THE SUPPLY OF ACTUARIES

A. Is the shortage of actuaries a problem, the solution of which is the responsibility of the Society alone, the insurance companies and consultants alone, or a joint responsibility?
B. What steps have been taken or can be taken to develop actuarial courses in the colleges and universities? Should a list of such courses be given in the Society's *Year Book?*
C. Is the shortage of qualified teachers in actuarial subjects a substantial factor? Have any steps been taken in this connection? What further steps can be taken?
D. What ties have been or can be developed between the Society or local actuaries' clubs and the universities and colleges to extend the field from which actuarial students can be drawn?

New York Regional Meeting

MR. WILLIAM S. YORK reported on the results of a survey conducted by the Committee to Review Membership Requirements. In the spring of 1958, questionnaires concerning the demand for services of actuaries were sent to companies employing members of the Society, as well as to other companies with at least $20 million of insurance in force, and to consulting actuaries and governmental agencies. Information was requested as to immediate needs for Fellows and Associates, and as to estimated needs five and ten years later. Supplementary information was requested on the range of compensation considered suitable.

The results, as shown in the accompanying table, clearly indicate a need to increase substantially membership in the Society. The present number of Fellows is about 200 short of current needs. At the present annual rate of increase, the number of Fellows at the end of ten years would be about 1,500, which would be at least 500 short of the number needed. The survey also indicated that there are 200 to 300 nonmembers of the Society who handle actuarial duties in companies which do not employ members of the Society full time.

An analysis of the salary data showed that salaries paid to actuaries who have been Fellows for more than seven years compare favorably with estimated average earnings in other professions. In comparing earnings of physicians, dentists and lawyers with actuarial salaries, company contributions to employee benefit plans must be kept in mind.

Mr. York presented figures showing the number of first-level degrees earned in the United States by field of activity. The figures suggest that students majoring in mathematics will probably not provide a sufficient source of potential actuaries.

MR. JOHN C. MAYNARD pointed out that between 1949 and 1959 the number of Fellows had increased at an annual rate of 5%. While there are not enough actuaries, he felt that encouraging progress had been made. With the growing enrollment at universities, it should not be difficult to maintain a healthy rate of growth. He considered the responsibility for increasing the supply of actuaries a joint one. One way of sharing it would be for actuaries to make plans and take an active part in carrying them out, and for insurance companies and consultants to assist with their financing.

Since the membership of the Society could double in the next fifteen years, the time may come when some change in the organization of the

NUMBER OF MEMBERS BY FIELD OF ACTIVITY

FIELD	ACTUAL MEMBERSHIP				ESTIMATED MEMBERSHIP NEEDED (INCL. PRESENT STAFF)†					
	In 1956*		In 1958		Immediately		In 1963		In 1968	
	Fellows	Assoc.	Fellows	Assoc.	Fellows	Assoc.	Fellows	Assoc.	Fellows	Assoc.
180 Life Companies employing members of Society and replying to questionnaire 1958	727	544	753	482	883	604	1,184	948	1,523	1,332
Consulting Actuaries	83	83	78	86	97	115	151	196	197	270
National Government	5	8	5	8	31	21	46	32	63	38
State, Provincial and Local Government and Dominion of Canada	12	12	14	14	20	31	29	48	34	57
236 Life Companies which do *not* employ members of Society, replying to questionnaire 1958	0	0	0	0	13	25	58	120	160	254
Subtotal	827	647	850	590	1,044	796	1,468	1,344	1,977	1,951
Retired	44	19	45‡	20‡	45	20	80	35	121	54
Miscellaneous	19	18	21‡	19‡	21	19	36	35	54	54
Nonquestioned Companies, no replies, etc.	§	§	62‡	136‡	74	178	104	303	140	444
Total Members	890	684	978	765	1,184	1,013	1,688	1,717	2,292	2,503

* 1956 numbers from another survey.

† Numbers through subtotals are from questionnaires; the rest are estimated.

‡ Estimated distribution of number needed to balance to total number of members.

§ Included above.

Society might be necessary. Mr. Maynard suggested that a central organization might continue for examinations and experience studies, but that permanent regional organizations might administer meetings and publication of material.

Concerning sections B and C, Mr. Maynard felt that the lack of actuarial courses or of qualified teachers had not been a serious problem in Canada.

Speaking on section D, Mr. Maynard described the activities of the Committee for the Promotion of Mathematical Careers of the Canadian Association of Actuaries. The Committee decided that the most promising area to work in was the secondary schools. Its activities have been along three main lines: (1) gathering material for discussions at schools; (2) giving talks at schools; (3) promotion of the mathematics contest sponsored by the Society of Actuaries and the Mathematical Association of America.

