

er now is an appropriate time for our profession to move closer to the academic community without retaining our own independent system of setting standards of admission.

We should not leave the subject of standards of admission without mentioning the quality of the examination procedures themselves. Maintenance of standards requires well-thought-out examination questions graded as competently and objectively as possible. Knowing how much time and effort we devote to setting the Society's exams, I cannot see how any college professor would be able to devote the time necessary to do as careful and impartial an examining job. I am convinced that the Education and Examination Committee, with the help of the Educational Testing Service, has a system of examinations which is superior to almost any college examination system in maintenance of standards, objectivity, quality of questions, and grading procedures.

Now let us examine a few other problems. The alternate route should not be confused with the system of delegating to the colleges the full responsibility for a professional education, such as is done today by the medical and legal professions, for example. It is generally admitted that, if the alternate route is adopted, only a portion of the students taking actuarial programs at accredited colleges will follow it. Therefore, it will still be necessary to include virtually all the material on the Society's syllabus in the course curriculum in order to avoid being unfair to those students who are planning to take the Society's exams. Thus the opportunity to modify the college curriculum may actually be no more available under the alternate route than it is today.

The application of two different standards within the same school system also could well create major problems. A poor student may pass the comprehensive exam, while a better student has somewhat less success with the Society's exams. Probably the clever student will hedge his bets by taking the Society's exams during the course of his schooling, figuring that if he does not get through Part 5 that way he can still take the comprehensive exam. It is entirely possible that a student with a succession of failures on the Society's examinations could nevertheless gain his Associateship by passing the comprehensive exam. It seems to me that this is a very undesirable situation.

We should also be careful not to fall into the trap of adopting procedures just because others appear to be using them. Because of their size, the medical and legal professions have no choice but to rely on the colleges for the basic education of doctors and lawyers. By contrast, we are fortunate in having a small enough profession that we can control our ad-

mission standards through our own examination system. I expect that these other professions would be delighted to be able to exert the same control.

Julius has stated that the actuarial syllabus tends to lag behind the latest thinking in some of our mathematical fields. This may be true, and one reason may be, as he says, the need to be fair to everyone taking a given exam. Another constraint, however, is the lack of good study material. In some cases we have had to wait for a number of years before we could eliminate an outdated text because there was nothing better to replace it. I do not see how this situation will be helped through the use of an alternate route. Either better study material is available or it is not. If a college has access to it, the Society should also.

I am also concerned about the effect of the alternate route on the education and examination effort of the Society. The Society's Education and Examination Committee devotes thousands of hours per year of volunteer labor in maintaining the present system. It is a remarkably well-run system, considering the nature of the constraints under which it operates. Yet the process of accreditation, co-ordination of the two routes, and administration of the comprehensive examination could cause a serious drain on the time of the Education and Examination Committee. To do this without accomplishing enough to make it worthwhile would be a serious mistake. Yet it is my understanding that even the proponents of the alternate route do not expect any large increase in the number of new Associates because of it.

Finally, we should consider whether we might be doing a disservice to those seeking an actuarial career but not capable of passing the Society's examinations. At present, these persons usually are quickly eliminated at the Part 1 or Part 2 level, before they have devoted too much of their careers to actuarial studies. They are then free to pursue other careers for which they are better suited. If they were to choose the alternate route, however, it could be several years before they really became aware of their own inabilities.

As I said earlier, I agree completely that colleges should be encouraged to participate in our educational process. I think, however, that there are other ways to accomplish this. For example, additional use might be made of college actuarial professors as consultants to the Education and Examination Committee, possibly by giving them more responsibility for preparation of text materials. Also, colleges could play a major role in the activities of the new Committee on Continuing Education, perhaps including conferences and seminars using their facilities. Finally, additional

financial assistance might be given by the Society or by the insurance industry to promising actuarial students or perhaps directly to colleges to encourage their actuarial programs.

To summarize, the proponents of the alternate route have a most commendable purpose in mind, one which deserves the careful consideration of every one of us. In giving it our consideration, however, we should keep in mind the need to proceed carefully. Our reputation for excellence has been earned over the years through our widely known strict requirements for admission. We must be sure we do not give away too much and get too little in return.

