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**THE ACTUARY OF THE FUTURE/
THE FUTURE OF THE ACTUARY**

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 JAMES C. HICKMAN
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- o The demand for actuaries in the 21st Century
- o What actuaries will be doing in the 21st Century
- o Implications for the selection, education and training of actuaries

MR. GARY CORBETT: Bob Shapiro, Jim Curtis, Jim Hickman and I will be discussing the actuary of the future and the future of the actuary. The double-barreled title was not designed to be "cute." We are, indeed, concerned about both aspects -- about what tomorrow's actuary will be and do and about the future of the actuarial profession.

I'll open with a brief background on the nature of the problem and why it is, and has been, a matter of concern to the leadership of the Society. Bob Shapiro will address what the financial services world will look like in the 21st century, and what this means for the actuarial profession. Jim Curtis will follow with his view of the future for employee benefits actuaries, followed by some comments from me on the future for actuaries in life insurance companies. Jim Hickman will discuss the future for other actuaries, such as those in regulation and academia, and conclude with his view on how all the changes should affect the selection, education and training of actuaries. Finally, we'll solicit questions and comments.

I'll see describing what has been going on in the Society regarding
the fu **RS**ary during the past five years. In 1982, the Career

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Encouragement Committee conducted a survey of actuarial employees. Among the conclusions from that survey was: "Employers are not focusing on numbers alone; they appear to be looking for actuaries with a broader bent, going well beyond the traditional technical skills."

A few years later the Committee on Planning characterized the problem this way: "In a world of increased change, actuaries as a group need to increase their abilities to deal with change. We need greater competence in such skills as -- problem identification, dealing with unstructured situations, applying interdisciplinary approaches, communications and conceptualization." Employers were described as wanting people who could sort through a mass of information to identify key problems and who were willing and able to operate within ambiguous, unstructured situations. Management and communication skills were deemed important if an actuary were to advance past the technical level.

This year, the Committee on Planning widened the focus from an inward look at the actuary of today to an outward look at the actuary of tomorrow. Jumping ahead to the early years of the 21st century, a century in which our current members will spend most of their collective careers, the Committee has asked such questions as: What will, should or can be the role of the actuary? What knowledge, methods and skills will be required of the actuary? What are the implications for selection, education, training and research?

Our panelists will be giving their views on these and other questions.

The Committee on Planning has now established a Task Force to undertake an in-depth study of the actuary of the future and the future of the actuary. This Task Force, chaired by Jim Murphy with vice chairs Ed Boynton and Bob Shapiro, will include employers of actuaries and users of actuarial services. The charge to this Task Force is to report to the Board, by next October, with recommendations that address such questions as: Should the Society's education (basic and continuing) and research programs be expanded to include disciplines and businesses not currently covered by the syllabus? Should the Society ensure that members are educated in nonactuarial areas vital to success? Should the Society's education and research programs be expanded to cover nontraditional applications of actuarial science? What should be the common core of

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knowledge possessed by all Society Fellows? How should the Society communicate, both within and outside the profession, the changing role of the actuary? How should the Society modify its selection methods to attract individuals who are more likely to succeed as actuaries in the future?

We are aware that a number of our members question whether there are any threatening clouds on the actuarial horizon. In May 1987 we published a supplement to *The Actuary* entitled, "The Value of the Actuary -- The Future of the Society." Although many of the articles in this supplement were provocative and responses were encouraged, less than five were received. This lack of response, combined with the results of last year's Actuarial Profile Survey, could lead one to the conclusion that many of our members have no real concern about their own futures or the future of the profession. There is evidence from other sources, such as the FEM White Paper survey, that a significant number of our members do share our concerns.

The first job of the Task Force will be to determine whether any significant future problems do exist. We expect the nonactuaries on the Task Force to help significantly in this regard.

Within the profession, particularly within the Society, we are trying to encourage a wide discussion of the future of the actuary and the actuary of the future. Harold Ingraham wrote on this subject in the July 1987 issue of the Academy's *Actuarial Update* and I've written an article for the November issue of *The Actuary*. We hope that this will be the first of many forums at Society meetings and actuarial clubs where members can contribute their views.

With this as background, I'd now like to ask Bob Shapiro to provide us with his views of the financial services industry and the actuary's role within this industry in the 21st century.