The contest has evoked a good deal of publicity and interest, and the response to it has been very encouraging. In 1959, 210 schools entered and approximately 3,200 students wrote the examination. All of the secondary schools in the Province of Ontario were invited to participate. As an experiment, it is planned to invite the 40 leading students in Ontario for a one-day visit to the University of Toronto. They will see various activities involving the use of mathematics and will be accommodated in the homes of actuaries. Mr. Maynard said that contests, visits, and discussions are also being carried on in other parts of Canada. While it is too early to assess the value of these efforts, the increase in enrollments in mathematics courses at the Universities of Toronto and Manitoba is encouraging.

MR. ROBERT P. COATES stressed that insurance companies, consultants and the Society are all concerned with the future supply of actuaries. Therefore, each should share in the responsibility for dealing with the problem. A chronic shortage would adversely affect the operations of companies and consultants, and would increase the likelihood of unqualified persons entering the field.

Mr. Coates questioned the value of encouraging large numbers of colleges to add actuarial courses. College standards differ widely, and it would do more harm than good to encourage mediocre candidates to enter the actuarial profession, only to fail the Society's examinations.

It is important to maintain strict standards of qualification for membership in the Society. There is a need for men fully qualified to assume the combination of professional, business and personal responsibilities

required by today's pressing problems. Little would be gained by securing an increased number of actuaries through a significant lowering of standards.

Mr. Coates felt that a continued effort to make the occupation of actuary known to qualified students offers the best hope of a sound long-run solution. These efforts should not be restricted to those who are taking actuarial courses or majoring in mathematics, but should be directed to all students with the necessary qualifications.

MR. JOSEPH C. SIBIGTROTH said that the problem of interesting college students in actuarial work is a joint responsibility of the Society and organizations that need actuaries. As a result of the Society's efforts to supply information to college mathematics departments, many students are now better informed about actuarial work, and show greater interest in the early examinations. In some colleges, however, students are still not getting this information. The reason is generally that the mathematics department concentrates its efforts on getting good students to take graduate work. Students should at least be informed about actuarial opportunities so that they can make an independent choice of their mathematical field.

Mr. Sibigtroth suggested that the Society might take the following additional steps in distributing promotional material, to see that it gets to as many students as possible: (1) try to have the preliminary examination booklet distributed to all mathematics students early in their college career; (2) designate Society members who live near colleges to visit them and attempt to work out an arrangement for better publicity; (3) in colleges where the mathematics department does not appear to be interested, work through the insurance department of the business school.

Mr. Sibigtroth felt that recruiting activities provide an excellent opportunity to publicize actuarial work. A summer student program is valuable in that it gives the recruiter the opportunity to talk to large numbers of students and to stimulate interest. In addition, such a program gives selected students a chance to obtain firsthand knowledge of actuarial work, and to tell other students about it when they return to college.

MR. DENNIS N. WARTERS felt strongly that the supply of actuaries was a joint responsibility of the insurance companies and consultants and of the Society. The companies and consultants need actuaries to carry out their functions, and the Society is concerned because if there are not enough qualified actuaries, others will get into actuarial work.

Speaking on section C, Mr. Warters said that there is a great shortage

of qualified teachers in actuarial subjects. Relatively few people are interested in entering the teaching profession; those who are, even if now employed by insurance companies, should be encouraged to do so.

MR. HARRY M. SARASON stated that colleges are just one source of actuarial students. Some of our best actuaries never went to college. In Great Britain, it is not unusual to employ actuarial students who have the equivalent (in years) of a high school education in this country.

MR. ERNEST J. MOORHEAD reported that the Actuaries Club of Boston had been negotiating with Harvard College concerning the introduction of a one-semester course in finite differences and life contingencies. While Harvard has agreed in principle, a suitable instructor has not yet been found.

MR. DAVID H. HARRIS stated that a list of colleges in which actuarial courses are given is available from the Executive Secretary of the Society.

DR. CARL H. FISCHER made a distinction between universities having a full actuarial program, and those merely offering some actuarial courses. He stated that there are 11 universities on this continent which have actuarial programs leading at least as far as Part 4; at Michigan, some Part 5 material is also covered. These universities have made a real contribution to the actuarial profession; Michigan alumni alone account for 10% of the entire membership of Fellows and Associates.

It would be desirable for more universities which do not offer a full actuarial program to teach a basic course in life contingencies; this would give mathematics students some idea of actuarial work before they decided on their career.