MR. JAMES C. HICKMAN: Each culture and each subculture devote a considerable part of their community efforts toward the development and maintenance of a system for reproducing the culture. This is quite natural, for it is perfectly obvious that any group that does not provide for a flow of entrants, and for the education of these entrants in the skills and values of the group, is headed toward extinction. Because most members of nontrivial groups have devoted part of their time to the development, application, and transmission of the skills and values that characterize the group, they tend rather naturally to be conservative in judging proposals for modifying their group's reproduction system. Therefore, those favoring proposals for modifying a cultural reproduction system must bear the burden of proving its superiority over the existing system, for such proposals carry with them the possibility of creating fundamental changes in the characteristics of the group.

For example, in both primitive and modern cultures questions concerning family organization and public education have been considered by the people to be of vital importance. Because such questions intersect with delicate and sometimes emotional topics, they may be constructively discussed only within a framework of mutual confidence and good humor. These high standards of tolerance can be only slightly relaxed when the topic under discussion is the actuarial education and examination system. Those who have persisted to the attainment of Fellowship in one of the great professional actuarial organizations may argue about the degree of relevance, adequacy, and arbitrariness of their course of study, but they share a common view that the actuarial education and examination process was one of the climactic experiences in each of their lives. In addition, a remarkably high proportion of the Fellows of the principal actuarial organizations have devoted a significant segment of their professional lives to recruiting and educating new actuaries. Because of

the intensity of the beliefs generated by the long-term and intensive involvement of most actuaries with the education and examination system, it takes a rather singular commitment to objectivity to carry on a dispassionate review of the merits and demerits of any major revision of the system. This is just the sort of commitment that we are asking you to make in your study of the alternate route proposal.

Before I turn to some of the points that I believe support the proposal for an alternate and more academic route to qualification as an actuary, there are some preliminary points that I want to attempt to establish. First, I hope that it is agreed that the objective of actuarial education is not the passing of actuarial examinations. To define examination success as the goal of actuarial education would be to produce a tautology; it would lead to no new insights. Society will not judge our profession with respect to our success in training students to pass a set of examinations that we propose ourselves. The alternate route, with its de-emphasis on examinations and its stress on general education, would not merit further consideration if we judge educational programs solely with respect to some particular set of examinations. If, however, we adopt as the goal of the actuarial reproduction system the education of new entrants into the profession so that they can use actuarial science to create and manage insurance plans for solving real world social and economic problems and incorporate new ideas and methods into actuarial theory, the alternate route proposal may be judged in a different and more appropriate frame of reference.

Earlier I spoke with approbation of the principle that those in favor of changing any ongoing system must bear the burden of proving the superiority of the proposed new system. In actuarial terms, one does not attach equal credibility to the collected wisdom of the ages and every possible hairbrained alternative. When I first tried to apply this conservative principle to the issue of the alternate route versus the existing actuarial education system, I concluded that the proponents of the alternate route must bear the burden of proof. However, upon second thought, it became much less clear upon whom the burden of proof should descend. The professions associated with medicine, law, dentistry, pharmacy, engineering, and theology have all tended to concentrate their professional education and qualification activities within the colleges and universities. (I could add to this list the "professions" built around football and basketball, but my academic colleagues might drum me out of the teaching fraternity for raising the issue.) Therefore, perhaps some part of the burden of proof should be carried by those who favor a continuation of the

present system. In accepting this burden, they would be required to demonstrate some singular aspect of actuarial science that makes it unique with respect to the professions that have been named.

It seems that the relatively small size of the actuarial profession and the fact that the fundamentals of actuarial science have been taught and extended in only a few universities are two candidates for these unique characteristics. It would appear, however, that in the 1970's each of these characteristics will be of diminishing importance as the profession expands and its interactions with the academic community multiply.

Perhaps in the past we have overemphasized the unique aspects of actuarial science to the detriment of possible enrichment that might be derived by closer contact with the education programs that are used in accounting, statistics, and business management. For an example, I will draw on my personal experience. What little I know about cost accounting and expense analysis I learned within the education system of the Society of Actuaries. It has often occurred to me that perhaps cost-accounting techniques developed for other industries might be built on principles that would deepen my understanding of insurance-accounting problems. Those who are apprehensive about the alternate route because of the possible deleterious effect of concentrating the training of some actuarial students in the hands of a few professors may be underestimating the importance to actuaries of general education in applied mathematics, statistics, accounting, finance, and the social sciences.

