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TOMORROW'S ACTUARY

BY

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I considered it to be a real privilege to accept the invitation to make this talk to the Casualty Actuarial Society. Although my actuarial training was in the life insurance field, I have long had collateral interests in the areas your Society encompasses. For 35 years I worked very closely with the late E. E. Cammack who was a charter member of the Casualty Actuarial and Statistical Society of America, as it was at first known. For a long time most of my work was devoted to the Ætna Life's group insurance operations and, as you all know, group insurance operations with their accompanying problems of experience-rating and retrospective premium determination present some problems that are very close to those you face in Workmen's Compensation and Liability areas.

As one of the Actuarial officers of the Ætna Life Insurance Company, I have, of course, always had a lively interest in the fortunes of our affiliated Ætna Casualty and Surety Company; and I have from time to time over the years even been given the privilege of trying to help grapple with one or another problem of the casualty or property business. About six years ago these collateral interests and occasional concerns became direct, real, and continuing ones. I won't say that, as President of the Ætna Life Affiliated Companies, I have been able to give any valuable personal guidance to our casualty actuaries; but I've had a lot more general exposure to some of the problems that concern them; and this has led to an increasing conviction on my part that their success in analyzing and understanding these problems will affect importantly the future success and growth of our casualty and property affiliated companies.

The membership of your Society contains, I am proud to say, substantial representation from the Ætna Life Affiliated Companies. We have 9 Fellows and 4 Associates of the Casualty Actuarial Society in our employ, which, I believe, makes our organization rank among the top two or three in terms of numbers of your membership employed.

The number of persons on our Casualty Actuarial staff and our continuing interest in the further extension of that staff are evidence of our Companies' real interest in the growth of the actuarial profession and the application of actuarially-trained personnel to our Company problems.

I have been asked to talk about "Tomorrow's Actuary." To do so means making some predictions. That's dangerous; but, just between us actuaries, it is a danger I am used to just as you are. What is the actuary's occupation but the making of carefully considered predictions of what will happen tomorrow based on a careful scientific analysis of what happened yesterday, plus common sense?

Editor's Note: Mr. Beers is a Fellow of the Society of Actuaries. Shortly after presenting this address he became Chairman of the Boards of Directors of the Ætna Life Affiliated Companies.

I hope that all here know that a great deal of each component is necessary in making predictions; first, scientific analysis of what has happened; second, common sense, to take into account future changes, either gradual or abrupt, that may be beyond mathematical analysis.

If the actuary by his very nature is constantly concerned with predicting tomorrow, it may be doubly dangerous to predict "Tomorrow's Actuary." It goes without saying that each of my hearers can, without discourtesy, disagree with anything, or everything, that I say; because in that part of the process of prediction which does not depend upon scientific analysis of yesterday's happenings, what is one man's common sense is another man's common nonsense—whence horse races, not to mention competitive differences in insurance premiums and policy provisions.

Maybe the basic question suggested by the title of my talk could be "Will there be a tomorrow for actuaries?" To this I give an unqualified "Yes!" I believe in the strength of our political and economic system and its ability to endure. And so long as it endures there will be a need for protection against the financial consequences of events whose frequency is predictable in the aggregate but unpredictable in the individual case. So long as this need for protection exists, there will be a growing need for actuaries.

I cannot refrain from digressing at this point to the extent of saying that the continuance of competitive free enterprise in the field of insurance cannot be taken for granted. Our history with respect to Workmen's Compensation, Disability Insurance under Social Security, National Service Life Insurance in peacetime, Compulsory Automobile Insurance, Compulsory Employee Disability Insurance, and our current controversy over Medical Care for the Aged, all give only too vivid examples of how government—state or provincial, or federal—may move, or try to move, into insurance. It has become obvious that insurance will not just *automatically* remain in the domain of free enterprise.

To keep insurance in the domain of free enterprise we must first see to it that the insurance industry does a thorough job of anticipating the insurance needs of the public and of meeting those needs through well-constructed reasonably-priced insurance. If we do our job *well*, there will be no real pressure for government action, and we should be in a prime position to resist purely political pressures; if we do our job poorly, we will have a lesser likelihood of avoiding government interference or displacement. As an industry, we have a basic responsibility for initiating successful private voluntary action to satisfy the insurance needs of the public. As individuals of professional competence in a highly technical area, we have the additional responsibility of contributing our skills to the evaluation of the technical merits of proposed legislation, state or provincial, or federal. Both Today's Actuaries, and Tomorrow's Actuaries, must play their parts in this continuing struggle to preserve the free institution of voluntary insurance.