MR. ROBERT D. SHAPIRO: My crystal ball is really more like a nerf ball! For many years the actuarial profession has been a respected profession. We have prospered for decades. But when you look to the future, I wonder whether the environment that facilitated our past success will be so kind.

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In the past, we have been the mathematicians of insurance and pension plans. We accumulated experience, priced, valued and projected mortality, morbidity, expenses, persistency and investment earnings. We were prized for our technical capabilities, and often baffled others with the "black box" in which we developed our analyses.

Our employers/clients have generally been life insurance companies or employee benefit plans. Within life insurance companies, we found ourselves structured in functional organizations. Within these functional organizations, the top spot for the actuary was chief actuary, and much of our progress along our career track was determined by examinations. Because of the specialized nature of the actuarial function and the career linkage to actuarial exams, there was little competition for organizational positions from outside of the actuarial profession.

Tomorrow is not going to be like yesterday. Looking ahead, we see life insurance companies evolving into broader financial institutions. Investment and expense management often have become more important than managing mortality and morbidity. The expected future environment demands that we change both as individuals and as a profession, so that we can adequately meet the evolving new needs of our constituencies.

As mathematicians of insurance and employee benefit plans, our education and training has emphasized financial analysis of structured problems in the design of financial security programs. The future will demand significant changes in both our education and our professional perspective.

Future financial analysis will have to be anchored in a broader business perspective so that the necessary degree of management insight can be brought into our analyses. More and more of our problems are not structured. We need to develop actuaries with the capability of understanding and addressing unstructured situations. Finally, we need to do more than just design programs. We also must think through how those programs can be managed effectively once they are designed.

Where do actuaries fit on the spectrum of the various professions? At one end of the spectrum, we find physicians, attorneys and accountants. These professions are characterized by a scientific knowledge base that goes back many

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hundreds of years. Their professional education is tied to university systems and they have broad public recognition. On the other end of the spectrum are groups that seek greater professional recognition but generally can be characterized by a less definable scientific knowledge base, little or no specific university-based education and limited public recognition. Their efforts to be recognized as a profession are largely predicated on a yearning for broader public acceptance (which one might argue is designed to enhance business potential and future income). The latter organizations often display many characteristics of trade organizations.

I envision the actuarial profession as somewhere in the middle of the spectrum, closer to the ancient professions, with a desire to become more and more like the ancient professions. If we are to achieve such a position, we have to avoid diffusing or destroying the core of knowledge that differentiates our profession from others. This is not to say that our core of knowledge cannot change over time as the environment changes. But our core should have an enduring base that separates actuaries from nonactuaries (e.g., assessing and managing future contingent events).

Although we have university training, our examination system is not university-based. There is a continuing discussion within the profession as to the desirability of and implementation of greater university involvement in our educational system. With respect to public recognition, I prefer to believe that this will come by doing the right things, in defining and facilitating the appropriate future role of the actuary, instead of through an effort designed largely as "public relations." I prefer to have the reality of what we are "seep through" to the public, instead of trying to convince them that we are something that we are not. Of course I don't mind helping to form the right perception using public relations, as long as we maintain consistency between what we are promoting and what we are.

The Society of Actuaries is trying to look ahead ten or fifteen years. In this way, we hope to direct our thinking toward answering the question "How may actuaries and the actuarial profession better serve the changing needs of the public?" instead of "How do we better perpetuate actuaries and the Society of Actuaries?" We hope to determine how to maintain and enhance our "special capabilities," as well as how to develop the general management skills needed to

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direct changing financial security programs in the future. We want to force our thinking to deal with future members of the Society, not just the current membership list. We need to ask a number of questions about these future members of the Society. Who should they be? How should we attract them? What types of roles might they have?

It is interesting to think about how our exam scores might relate to those of CEOs and MBAs taking an identical exam. As we evolve our professional thinking, it will be important for actuaries to be able to wrap our technical foundation and its related technical language within broader concepts and communication skills that will allow us to manage at a broader business level. Hence, over time, our scores need to be consistent with those that might be developed by CEOs and MBAs.

Let's put ourselves in the year 2000 and try to define the kind of environment that we will be in at that time. What will be the needs of the public? Who will be our potential employers and what will be their needs? How should the role of the actuarial profession and the Society of Actuaries be established to effectively meet these needs?

From our answers to this set of questions, we should be able to derive a sense of reasonable expectations for the public and the profession, and define an appropriate mission for the Society of Actuaries. In order to achieve this mission, we will need to establish a set of goals and strategies for the Society that will drive us from what we are today to where we need to be.