The principal idea that I want to develop within my allotted time concerns the relationship between actuarial education and actuarial innovation. My argument will rest on two points. The first is the proposition that, to remain a profession, a group cannot be content with simply elaborating and transmitting an existing body of theory and its applications to the next generation. Rather, borrowing Peter Drucker's colorful phrase, in an age of discontinuity a profession must strive to harness new ideas and new technologies to the solution of problems which society perceives to be real and pressing if it is to attract talented new members and if it is to earn public esteem. The second point in my development is that any educational system which is tied closely to a particular set of examinations, or a narrow definition of what constitutes the body of theory applied by the profession, is unlikely in this age to attract the talented new entrants that are essential for a profession's continued vitality.

To a generation of actuaries who have lived through the computer revolution, it does not seem necessary to document the fact that our age, at least when compared to earlier ages, is marked by extremely rapid change. One of the new thrusts of the Society of Actuaries is in the direction of

continuing education with the objective of assisting actuaries keep up to date on the flood of new developments that influence their professional lives.

I would like to jog your memories by listing some of the intellectual developments originating in the post–World War II period which may have a considerable impact on actuarial science:

1. In 1954, L. J. Savage's book *The Foundations of Statistics* was published. This book, which was built on foundations laid by deFinetti, Ramsey, von Neumann, and Morgenstern, and many others, provided the intellectual foundation for the development and subsequent popularization of Bayesian decision theory. This theory has had a profound impact on the application of statistics in practical affairs, and it has not left actuarial science untouched. Bayesian decision theory has resulted in significant new insights in graduation, credibility, experience-rating techniques and price-adjustment systems in general. Perhaps it is unrealistic to expect each young actuary to become familiar with the great schools of statistical thought. Yet it would seem to be undesirable to enforce, through a single education system, an official actuarial view on this matter.

2. In 1952, Markowitz published his first pioneering paper on investment portfolio selection. This paper has provided a framework within which much of the research on investments has been carried out for almost two decades. It seems perfectly obvious that fundamental research on investment management should have implications on the financial schemes developed and managed by actuaries.

3. In 1963–64, the massive Bohman-Esscher report provided for the first time some extensive numerical evidence of the accuracy of the various approximate solutions to the distribution problem in risk theory. The technical details of mathematical risk theory may not be of interest to all actuaries, yet can we afford not to encourage and reward some students for mastering this material?

Julius has already explained why a set of uniform examinations, used throughout a continent, must lag somewhat behind the front line of new technical developments. Those in favor of the alternate route would assert that this lag in the actuarial education system increasingly frustrates talented students and threatens the intellectual vitality of the profession.

The society that North American actuaries serve has changed at a rate which is in some sense commensurate with the rate of intellectual innovation; the education of actuaries cannot remain immune to these changes. Two illustrations which will at least hint at the magnitude of the changes in the social arena where actuaries operate will be listed:

1. The post–World War II years have seen a massive expansion of central government programs to mitigate against the financial consequences of misfortune or imprudence.

2. It now seems to be a political axiom that central governments have a responsibility to smooth the fluctuations in economic activity by a mix of monetary and fiscal policies and that this smoothing objective is to take precedence over price stability. One simply cannot perform responsible actuarial work in the current age without being acutely aware of this public decision.

To enforce among students, through the current fixed examination system, a deep understanding of these trends and their actuarial implications is very difficult. Perhaps the alternate route, through its accreditation standards, can encourage and reward the acquisition of such knowledge.

The purpose of this diversion into a superficial review of recent intellectual and economic history was to establish the fact that, to remain where the action is, actuaries cannot simply continue to apply the techniques of classical actuarial science. For one thing, there now may be more efficient methods for solving old problems and, for a second, the old problems may no longer be problems.

I vividly recall my indignant reply to those who asked me a decade ago if the advent of electronic digital computers had reduced the need for actuaries. Yet the question perhaps was not as poor as my heated reply may have indicated. For, when computation suddenly became one million times faster and ten thousand times cheaper, the economic value of skill with arithmetic and the desk calculator and with some actuarial approximation suddenly dropped. There of course remained a vast area of actuarial science and actuarial judgment which was only indirectly influenced by the computer. In addition, the efficient application of the computer to insurance administration and research requires a high degree of actuarial competence. Yet the question does lead to a significant insight.