I will not attempt here to predict what the technical and scientific revolution we are now going through will generate in the way of specific insurance needs of tomorrow. There were a lot of insurance companies in existence both 50 and 100 years ago, but could anyone in 1862, or even in 1912, have predicted the rise of Workmen's Compensation insurance, or of Automobile insurance, or of Homeowners policies? How many years ago could you have imagined Uninsured Motorists Coverage, or Falling Aircraft protection? It

is not very long ago that I would have called an actuary crazy if he had talked of Nuclear Energy Liability or Property coverage.

I shall direct my attention not to the list of perils to be insured against but rather to the *manner* in which insurance needs may possibly be met by Tomorrow's Actuary, adopting a very flexible quantitative definition of tomorrow's nearness to today.

I feel that we are moving toward a basic realignment of insurance operations. I can visualize tomorrow's insurance company as being organized horizontally rather than vertically. By that I mean that the traditional vertical separations into life, annuity, health and accident, casualty, fidelity, surety, fire, marine, and all the other traditional lines may be supplanted by a horizontal orientation. The major categories of insurance could conceivably be limited to two: personal, and corporate.

Among the personal lines might well be such coverages as life insurance, annuities, health and accident, automobile, residence fire and other forms, personal liability and property coverages—all those forms of insurance which are bought by a prudent individual in his capacity as an individual. The corporate category might include what we now specify as the group life and health insurances, group annuities, workmen's compensation, general liability lines, bond lines, and coverage of corporate property against fire, theft, marine and other perils—all those coverages which are now bought by a prudent corporation manager in his capacity as a corporation manager.

It is not hard to foresee that the present trend toward packaging will continue. It may even prove to be possible some day to package all the personal lines for the family (considering the individual for this purpose as a single-person family). If a single policy contract can then embrace all of the coverages now sold separately, the next step will be to provide flexibility to enable this package policy to fit many varying needs—the urban dweller versus the rural, the apartment-dwelling subway rider versus the home-owner driving his own automobile, the young family versus the mature—and it will be desirable to build into each policy a good deal of flexibility to provide changing types of coverage and changing amounts of coverage, as the family's needs change. For a present example of this, observe how the so-called "family" life insurance policy covers new babies automatically, sometimes even without extra premiums, or how some life insurance policies contain options to buy stated additional amounts of insurance every 5th year, or how automobile insurance policies cover additional or replacement cars by simple endorsement or even automatically. One is tempted to look forward to the day when all of this will be done by means of an administratively simple long-term policy under which the varying protection will be integrated with varying needs—and nearly every insurance need is a varying one, whether for death benefits, or disability or medical care insurance, automobile coverages, property lines, or retirement benefits; and ability to pay varies too, so the premium structure needs flexibility also.

When I referred to an administratively simple long-term varying benefit policy, I was of course assuming administrative machines and methods that do not exist today; although I think they are discernible on the horizon.

Obviously, I am being very visionary. You can all see many problems that would have to be solved before anything like this could come to pass. Some of these problems are actuarial, some legal, some legislative, some adminis-

trative, some agency. All of these problems are difficult, most of them presently insuperable. But don't forget the famous boast of the smart-aleck engineers, "Difficult problems solved instantaneously. Impossible ones take a little longer." The competitive race goes to those who solve "impossible" problems. That, in my opinion, is what actuaries are for.

I have talked of the personal coverages of the future. What about the corporate coverages? I see the problems as being analogous in general but quite different in specifics. The corporate coverages will have to have greater flexibility, there will be more "tailor-making," and there will inevitably be corporate insurance needs outside the range of personal coverages. There may not be much similarity between the corporate and the personal coverages either in the whole of the package or in its constituent parts.