Susan Litwin, in her book *The Postponed Generation*, describes the high-tech professionals of Silicon Valley in phrases that are often applied to actuaries. For example, she uses terms and phrases like "precise, paper-skinned, white shirted, boring, one dimensional people." She further describes these Silicon Valley "techies" as "people who have good jobs but have little capacity to enjoy life," "took literature in college, but did not read the book," and "spent days crunching numbers, and even that activity seems too muscular and too voracious for them." She then points out that these individuals are content, as they are valued, coveted, rewarded, treated well and have substantial opportunities!

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Most of us have been content because we similarly have been valued and treated well. What happens, however, if this situation changes? Would we be as content? Would we be able to attract high-level people into the profession? Would the new people coming into the profession be content? Do we need to do some things in new ways to help new entrants into the profession as well as individuals in the profession today?

In 1986, Cornell University did a survey of employers asking them what they wanted to see in business school graduates. The top two categories of employer objectives for graduates were "leadership potential" and "interpersonal skills." Actuaries are more generally known for their strong analytical ability, strong work ethic and strong functional knowledge. Are traditional Society of Actuaries processes, including recruiting and exam systems, going to be able to attract and train the desired type of people?

As we struggle with defining the appropriate role of the actuary of the future, we need to ask ourselves several critical questions. What special skills do we have? What businesses need these special skills and how do they need them? What other professions can do some of these things as well as or better than actuaries? Where do we do things better than others? How do we effectively leverage these distinctive capabilities?

As we define the future of our profession, we obviously have many things to think about. It is not unlikely that we will find ourselves working for new employers/clients, applying new perspectives, working with new contingencies and recruiting different types of people. Obviously, we would like to identify businesses that need our help, particularly where no one else can do what we do or bring our type of skills to the table. If we work hard at this process, and address the various issues with appropriate sensitivity, we will be able to define our future in a way that best meets the emerging needs of the public and simultaneously strengthens the actuarial profession.

MR. JAMES A. CURTIS: We actuaries earn our living using the probabilities of certain events, and by advising our clients and companies about future expectations. I guess it is only fair that we step back once in awhile and consider our own future. I have applied no probabilities to my remarks and hope that you will not use too high a discount factor in bringing possibilities for

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the future back to the present. I believe that the demand for the actuary in the 21st century will be greater. Here are some select reasons for this belief.

First, our total population will increase, which means more of almost everything, including actuaries. I believe strongly that the unique analytical skills and problem solving expertise of actuaries will be in greater demand. As society becomes more complex, so do the problems which need solving. I don't believe that the advent of artificial intelligence will change this fact. Recently, I heard that the IRS was considering using artificial intelligence for selecting returns and performing audits. I was somewhat surprised, because judging by their reaction to my tax return, I thought that they were already using artificial intelligence.

Second, we have a much larger older population. That fact will create additional medical concerns for the elderly. As a result, there will be more problems for our health actuaries to solve.

Third, I believe that there will be increased demand from the public for greater regulation of actuarial work. This results from an increased awareness and demand for solvency of insurance companies, medical delivery systems and pension funds. Therefore, there will be an increase in the required number of actuaries, both as regulators and those providing work to regulators.

As to what actuaries will be doing in the 21st century, I believe there will be some significant changes. This is not to say that the current types of actuarial work will disappear. Not at all. In fact, I believe there will be an expansion of that work, if for no other reason than the fact the population will continue to increase. Added to this, however, will be some areas where actuaries have not trod before, or at least have not been involved to the extent that their unique abilities would enable them to be. Many years ago, I asked someone about the future of health actuaries if national health insurance legislation were to pass. He replied that as long as there were problems to be solved using probabilities, there would always be a future for actuaries. Here are a few places where I believe there will be a continued need for the use of probabilities.

First of all, the Social Security system has had, and will continue to have, a serious strain to pay promised benefits. There has been little success to date in

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solving problems facing the system and Congress has not helped. In fact, Congress probably has been part of the problem rather than the solution. Everyone seems to have a "quick fix." However, no one has come up with long-range solutions. I'm sure you have read articles about the many people in their thirties and forties who firmly believe there will be no Social Security when they reach retirement. I believe the private pension system will be called upon for solutions through means other than the governmental system and payroll taxes. The burden of finding new solutions to problems in the Social Security system will become an actuarial problem in the 21st century, perhaps sooner.