Once a theory is complete, once it has been reduced to a set of formulas and routine operating rules, the application of the theory is naturally turned over to nonprofessional personnel for very sound economic reasons. If ingenuity, judgment, and the creation of new theory are not required to solve a problem, there is no justifiable reason for employing a highly educated professional in the solution process. Routine work can, in this age, be turned over to a machine, for example, electrical engineering developed to solve problems involved in the generation and transmission of electrical power. The solution of many of these problems has now been routinized, and much of electrical engineering education and practice is now concerned with problems in electronics and communications. Although I am well aware of the dangers of reasoning from analogy, it does seem that our system for producing actuaries must attract some

who will be willing to experiment with innovative ideas and we must educate them to be vigorous in their exploration of new fields of knowledge.

I turn now to my second supporting point, namely, that an education system which is tied closely to a set of formal examinations over sharply defined subjects is not necessarily the optimum method for attracting the type of innovative new entrants that the profession requires. I shall also claim that the force of this point is increasing as more and more workers become knowledge workers. The demand for creative thinkers has increased from fields such as science that have always sought such people, but now it comes also from fields which in the past have not sought knowledge workers.

Obviously this is a much more difficult point to establish than my first. Even if I succeed in supporting the point, in general there will remain a gap which may be bridged only by assuming that the experience of actuarial science will not differ markedly from that of similar technical professions.

In supporting this point, I can do no better than to quote from C. P. Snow's delightful essay on G. H. Hardy, the great English mathematician:

> The second minor upset of his undergraduate years was professional. Almost since the time of Newton, and all through the nineteenth century, Cambridge had been dominated by the examination for the old Mathematical Tripos. The English have always had more faith in competitive examinations than any other people (except perhaps the Imperial Chinese): they have conducted these examinations with traditional justice: but they have often shown remarkable woodenness in deciding what the examinations should be like. It was an examination in which the questions were usually of considerable mechanical difficulty—but unfortunately did not give any opportunity for the candidate to show mathematical imagination or insight or any quality that a creative mathematician needs.
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> It was all very English. It had only one disadvantage, as Hardy pointed out with his polemic clarity, as soon as he had become an eminent mathematician and was engaged, together with his tough ally Littlewood, in getting the system abolished: It had effectively ruined serious mathematics in England for a hundred years.[1]

In my view the case for the alternate route rests on the proposition that in an age of rapid change any loss of standardization incurred by opening an alternate route will more than be balanced by the benefits accruing from entrants with fresh and innovative approaches to actuarial

[1] C. P. Snow, *Variety of Men* (New York: Charles Scribner's Sons), 1967.

science. I also claim that, by using the twin controls provided by accreditation standards and the comprehensive examination, the alternate route may be adopted without creating lower intellectual standards within the actuarial profession. Statistics collected on graduates of existing collegiate programs of actuarial science seem to support this claim.

MR. STEPHEN G. KELLISON: I am appearing today to present some of the arguments against the alternate route. I am afraid that this is a role in which most other actuarial professors would feel uncomfortable. I can assure you, however, that I am quite pleased to be able to participate on this panel in this capacity.

Pete has given you some arguments against the alternate route from the viewpoint of a practicing actuary in industry who has been active in the education and examination effort of the Society of Actuaries. I would like to present some arguments against the alternate route from the viewpoint of an actuary engaged in teaching actuarial science at a university.

I have broken down my arguments against the alternate route into six broad areas.

The first argument involves the question of maintaining professional standards which are both *high* and *uniform*. Even though this point is of great importance, I will discuss it only briefly, since Pete has already discussed it in detail.

There is no question that standards on actuarial examinations are higher than standards in college course work. Most students who are successful on Society examinations devote substantial effort above and beyond that required in college courses. This additional effort, resulting in a deeper understanding of the subject material, would undoubtedly diminish under the alternate route. Furthermore, university administrators and even faculties are not always as dedicated to the attainment and maintenance of high professional standards as most of you would presume.

It has been my experience that the standards maintained by the present system are not unattractive to students. Many of my students have informed me that they were originally attracted to the profession because of the challenge of the examinations coupled with completely uniform, objective standards.

The second argument relates to one of the points raised by the proponents of the alternate route, namely, that it would help free our universities from the rigidity of the present system and would introduce greater flexibility into actuarial education. Actually, the present system has not really been that unresponsive to change. For example, in less than three years we have seen new textbooks in compound interest, life contingen-

cies, and demography; matrix algebra has been added to Part 1; numerical analysis has replaced finite differences on Part 3; risk theory has been added to Part 5; and sources and characteristics has been greatly de-emphasized on Part 5. This rather remarkable record in a short period of time indicates that the current system is not becoming dated and is striving to be relevant to what a modern actuarial education should be.