If the future development of our business does in fact involve realignment into these horizontal categories, very serious differences in present-day marketing channels will have to be reconciled. Today the greater part of the personal life insurance lines are sold through an agency organization just about as different as it can be from the organization for selling casualty and property coverages to individuals or to corporations. I am not going to be so rash as to predict how the personal lines of the future will be sold, but I have no fear in predicting that any integration of today's separate organizations into unified marketing channels for tomorrow will require careful and continuing quantitative and qualitative analysis of what we are doing. The *quantitative* part of this analysis—the reduction of diverse kinds of data to dollars which can be compared, the conversion of large masses of statistics from shapeless incoherence to meaningful summaries, the application of modern mathematical tools to the problems of management decision-making—all this quantitative work will be the special function of the actuary, tomorrow just as it is today. The change that will be forced on us will be more *qualitative* analysis, based on a deep understanding of other fields, especially the field of insurance marketing. Actuaries will have to learn about the problems of selling and about the needs and attitudes of salesmen. They will have to take always into account that completely essential part of the insurance business which concerns itself with getting business onto the books and keeping it there. I don't know whether I need to make myself unpopular by suggesting the addition of marketing to the curriculum burdens of the future, but I'm sure that the Actuary of Tomorrow will have difficulty in getting far without an adequate knowledge of this subject.

I turn now to a different facet of the Actuary of Tomorrow.

The Actuary of Tomorrow will in my opinion be subjected to quite different study and examination training from that which burdens current aspirants for Fellowship. One element of change should be a drastic reduction in the number of years of study and in the volume of data to be absorbed in the process of separating those students who are worthy of membership from those who are unworthy. I foresee increasing use of new techniques for learning the technical tools of the trade and new tests for determining whether a student has grasped those tools and whether he has the mental attitude and equipment which are appropriate for the actuarial profession. A very great deal has been done in the past to simplify preparation of examinations and selection of worthy candidates. I am confident that a great deal more can and will be done in the future.

Even the mathematical content of the training of Tomorrow's Actuary will undergo considerable transformation.

Generally, the numerical solution of any mathematical problem involves a balance between the pure mathematical theory and the available means of computation. In actuarial mathematics during much of my experience the limiting factor has been the inadequacy of the computation facilities rather than the inability to develop proper theory. The development of refined theory has been held back by the limitations of computation ability. To paraphrase slightly some language that seeps out of our data-processing areas, actuarial mathematics has been "computation-bound." Until about seventy years ago the actuary had to express his algebra in forms which would allow a sufficient degree of approximation with no more than a reasonable amount of mental arithmetic, using logarithm tables to reduce the labor of multiplying and dividing, or finding roots and powers.

By the commencement of my own working lifetime the use of logarithms had practically but not quite disappeared, because of the advent of what we considered "high-speed calculators," such as the hand-cranked Monroe and the much more rapid but still hand-cranked "Millionaire." This led to a shift of emphasis in life actuarial mathematics from approximation formulas suitable for logarithms to the use of original arithmetical data and low-scale summations of such data into commutative functions—suitable for adding and multiplying machines—and formulas calling for square roots became completely impractical!

We are now going into a further development of the tools of the trade, which will again mean a shift in the emphasis of our mathematical training. With modern computing facilities the arithmetical work involved in the reduction of the most complicated probabilities to usable numbers can be performed in something close to what the engineers call "real time." As a result we see pressures to spend more of the students' time on learning to handle computers and less on the development of algebraic devices to avoid computation.

An example of the change in emphasis relates to the classic problem of determining a yield rate for the amortization of bonds. We used to use a thing called a "Makeham formula" by which the application of the facts to a test interest rate resulted, after some arithmetic, in a second interest rate which would be closer to the desired true yield rate. Continued reentry of successive interest rates into this formula gave a series of rates which converged on the desired answer. Very considerable thought was devoted to the technique of selecting a starting approximation and to the improvement of the convergency power of the formula. Today in our Company, this theory has been scrapped. We choose a convergence formula on the basis of its ease of programming and we choose a starting point almost at random. The fact that the computer has to make eight or ten or more passes through the formula to get the desired result, where the more sophisticated *algebra* of yesterday might require only three or four passes, is of no moment, since the difference can't be more than a few seconds of computer time. The change in the availability of arithmetic facilities has dictated a change in the emphasis of the algebra.