Our senior citizen population is getting older. That is, those in retirement are increasing in number at a rapid pace. Just a few years ago, it was estimated that the centenarians numbered about 2,500, and by the year 2000 they're expected to be over 108,000. This estimate was determined by using actuarial techniques, including probability.

Just think of what this does to the problem of providing health care. Dramatic changes will occur in the health care delivery systems. If you think HMOs and PPOs have had a big effect on the system to date, "you ain't seen nothin' yet." Changes will be made to find more efficient and cost effective ways of providing services. I know that in the continuing care retirement communities (CCRC), three disciplines in our firm are becoming more involved -- life, health and pensions. I suppose casualty actuaries also could be involved in solving these very complex problems. The burden of finding solutions will be in the private arena and consulting actuaries in the health discipline will be in great demand, even more so than they are today.

Using actuarial techniques, demographics show us that our labor force in the 21st century will have a smaller percentage of younger workers from which to draw. Obviously, the work force will continue to become older. Retaining older workers will demand different approaches to providing fringe benefits. Employees will work longer and will receive retirement benefits for a shorter period of time. Presumably employers will continue to provide medical care, and so there'll be more problems created in both benefits and the funding for benefits.

Recently, I read that the former head of investments with CitiBank said that the deficit problem for the federal government will not be solved by either increasing

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taxes or decreasing spending. More creative solutions will be needed to solve complex problems. And I believe that solutions will come from individuals who are able to deal with compound effects -- and that spells ACTUARY.

What about the individual wage earner in the economic environment of the 21st century? They too will need solutions to their financial problems, particularly in the matter of financing their retirement. Again, Social Security will not provide all needed benefits. Instead, private plans and personal savings will be needed to supplement Social Security. This provides areas of opportunity for which actuaries are uniquely suited.

Increased regulation will create a need for more actuaries to meet regulators' demands. In all probability, health actuaries will become "enrolled" in a manner similar to pension actuaries today.

I still believe that there will be many things to do that you are now doing in the employee benefits areas, such as actuarial valuations of pension plans, government filings, and pricing health care. Many of the problems I discussed above do not require mathematical solutions. But there may be changes along the way. I believe the actuary's "strong suit" in the future will be for less mathematical skills and far more analytical skills. After all, mortality risk is much less important in many of today's products than investment risk. The actuary of the next century must be trained in economics, finance, investments and social problems.

I believe we will see a major change in the education and training of actuaries by the year 2000. Jim Hickman will be discussing more about that soon. The typical college curriculum in actuarial science emphasizes the following subjects in their order of importance:

1. Mathematics.
2. Mathematics.
3. Mathematics.

I know very well the actuary needs a very good grounding in mathematics, but I do wonder sometimes if the emphasis needs changing in the future.

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Years ago, actuaries were obliged to devise unique formulas for solving problems. Some of you are old enough to remember using the old Marchant calculators. I spent one whole summer working on a problem using a desk calculator and today that problem could be solved in about thirty minutes using high-technology computers.

Then what is the role of the actuary in the future? I believe that the role will still be that of a problem solver, but maybe in a broader perspective. The 21st century actuary will need to apply an analytical process to difficult problems and provide a variety of possible scenarios on a "what if" basis. Of course, many of you are using that methodology today. However, I see an expansion of this into nonactuarial areas, such as economics, finance and government.

I believe the actuary will take a stronger advocacy position on problems than is done today. For example, accountants recently gave their opinion of the Social Security system. They said that, because tax policies were involved, they would take an advocacy position. However, according to Bob Myers, they not only failed to recommend anything on taxes, they made some errors along the way. Why did accountants assume a role in explaining what is wrong with funding Social Security benefits? Did we as actuaries inadvertently relinquish this to them? It seems to me actuaries could do a better job in taking an advocacy position on this and other matters, and I think we must do so in the future.

The implications for the selection and training of future actuaries are many. Obviously, the profession needs thinkers -- individuals with creative and analytical minds. There is no doubt mathematical skills will be needed, but I wonder about the emphasis. If actuarial calculations will be done on computers, performed by computer operators and programmers, is the need for an emphasis on math as great as it has been in the past? Perhaps that question could be rephrased by asking if we are losing some very good analytical problem solvers simply because they do not want to study mathematics as deeply as is required to become an actuary today.