The current Education and Examination Committee of the Society makes every attempt to keep the syllabus up to date. For example, in 1968 a committee was formed to review the mathematical content of the examinations. The work of this committee was greatly influenced by comments solicited from actuarial professors and directly led to several of the improvements in the syllabus just noted. Hopefully, the Education and Examination Committee will continue to be as responsive to changing conditions as it has been in the past few years.

Finally, if the alternate route is adopted, there will be an incentive for actuarial programs to gear themselves to the material to be covered on the comprehensive examination. Thus, in effect, we will wind up substituting a new rigidity for an old rigidity.

The third argument is that the alternate route may not appeal to any significant number of students. In discussing the alternate route with the students in my classes, I have found few, if any, who would prefer the alternate route to the present system. Most of them recoiled in horror at the thought of writing an examination at one point in time that covered as much material as our present Associateship examinations. Most students showed a marked preference for writing examinations one at a time, just after completing course work related to that examination, rather than waiting until they had completed their entire program and then taking an all-or-nothing gamble on the comprehensive examination. Incidentally, my colleagues in the Psychology Department inform me that, in general, a series of examinations at periodic intervals is superior to one giant examination at the end of a college career. Among the students I interviewed, the alternate route would generate substantial interest only if the comprehensive examination were substantially easier to pass than the present Associateship examinations.

The fourth argument against the alternate route is that there is an extreme shortage of actuarial programs and professors in North America, particularly in the United States. I question whether we have enough educational facilities at universities to handle effectively any significant transfer of the education and examination effort from the profession to the universities, either at the present time or in the near future.

Any lack of innovative approaches to actuarial science at universities,

as alleged by the proponents of the alternate route, is more attributable to this extreme shortage of qualified actuarial programs and professors than it is to our present examination system for admitting new entrants. Furthermore, the alternate route will have little effect in encouraging more qualified actuaries to enter teaching.

In most actuarial programs one or two individual professors can often largely determine who does or does not get the necessary marks in course work and the degree required for the alternate route. This is placing a significant amount of power in the hands of one or two persons, since the result is going to be used for something as important as a student's qualifying for professional standing.

Moreover, it appears to be assumed in most of the discussions to date that these same professors would be intimately involved in the setting and grading of questions on the comprehensive examination. I question whether this is desirable in view of our intent to maintain the comprehensive examination for objective, uniform standards. The Society has always recognized this problem and not allowed professors to serve on an examination committee which covered material they were teaching. I believe this has been a sound policy.

In teaching, I naturally develop a close rapport with my students. Frankly, I would question my own ability to be completely objective in giving grades which would affect a student's qualifying as an actuary. Moreover, I feel that adoption of the alternate route would impair my effectiveness as a teacher because of the pressure created by the importance of these grades. I would much prefer to have students qualify on the basis of examinations taken anonymously, as is currently done. I would not like to see the actuarial profession create the possibility of a moral problem for its professors.

The fifth area of my concern involves the impact that the alternate route would have on the universities. The proponents have stated that the alternate route would strengthen university programs, and this is probably true for the larger, well-established programs. It could, however, easily prove to have adverse effects on the newer or smaller programs.

One such effect would be to discourage the formation of new actuarial programs. It would be difficult to start a new program on a small scale and then attempt to develop it. Being unaccredited for several years would be a major handicap. In fact, accreditation might also jeopardize certain programs already in existence. Universities do not like unaccredited programs, since they give the entire institution a black eye. Faced with the choice between an unaccredited program and no program, many uni-

versity administrators pressed for funds might opt for no program.

It is not always a simple matter to get an unaccredited program accredited; it may take dollars. The dollars may not be easy to come by, however. Because of widespread taxpayer dissatisfaction with increasing taxloads and the unrest on our campuses characterized by demonstrations and student strikes, universities are fast entering a period of much more stringent budgeting than in the immediate past.

I am less optimistic than the proponents that we will be able effectively to accredit actuarial programs. Accreditation can shed some light on the background of the faculty, library facilities, computing facilities, and so forth; but it sheds very little light on what is happening in the classroom and in the students' minds. The problems involved in accrediting actuarial programs are particularly severe because of the extremely small size of the faculties.