Dr. Fischer showed the need for actuarial teachers by reviewing the staffing situation at the 11 universities offering actuarial programs. Ideally, a teacher should have both a Ph.D. degree and a Fellowship in the Society; if a choice had to be made, Dr. Fischer preferred the Fellowship.

DR. CECIL J. NESBITT said that while there was undoubtedly a shortage of teachers qualified in actuarial science, some supply was developing. Michigan has been aided by a fellowship fund supported by a considerable number of companies to encourage study in actuarial science. Some former Michigan students are now teaching this subject at other universities, and some students now working toward their doctorate degrees will teach it. Two factors are necessary if these young men are to have satisfying academic careers: an increase in the number of students

taking actuarial courses, and continued fostering by the Society of a healthy interest in actuarial science for its own sake, to provide a research outlet for future teachers.

MR. ROLAND F. DORMAN reported that in the fall of 1958 the Actuaries Club of Hartford made a survey of twenty-five actuarial clubs to find out what they were doing to stimulate interest in actuarial work. Fourteen clubs reported an active program, usually including some form of mathematical examination, nominal prizes, and some form of actuarial career publicity. Ten clubs reported some contacting of schools or colleges, including in some instances the offer of actuarial speakers for student career groups. Three clubs reported sponsoring of chairs of actuarial science involving financial assistance from life companies in the region. A number of clubs have prepared actuarial career brochures. One club has a unique system of prizes for high school mathematics teachers who make outstanding contributions to the cause of mathematical education.

In connection with the 1959 mathematics contest sponsored by the Mathematical Association of America and the Society, the Actuaries Club of Hartford is awarding book prizes on a sectional basis in Connecticut. There was a substantial increase in enrollment of Connecticut high schools for the 1959 contest; 65 schools and over 2,000 students participated.

Mr. Dorman stressed that the regional clubs had an important role to perform in the task of increasing the supply of actuaries.

MR. CHRISTIAN L. STROM said that the Chicago Actuarial Club had a program of acquainting mathematical students and teachers at local high schools with opportunities in actuarial work. The program has been successful in reaching many students and teachers who had not previously heard about the field. The club has also performed liaison between the Society of Actuaries and the local chairman of the mathematics contest sponsored by the Society and the Mathematical Association. The announcement of the contest mailed to the high schools included a letter from the club stating its willingness to give additional information and announcing that it would award nominal prizes to the ten top-ranking students in Illinois.

Omaha Regional Meeting

MR. JOHN C. ARCHIBALD opened the discussion by reviewing a summary, prepared by Mr. William S. York of the Metropolitan, of the results of a questionnaire designed to elicit present and future actuarial manpower requirements. Responses were received from companies ac-

counting for employment of 87% of the Fellows and 78% of the Associates of the Society and from 77% of the 308 companies questioned who do not employ a Society member full time. The results were reported by Mr. York at the New York regional meeting.

Mr. York had also investigated possible sources of new members. He had recognized the need to look outside of mathematics majors since they constitute such a small group, and had suggested engineering, economics and business majors as being broader areas.

DR. CARL H. FISCHER reported that the current shortage of actuaries is properly the joint concern of the Society and those who employ actuaries, perhaps more particularly the latter. Companies and consultants can best help by providing money and other aid in publicizing the profession and in furnishing scholarships to students taking actuarial programs.

He felt that the competitive mathematics examination for high school students sponsored by the Society and by local actuarial clubs is an effective form of publicity which attacks the problem at the right point.

However, he doubted the effectiveness of the cash awards given for the nine top ranking students on Part 2. In support of this conclusion he cited that while eleven Fellows and two Associates resulted from the 27 prize winners in the years 1947–1949, out of the 27 winners in 1950–52 only four Fellows and two Associates emerged. In particular the class of 1952 produced no Fellows and only one Associate. Similar results are thought to apply to more recent years. Dr. Fischer suggested that the effect of the prizes may have been to attract pure mathematics students who had no intention of entering the profession, thus possibly preventing some serious students near the pass mark from passing.

In discussing section B, Dr. Fischer distinguished between actuarial *courses*, such as the Introduction to the Mathematics of Life Insurance, and actuarial *programs*, whose objective is to regularly provide full preparation for at least the first four examinations. While the former are to be encouraged, he suggested that only eleven schools on the continent offer true actuarial programs. These, he felt, should be listed in the Society's *Year Book*. He felt also that, with the exception of the Atlantic Coast, where for geographical reasons another school is needed, the primary need is for more students in existing actuarial schools rather than more schools.