We now have the enrolled actuary designation. Tomorrow, as I mentioned earlier, we may have the same for health actuaries. But, they may not necessarily be required to be Fellows of the Society of Actuaries. The point is not

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whether enrolled actuaries, who are the members of the Society of Actuaries, could have passed the exams. Instead it is that many chose not even to try. They are qualified, according to the Joint Board standards, and I'm sure many of them have a great amount of expertise on pension matters.

Why didn't the profession attract more of these enrolled actuaries? Could it be that they felt it was too great a price to pay when they really only wanted to be a pension specialist? Why have some insurance companies embarked on a program to obtain enrolled actuary status for their employees and abandoned the actuarial exam route? I don't have answers to these questions, but I do think that they are worth considering.

I have wondered if the actuarial profession should involve itself more in the process of setting the curriculum for college actuarial programs. I know that this is the province of the colleges, but perhaps there could be a joint effort of some kind. I believe we should try to attract, educate and train individuals to be actuaries who can meet the future demands of society.

As I mentioned earlier, I believe there will be a great need for actuaries who are great thinkers, analyzers and problem solvers in the broad sense. While these characteristics can be applied to many mathematicians, they can also be applied to some who are not mathematicians. If the profession is going to continue to be great in the future, we need to attract the best minds possible. We must be inclusive in that regard, and not exclusive.

We all have the same objective for the future of the profession and its future actuaries. What about the legacy that we will leave them? For employee benefit actuaries, what about leaving them the profession as it is now? I doubt that our current professional structure will work, because by the 21st century, many changes will have occurred which will change society's needs for the actuary. That leaves us with the following observation: the profession must be changed to accommodate society's future needs. The question for us is how do we accomplish this? We have many great analytical minds and thinkers in our profession, so let's put them to work on the problem.

MR. CORBETT: Jim has discussed the future of the actuary in the employee benefits area. It's my assignment to look to the future of actuaries in life

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insurance companies. The best guide to the future is always a clear picture of where we are today, including the identification of trends. Therefore, I'll start by describing how the role of the actuary has changed in life insurance companies since I entered the business thirty years ago.

Although my thesis is difficult to prove statistically, I am convinced that actuaries entering companies in more recent years have not been as successful, measuring success by position and relative salary level, as previous generations were at comparable points in their careers. I believe there to be three causes for this relative deterioration in position and importance within life insurance companies. (1) Many younger actuaries, although technically excellent, are lacking in the attributes leading to success in management. (2) There is greater competition for management positions in life companies than there once was. (3) The requirements for success have changed and the actuarial profession has been slow in adapting to these changes.

I originally questioned this view, held by a number of Planning Committee members, that today's recruits tend to be more oriented to math and less to business and management. I now realize that this is very likely since there are far more opportunities available today to the student who is good at math, but prefers business to research or the sciences. When I graduated from the university in 1958, an actuarial career was one of the few which appealed to a person with these characteristics. Data processing was then in its infancy, investments did not yet have a strong quantitative base and none of the best students at that time became accountants, who were regarded primarily as bookkeepers and auditors. This situation has certainly changed in the past ten or so years. I'm not sure whether I would choose an actuarial career today. It would still be attractive, but so would many others, including accounting. Therefore, I'm led to the conclusion that we probably are losing good math-capable, business-oriented students to other professions. But I hasten to add that I've not really observed such a change in the companies I've worked for, in companies I consult with, or in Society affairs.

I believe the greatest single cause of the reduced success of actuaries within life companies to be *the greater competition for available management positions*. In the 1950s, many companies actively recruited university graduates for only three areas -- legal, investment and actuarial. Of course, there were university

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grads in the field force. Investment people, to this day, have largely stuck to the investment area, not getting overly involved with the liability side. This left the field largely to lawyers and actuaries and the actuaries generally outnumbered the lawyers -- dare I say in quality as well as quantity? For many years, presidents of life insurance companies were either lawyers or actuaries with a few agency and investment officers thrown in.

I've been talking about CEOs, but the same phenomenon applies at all senior management levels. For example, in the early 1960s, the head of data processing was frequently an actuary, and until quite recently, the controller was an actuary -- there being few CPAs in life companies. Today, at least in the larger companies, the chief financial officer is more often an accountant and the corporate actuary may report to him or her. As a former company officer, I think this change is all for the better, but it definitely has not been to the benefit of the actuarial profession.