If we have stringent accreditation guidelines, we will run the risk of adversely affecting our newer and smaller programs. If we have lax accreditation guidelines, we will run the risk of a substantial lowering of standards. I suggest that we might better spend our time and effort improving our procedures for evaluating new entrants into our profession on an individual basis rather than attempting to evaluate university programs. In other words, we should evaluate the result instead of the process.

The sixth and final argument is a counterargument to the concept that the alternate route is a natural evolution which would have the actuarial profession follow the same pattern other professions have followed. It is true that most other professions do provide for training and qualification through the university system. In considering this argument more deeply, however, there are several factors which should be kept in mind.

First of all, most other professions do not have an *alternate* route; university training is the *only* route. This splintering of ways to enter a profession leading to a duplication of effort and a double standard is not typical.

Second, most other professions have never had an examination system outside the universities which would even approach in caliber the present system for actuarial science. Thus the need to utilize the universities for other professions was more pressing.

Third, as previously mentioned, the number of actuaries actively engaged in teaching is very small. This creates unique problems for our profession which are not present for the larger professions with much more extensive university facilities. Not only does it create a problem for indi-

vidual professors in objectively evaluating a student's performance, but it creates a problem in evaluating a university's accreditation every time there is a change of even one person on the faculty.

Fourth, it is important to note that in some other professions, such as law, a significant transfer to the universities was effected *after* the development of relatively large university facilities and not *before*.

In closing, I would like to say that I sympathize with some of the motivation lying behind the alternate route as it relates to actuarial education. There are several areas, however, in which universities could play an increased role in actuarial education, without creating the serious problems associated with the alternate route. For example, Pete has listed several constructive proposals which deserve active consideration.

We should keep clearly in mind that actuarial education and the giving of actuarial examinations are two different things. Every profession needs to make a determination concerning which individuals it will admit to membership and which it will not. No system of doing this is perfect. Although not perfect, a system of objective, uniform examinations which are graded anonymously is, I feel, an effective means of making this determination for a profession such as ours characterized by small numbers and high entrance requirements.

MR. L. BLAKE FEWSTER: The previous speakers have thoroughly covered the concept of the alternate route and presented the various arguments for and against the proposal. At the moment I am enjoying the luxury of not becoming involved in these arguments. Instead, I would like to present some facts concerning new actuarial recruits in Canada and the United States during the past five years and from these facts make some observations concerning the relative application of the alternate route in Canada and the United States.

In Canada, because of the smaller numbers, there are the advantages of a more homogeneous group of actuaries than in the United States from the standpoint of educational qualification. A survey conducted during the past few weeks shows that 31 employers in Canada have hired 227 recruits during the past five years and these recruits have come from 32 different schools. A similar survey shows that 58 employers in the United States have hired 1,004 recruits during the same period and these recruits in the United States come from 321 schools. Note that there are $4\frac{1}{2}$ times as many recruits in the United States but 10 times as many schools involved.

A further fact is that, if we look only at schools which have produced ten or more recruits during the last five years, there are 8 such schools in

Canada, and these have produced 183 or about 80 per cent of the total actuarial recruits in Canada during this five-year period. In the United States there are 23 such schools, and these have produced 392 or about 40 per cent of the total actuarial recruits in the United States during this period. This leaves about 300 schools to produce the remaining 600 recruits in the United States.

TABLE 1

SURVEY OF ACTUARIAL RECRUITS AMONG EMPLOYERS

YEAR OF GRADUATION	NUMBER OF SOCIETY EXAMINATIONS COMPLETED AT DATE OF EMPLOYMENT*									
	0	1	2	3	4	5	6	7	8	Total
	A. Total of 31 Employers in Canada—227 Recruits from 32 Schools									
1966...	7	6	8	15	6	.....	.....	.....	.....	42
1967...	5	6	12	6	4	.....	.....	.....	.....	33
1968...	10	1	17	7	8	3	.....	.....	.....	46
1969...	8	13	15	14	6	.....	1	1	.....	58
1970...	7	9	13	8	7	2	.....	2	.....	48
Total	37	35	65	50	31	5	1	3	.....	227
	B. Total of 58 Employers in the United States—1,004 Recruits from 321 Schools									
1966...	32	33	34	9	4	2	2	.....	1	117
1967...	50	50	20	16	2	2	.....	.....	.....	140
1968...	77	64	40	13	8	3	1	.....	.....	206
1969...	114	79	44	28	10	2	1	.....	.....	278
1970...	99	89	50	16	6	2	1	.....	.....	263
Total	372	315	188	82	30	11	5	.....	1	1,004

* For purposes of this survey, the situation at the first position of full-time employment was considered. Examinations sat for and completed around the time of employment were included.