In the life actuarial field, we used to devote a lot of time to the study of techniques for predicting the financial effects of changing the slope of the

mortality curve or of changing the interest assumption. We did so because the physical labor of developing a new mortality table and the necessary auxiliary commutation function was fearsome. Today, if we want the result of changing interest and mortality assumptions we find out by actually changing them, throwing the stuff into a computer, and examining the actual results quickly enough and cheaply enough for it to be practical to make numerous tests.

In some recent studies of the Society of Actuaries, 17 successive variations of a mortality table were tested before a satisfactory result was reached. If 34, or 50 variations had had to be tested, it would not have been too onerous to do so. The elegant theories for predicting algebraically the results of mortality variations are withering on the vine.

Although this example has been drawn from the life actuarial fields with which I am more familiar, I have no hesitation in assuming that the widespread use of computers will spell analogous changes in technique in those fields which have been thought of as "casualty." With advanced facilities for gathering data, for sorting and classifying the information, and for computing very rapidly and cheaply the financial effects of using the data, the Actuary of Tomorrow in any field will have sharply different premises upon which to base his decisions as to how to combine theory and practicality. The very existence of the new tools for computation will determine new directions for pure actuarial research and different emphasis for actuarial theory.

An always interesting subject for speculation is the probable position of the actuary in the insurance company of tomorrow. Will he be a mathematical specialist living out his lonely life in a transistorized ivory tower? Will he be a technician, called in for consultation on the matters within his limited purview to assist the actuarially uninformed in making the important decisions? If he is, it will not be good for the insurance business, nor for any human undertaking in which good decisions depend upon scientific compounding of the kinds of probabilities dealt with in actuarial science. Neither the Actuary of Tomorrow nor the Actuary of Today will make his maximum contribution to the business in which he is engaged unless he adds breadth of vision and sound business judgment to his purely actuarial attainments. I have referred to the desirability of an understanding of marketing problems. If an actuary is to have breadth of vision he will add an understanding of underwriting problems, administrative problems, in fact whatever problems are important facets of the total problem of achieving progress in a competitive world. Of course, some of our number will get greatest satisfaction from concentrating on the actuary's professional mathematical techniques. In many cases I hope that the Actuary of Tomorrow will feel that he realizes his full potential only if he is called upon to graduate from actuarial work to executive responsibilities. As an executive he will be called upon to prove his breadth of vision, his imagination, his responsibility, his judgment, his versatility, and all the other characteristics of the modern business executive.

I used the expression "graduate from actuarial work" to describe the process by which men graduate from specialized backgrounds such as sales, underwriting, law, claims, finance, etc., into jobs which cut across all those fields. The executive of tomorrow will, I hope, be found more frequently to have graduated from an actuarial background than is currently the case. The training ground of the actuary ought to become more and more recognized as a

good recruiting ground for executives as actuaries demonstrate more and more both their thorough understanding of the fundamentals of the insurance business and their breadth of vision. This has been happening to a greater extent in the life field. I expect it to happen in the casualty and property field.

To make this prediction of mine come true you must do a number of things. You must recruit far more young men, and bright young men, into the ranks of your students. You must maintain or even raise your standards of qualification for Fellowship without making the student's life so hard as to discourage recruiting. You must continually review and modernize your courses of study. You must maintain high ethical standards. These things I am confident you will do, and on the premise of that confidence I believe the casualty Actuary of Tomorrow will be a man of greater influence and prestige in the company of tomorrow.

By the time I get this far toward visualizing the Actuary of Tomorrow, trying to cope with the insurance problems of tomorrow, I find that I may not really be talking about the *casualty* Actuary of Tomorrow; but about *the* Actuary of Tomorrow, a man whose training and technical tools cut across the boundaries which now serve—very vaguely in some areas—to distinguish the so-called life actuary from the so-called casualty actuary. The possible realignment of insurance categories into personal and corporate, the development of new theory in the presence of new powers of data handling, and the logical conclusion of the existing trend toward what may be called "multiple-linearity" in insurance organizations, all will spell increasing pressure toward closer association between the two present major professional actuarial bodies.

I see nothing to fear and perhaps much to be gained in such a trend. Many of the charter members of your Society were competent in both the traditionally life and traditionally casualty aspects of actuarial work. May a similar versatility be an important feature of the "Actuary of Tomorrow"!