Finally, the external and internal environments have changed and the actuarial profession has adapted only slowly to these changes. The rapidity of external changes and the turmoil in the marketplace have meant that the questions that should be asked are not as obvious as they once were. There is a necessity to operate within ambiguous, unstructured situations. Actuaries tend to be better at both asking and answering reasonable structured questions than at determining what questions should be asked. Obviously, it's not only actuaries who find such an unstructured environment difficult but, I fear, we may be less capable than some other professions. Certainly our structured examination system, which assumes each question has an answer, and, more importantly, doesn't require the student to consider which questions should be asked, does not help. The case study approach, used in many MBA and other management programs, is superior on this score.

However, I'm not so sure that actuaries are coping with this lack of structure in the environment significantly worse than are other professionals. It's when I consider the integral environmental changes I am sure that actuaries are losing out. The basic change is the move within companies to organizations based on business units rather than on functions, such as administration, underwriting or actuarial business units.

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The position of chief actuary was traditionally one of the most important in the company -- perhaps only second to the CEO. Today, many of the larger companies have no chief actuary, substituting the corporate actuary, who has no responsibility for product design and pricing and who may, as I said earlier, report to the chief financial officer. Furthermore, the corporate actuary is often the only senior actuarial officer in the company. This means that corporate is the only purely actuarial road to senior management.

What happens to the extremely capable and innovative pricing/product actuary in a company that buries such people in strategic business units (SBUs), some of them quite narrow in scope? What is his or her line of promotion? The obvious line is to the management of the SBUs. I would have thought that actuaries were ideal candidates for these management positions. Unfortunately, the actuary in such a position seems to be the exception rather than the rule.

Many actuaries apparently don't want the position because they don't feel comfortable managing -- perhaps because they've had no specific training. The other side of the coin is that the competition for these positions is often business school graduates, trained in at least the theoretical aspects of management -- in particular, marketing.

The picture I've painted certainly doesn't hold true for all companies. Many, perhaps most companies retain function-based organizations and the chief actuarial position. But, I believe the move is towards line-of-business organizations, with the probable impact on actuaries I've just described.

In summary, I believe that fewer actuaries are achieving high positions in companies for three reasons: (1) less qualified entrants because of competition from other professions; (2) competition from nonactuaries; and (3) the changing organization of companies.

So far as the future is concerned, I see all three factors continuing. As regards the latter two (more qualified competitors and the changes to SBUs) we can do little about them -- nor should we try. However, we can equip the actuary to compete better within the new organization and we can try to attract more business/management oriented people to the profession.

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We could require, or at least encourage, prospective actuaries to seek out management education in their university days and we can teach management, either as part of the syllabus or postfellowship. Until recently, I have questioned whether the Society should teach such subjects as management and communications, even on a continuing education basis. It's not that I considered such subjects unimportant, just that I believe there are other organizations and institutions better equipped than we to teach them and we should use our limited volunteer and staff resources to teach subjects more closely allied to traditional actuarial work. I've moderated my view on this matter, not only because of the need I recited earlier for actuaries to be trained in management, but also because of the tremendous interest shown by our members in such subjects at meetings and in seminars.

How can we attract more management-oriented individuals to the profession? The Career Encouragement and Public Relations Committees are currently working with the Committee on Planning to increase the emphasis on the nonmathematical and business aspects of an actuarial career in publications aimed at prospective actuaries. Also, we must continue to review the E&E process to ensure we are not discouraging candidates, who would make excellent actuaries with our rather long and math-oriented set of examinations.

I hope with these latter comments I've not trespassed too far into Jim Hickman's domain, which includes the implications of the future changes on the recruiting, selection and training of actuaries.

MR. JAMES C. HICKMAN: One of the finest leaders in United States history was Abraham Lincoln. One time he said: "It is best that we know where we are before we study where we are heading and how we are to get there." I am going to start by talking about where we are. In fact, I am going to use notes that I use for most of my "deanly talks." Rather amazingly, actuaries are pretty much where everybody else is in education.

What do you have to have for an educational system? You have to have students, you must have ideas, and you must have a demand for the students with the ideas and the institutions to get the educational job done.

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How are we on students? Surprisingly, the Society is at about the same place as American higher education in general. There are more students than we had expected. Remember, the baby boom is now over twenty-five years behind us and we're astounded that there are as many students as there are.