Tables 1–3 summarize the results of the recent survey. Each table contains yearly breakdowns of the actuarial recruits by the number of Society examinations completed at the date of first employment.

Table 1 shows all recruits divided into those of Canadian and of United States employers. Table 1A is a consolidation of the figures in Table 1 to indicate the relative standing of examination success as of the date of first employment.

The average number of examinations completed at date of first employment is 2.16 in Canada and 1.15 in the United States.

TABLE 1A

Exams Completed at Date of First Employment	Number of Recruits		Per Cent of Recruits	
	In Canada	In United States	In Canada	In United States
4 or more	40	47	17.6	4.7
3 or more	90	129	39.6	12.8
2 or more	155	317	68.3	31.6
1 or more	190	632	83.7	62.9
0 or more	227	1,004	100.0	100.0

TABLE 2

SURVEY OF ACTUARIAL RECRUITS FROM CANADIAN AND UNITED STATES SCHOOLS

Year of Graduation	Number of Society Examinations Completed at Date of Employment*									
	0	1	2	3	4	5	6	7	8	Total
	A. Total of 231 Recruits from 21 Canadian Schools									
1966	7	7	11	15	6	.....	.....	.....	.....	46
1967	5	5	12	6	3	.....	.....	.....	.....	31
1968	7	1	19	7	8	3	.....	.....	.....	45
1969	7	11	17	16	7	.....	2	1	.....	61
1970	6	9	14	8	7	2	.....	2	.....	48
Total	32	33	73	52	31	5	2	3	.....	231
	B. Total of 986 Recruits from 310 United States Schools									
1966	32	32	31	9	4	2	2	.....	1	113
1967	49	50	20	16	3	1	.....	.....	.....	139
1968	77	64	38	12	8	3	1	.....	.....	203
1969	114	79	42	26	9	1	.....	.....	.....	271
1970	98	88	49	16	6	2	1	.....	.....	260
Total	370	313	180	79	30	9	4	.....	1	986

* For purposes of this survey, the situation at the first position of full-time employment was considered. Examinations sat for and completed around the time of employment were included.

Table 2 has the recruits broken down into those from Canadian schools and those from United States schools. The total recruits analyzed in Table 2 are 14 less than those in Table 1, since Table 1 includes 14 recruits from schools outside North America. Table 2 demonstrates a similar pattern of examination success as of the date of first employment to that of Table 1, as Table 2A illustrates.

Table 3 contains a breakdown of recruits of those schools listed in the September, 1968, edition of *The Actuary* as offering actuarial science courses, and Table 3A demonstrates the pattern of examination success as of the date of first employment.

TABLE 2A

Exams Completed at Date of First Employment	Number of Recruits		Per Cent of Recruits	
	From Canadian Schools	From United States Schools	From Canadian Schools	From United States Schools
4 or more	41	44	17.7	4.5
3 or more	93	123	40.3	12.5
2 or more	166	303	71.9	30.7
1 or more	199	616	86.1	62.5
0 or more	231	986	100.0	100.0

Note that there is much similarity in results from these selected actuarial schools, with the average number of examinations completed at date of first employment being 2.47 for the 7 Canadian schools and 2.30 for the 14 United States schools. These 7 Canadian schools do, however, fulfill a much larger percentage of recruit requirements in Canada than do the 14 United States schools in the United States.

Certain conclusions might be drawn from these statistics, although some caution is necessary. The survey does not include every actuarial recruit in Canada and the United States during the past five years, but I do think it indicates the over-all pattern.

If we are optimistic, we might expect that those who have completed at least three examinations at the date of graduation would complete Parts 4 and 5 within a year or so of graduation. Or, if the alternate route were in existence and we assumed that people similar to those who now have completed three of the Society's examinations at the date of employment would qualify under the alternate route, then in Canada the alternate route might produce 40 per cent of the necessary recruits but in the United States only 13 per cent. With proper publicity and support for