Referring to section C, Dr. Fischer recognized that, while the present shortage of actuaries is not due primarily to the shortage of qualified teachers, more teachers are needed. He felt that two teachers constitute

a minimum requirement for a well established program, citing the possibility of absence (illness, sabbatical, etc.) and the monotony of courses to which one person would be destined, in support of this view. If the two teacher minimum is assumed, the accompanying table, indicating the present distribution of teachers and their Society membership, demonstrates that only 15 of a minimum required staff of 23 (allowing Michigan its present three members) are currently filled.

Effective steps now being taken to reduce the shortage of teachers include the contribution by companies of funds for fellowships for the doctorate in actuarial science.

With respect to section D, the greatest handicap to the problem is recognized as the small size of the profession and the public's almost

TEACHERS IN ACTUARIAL SCIENCE PROGRAMS

School	Total Teachers	Fellows	Associates
Drake	0	0	0
Georgia State	2	0	0
Iowa	2	1	0
Manitoba	1	0	1
Michigan	3	3	0
Nebraska	1	1	0
Occidental	1	1	0
San Francisco	0	0	0
Texas	2	1	0
Toronto	2	1	1
Wisconsin	1	0	0
Totals	15	8	2

complete lack of knowledge of the actuarial profession. Communications should be perfected.

He suggested that among college students the choice is between concentrating on students who have already taken the minimal sequence in mathematics, chiefly mathematics majors and engineers, and on students who have not yet taken this amount of mathematics although qualified to do so. In view of the relatively small size of the group of mathematics majors, the fact that many are genuinely interested in pure mathematics, and that professors may tend to encourage their poorer pure mathematics students to enter actuarial work, he felt that more attention should be devoted to the other two groups. Engineering students, because of their mathematical skills and their desire, generally, to apply them to real-life problems might be excellent candidates for actuarial careers. Some students in colleges of business administration who have the aptitude might

be glad to take the required mathematics if the possibility of an actuarial career could be brought to their attention early in their college careers.

Dr. Fischer, however, felt that major efforts should be concentrated in the high schools and that intense efforts should be directed to better communication with high school mathematics teachers and particularly with high school vocational counselors.

MR. ALLEN K. ARCHER believed the present shortage of actuaries to be primarily due to (1) limited public knowledge of the profession; (2) supply of and demand for students capable of success; and (3) present average age at fellowship.

He felt that public knowledge of the actuarial profession could best be improved by development of a simple salable story defining the actuary and outlining the opportunities of the profession. Responsibility for leadership should rest with the Society but responsibility for execution should be divided. As a first step Mr. Archer recommended employment of a full-time actuary as Executive Director of the Society with responsibility for public relations and contact with universities.

Competition with other scientific fields for students capable of achieving success in the actuarial profession and a shortage of qualified mathematics teachers were cited as contributing to the present shorage. Mathematics contests are helpful but would be more effective if directed toward an earlier age group; *e.g.*, such a test is given to Grade 11 students in Manitoba.

Mr. Archer recommended lowering the average age at fellowship by giving the examinations twice a year and by encouraging a substantially greater number of students to start in undergraduate years.

MR. VICTOR B. GLUNTS suggested that the actuarial profession work through the vocational and educational guidance departments of secondary schools in order to more effectively acquaint students and parents with its opportunities.

MR. ROLAND F. DORMAN reported, as he had at the New York Regional Meeting, on the results of an inquiry with respect to methods of promoting interest in actuarial work sent by the Actuaries Club of Hartford to the other clubs listed in the Society's Year Book.

MR. ROBERT E. LARSON disagreed with an earlier conclusion that more than one teacher of actuarial science is necessary for a school offering an actuarial program. He felt that the Society should not go further in reducing the level of difficulty of its examinations.

MR. ALDEN W. BROSSEAU suggested that too much emphasis may have been placed on recruiting from mathematics majors, in view of the fact that primarily business, rather than mathematical, skills are

ultimately required of the successful actuary. He felt that better success would result from locating college actuarial programs in business or economics departments. Courses in insurance are not necessary for a prospective actuary and courses devoted to Part 4 can better be learned after the student starts working. Advantages of this suggestion as compared with continued concentration on mathematics majors would be the larger population of students available and the fact that the college could educate the student, leaving his training to the companies.

MR. PEARCE SHEPHERD commented that several of the suggestions arising from the discussion are already under study. He felt that, with due respect to the need for shortening the actuary's training period as much as possible, a certain time interval of work experience is required for the production of good actuaries. He emphasized the role that local and regional groups play in increasing the supply of actuaries.