Where did they come from? A higher proportion of students are going into higher education. There are more returning adult students, perhaps because this is a very pragmatic age. One quarter of the American and Canadian students in higher education today are in business. That is roughly double of what it was ten years ago. This is indeed a very pragmatic generation.

There are also a lot more women in higher education. This is a social phenomenon, not an economic force. Business education in the United States today is 45% female. Actuarial education does not have that high a proportion of increase, but it doesn't lag very far behind. There is a fundamental shift in the employment expectations of young women. I do not expect it to roll backwards.

Another characteristic of today's student body is that it is increasingly foreign. Is that bad? No. It is an example of the "melting pot" nature of our two great nations. There is however, a distressing aspect, in the sense that in research, we are in fact "eating our own seed corn." Today 35% of the business Ph.D. candidates in the United States and Canada are not citizens of those two nations. In engineering, the ratio is about 50%. This is serious, because it is from these fields that the technological and business leadership of the world comes.

How are we doing on new ideas? Well, basic science is in pretty good health in our two great nations, particularly in the areas that we are examining. Part of the new ideas in the last twenty years have come from finance. Actuaries clearly have discovered asset and liability time-matching ideas. They are important, not only in actuarial science, but also in all of finance. We have discovered stochastic processes in finance. Probably nothing quite matches the "Report on the Status of the Solvency Committee Report Canadian Session," by Johnston-Black-Howes (*1986 Symposium for the Valuation Actuary Proceedings*) regarding options pricing of the early 1970s in its intellectual and market implications. Thank goodness actuaries have a "leg-up" because they know more about stochastic processes.

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Another product of the last twenty years has been the growth of technical ways for blending experience, both past and new. The great development of credibility in that period may be matched by the same set of ideas in electrical engineering and throughout business. We have ideas: new ideas, old ideas and good ideas.

How are we doing on demand? Well, not surprisingly, the demand for actuaries and the demand for graduate school students is driven by some big forces. One of those forces that both Jim and Gary alluded to is health care. In the United States almost 12% of our GNP is needed to care for an aging population. There is virtually only one way that the importance of health care can go. Absolutely to nobody's surprise, there is high demand for actuaries that can help study, understand, control, and manage health care costs.

In the late 1970s in the United States we had negative real interest rates. Then within three years, we had historically high real interest rates. Who would have expected it? Not me. I failed, because in 1981, in a meeting like this, I said, "Gee, we've got negative interest rates. When will it ever change? These negatives are destroying pension and other savings institutions."

I should just have waited about three years, because it changed with a vengeance. And what happened? Is it to anybody's surprise that suddenly there was a greater demand for people that could understand, develop and manage interest-sensitive products? Good gosh, no. It was exactly what you would have expected.

In the past, we have largely dealt with slow but sure mortality trends. Suddenly that too changed. The AIDS epidemic shows us what impact the intrusion of outside events can have. What do you think it has done to the demand for actuaries who understand the theory of vital statistics and epidemiology? It has accelerated it.

We have been living in an age of technological change. The one that really zapped actuaries was the computer revolution. The computer revolution suddenly returned us to a primitive state as far as mathematics are concerned. No longer did the computational tricks of commutation symbols, for example, make very much difference. Computation became easy; principles remained hard.

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That has had a profound impact on our profession and will continue to have such an impact.

Probably the biggest impact is internationalization. On a global level, it is no longer possible for our nations, or any other industrialized nation, to carry out a domestic macroeconomic policy without recognizing what is going on abroad. The growth rates of the industrialized nations are virtually identical today. That shows up in your firms, many of which are owned internationally, and your businesses. These are some of the big forces that are influencing the demand for both business school graduates and actuaries.

There has also been a big shift in the educational institutions that supply students and ideas. The universities aren't growing; they are shrinking. That means opportunities for actuaries in the large research universities also are not growing; they are declining. They are shrinking in part because taxpayers made a decision and in part because the actuarial profession is reluctant to turn to the universities for research support.

Continuing education, however, is booming. It is booming at universities, in professions like ours, and in the consulting firms. Why? Because up until this generation, you could work throughout your lifetime using the same set of skills that you had acquired between the ages of twenty and twenty-five. But that is gone forever. Today you have to be retrained several times during your professional lifetime. We will never go back. Clearly, the necessity for reeducation has created a big demand.