TABLE 3

SURVEY OF ACTUARIAL RECRUITS FROM SCHOOLS OFFERING ACTUARIAL SCIENCE COURSES*

YEAR OF GRADUATION	NUMBER OF SOCIETY EXAMINATIONS COMPLETED AT DATE OF EMPLOYMENT†									
	0	1	2	3	4	5	6	7	8	Total
	A. Total of 178 Recruits from 7 Canadian Schools									
1966	4	4	8	15	6	.....	.....	.....	.....	37
1967	2	2	9	4	3	.....	.....	.....	.....	20
1968	6	1	13	6	8	3	.....	.....	.....	37
1969	5	8	9	15	7	.....	2	1	.....	47
1970	2	8	11	6	6	2	.....	2	.....	37
Total	19	23	50	46	30	5	2	3	.....	178
	B. Total of 201 Recruits from 14 United States Schools									
1966	4	3	12	5	4	2	1	.....	1	32
1967	2	3	8	7	3	.....	.....	.....	.....	23
1968	.....	9	11	8	7	2	1	.....	.....	38
1969	9	8	13	16	7	1	.....	.....	.....	54
1970	6	12	16	13	5	1	1	.....	.....	54
Total	21	35	60	49	26	6	3	.....	1	201

* As listed in *The Actuary*, September, 1968.

† For purposes of this survey, the situation at the first position of full-time employment was considered. Examinations sat for and completed around the time of employment were included.

TABLE 3A

EXAMS COMPLETED AT DATE OF FIRST EMPLOYMENT	NUMBER OF RECRUITS		PER CENT OF RECRUITS	
	From 7 Canadian Schools	From 14 United States Schools	From 7 Canadian Schools	From 14 United States Schools
4 or more	40	36	22.5	17.0
3 or more	86	85	48.3	42.3
2 or more	136	145	76.4	72.1
1 or more	159	180	89.3	89.6
0 or more	178	201	100.0	100.0

the actuarial schools referred to and with their fairly wide geographical distribution, perhaps an even larger percentage of actuarial trainees would pursue the alternate route in either country. The survey being conducted by the Academy committee to determine success patterns in later examinations will shed further light here. Even so, problems of accreditation would exist, and these problems would be more severe in the United States than they would in Canada.

Let me hasten to add also that, as is true in the United States, the alternate route would not produce sufficient recruits in Canada. For some time yet a large number of trainees would need to follow the traditional route—some graduates from schools not accredited and some graduates from accredited schools whose grades were below the required standard. Nevertheless, we might expect increasing pressure in Canada for some type of accreditation for perhaps just the first three parts and without the comprehensive examination, which some feel serves little purpose. Accreditation for Parts 4 and 5 may also be desired, but, as has already been suggested by other speakers, the existence of the proposed alternate route would require, both in Canada and in the United States, a heavier commitment of fully qualified actuaries to our educational institutions.

Let us compare membership requirements in the American Academy of Actuaries and the Canadian Institute of Actuaries. Full membership in the Academy requires the further passing of the equivalent of three more Society examinations beyond the Part 5 level. In other words, a considerable examination effort would be required beyond the alternate route level. Full membership in the Canadian Institute of Actuaries will, in the future, require complete Fellowship standing by examination, so that if the alternate route existed, candidates would face an even larger examination effort to become members of the Institute than would be required for Academy membership.

As for actuarial education in university, in Canada the majority of this is concentrated at the undergraduate level. Some Canadians feel that too much emphasis in university on specific actuarial courses at the undergraduate level will produce technicians rather than persons with a well-rounded education. In the United States there is more of a tendency to deal with university actuarial education at the graduate level.

Another comment about the alternate route equally applicable to Canada and the United States is that success in the early examinations at the undergraduate level is often a guide in recruiting new employees. The existence of the alternate route would require new tactics by both employers and their prospective employees.

Finally, as a Canadian, I would like to make a brief comment about

the Society's education and examination system, whatever it may be in the future. At the moment, about 20 per cent of the Society's members are Canadian residents. Further, about 80 per cent of the members of the Canadian Institute of Actuaries attained their actuarial qualifications through the Society's examination system. All this is to demonstrate that Canadians have an interest in the alternate route discussions and will be concerned with any action taken by the Society. Canadians enjoy the privilege of sharing in the Society's education and examination system and have relied heavily on it, and, while there are some members of the Canadian Institute of Actuaries who would have us set up our own complete examination system in Canada, there appears to be no need for such an extreme move at the present time.

The alternate route would have different implications in Canada than it would in the United States, but the difference is mainly a matter of degree rather than of principle. In the end, we all want to keep improving our education and examination methods. Within the Society, members from both Canada and the United States must work together for this purpose, and, within the profession, members of all the actuarial organizations in North America must share in and benefit from these discussions.