We don't know yet in our society who pays, who supplies, and who goes to continuing education. But those are extremely important issues. Opportunities have ballooned for actuaries to not only be students but also teachers in continuing education.

The valid criticisms that you have heard from my colleagues happen to be almost precisely the same criticisms that are levied at education in general. For example, communication and leadership skills are lacking.

Bob Shapiro gave you statistics from Cornell. On Friday of this week, our board of visitors of the University of Wisconsin will receive the results of a

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survey of our graduates and their employers five years out into the world. And what do you think? Exactly the same results. Both students and their employers thought they were lacking communication and leadership skills. It is, in fact, a universal criticism.

What went wrong? Is there anything that we can do about it? What went wrong is basically an economic consequence. Almost from kindergarten to the Ph.D. level, students have not been listened to critically. They have not had teachers read what they have written and respond critically. They have answered short-answer tests. The only way to learn to be an expositor is to have somebody read or listen and respond critically. However, it is a one-on-one process that is expensive. We are not willing to pay the price.

I believe that we can do something on the professional level, but we must be modest. At twenty-five and thirty, you cannot easily rectify deficiencies in communication skills that have developed over an extended period. The new generation has not read as much as you did. Much of their information has been received from screens and television monitors. To reach them, visual impressions are important. They do not come with the literary background that you did. Educational challenge? You bet it is.

How about leadership? Business schools have been criticized because the nation has asked us for leaders, and instead we sent a bunch of consultants. We accept this criticism. How do you create leaders? I don't know. The military academies don't know. If you go back to the great leaders, from Moses to Caesar to Churchill to Lincoln, they all appeared to have been students of the classics. I don't know whether that made them great leaders, but they had both expository skills and a deep historical and literary knowledge.

I believe that the criticisms about communication and leadership skills are not independent. They are, however, difficult to rectify. That is not an excuse for not trying. It is an attempt to keep humble at our chance for success.

One problem is we now have actuaries "of the third kind" -- financial actuaries. They are important and they have the background to master the new financial topics because of their proficient mathematical skills. However, we have not developed the system to recruit and train financial actuaries.

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Another one of the criticisms is that actuaries have a problem in separating the fundamentals of their profession from those topics that are necessary for current practice. Those of you in practice continually criticize the educational structure for not doing well on current tax laws, regulations, and computer software. We have not done well. The question is should we? If you believe that the current tax laws, current regulations, and current software will be the same five or ten years from now, then you also believe in the tooth fairy. None of those propositions are correct.

I believe the educational process must separate fundamentals from those topics which must be taught for current practice problems. Remember, I did not say that requirements for current practice are unimportant. They are important. But they should be part of our continuing education effort because they change. As an example, if you believe there is the same degree of invariance between the central limit theorem and the current Social Security integration rules, you are making a big mistake. They are different, and they probably need to be taught differently at different times in one's career.

What are some of the suggested responses? One came from Harold Ingraham, in his talk earlier on the subject of unification on the fundamentals. Many of you in life companies have been dealing with issues in health insurance. I have been appalled, in my consulting work, at the lack of knowledge about credibility and loss reserving among people who came up the "life route" and have not had to use these ideas. These concepts are part of the fundamentals and should be taught there. The distinctions that we have attempted to make on fundamentals, between the casualty and life segments of our profession, have been a source of amusement among our friends throughout the world. These distinctions do not have an intellectual foundation. We must get together on the fundamentals.

Concomitant with that, we have to maintain flexibility on the specialties because they are proliferating. But we need to make a distinction. And we probably need to enforce and reinforce continuing education, because topics that change are important, such as tax laws, regulations, and computer software. The most important thing that we can do, however, is to cultivate intellectual roots. Actuarial science, like any other science, cannot be pulled up by its roots and be transplanted. The profession does have intellectual roots, and unless we recognize them, water them and reinforce them, we will die -- both as a science

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and as a profession built on that science. My final and, I hope, best words are "cultivate the roots and the tree will flourish."

MR. CORBETT: Mark Twain once said: "From time to time you should take out your brain and jump on it. It gets all caked up." I think that's what we are trying to do here. We are all trying to encourage you, figuratively speaking, to take out your brain, jump on it, and let new thoughts come in.

You have heard how four actuaries view the brave new world, the 21st century. Now we would like to hear your views, either as questions or comments.

MS. PHYLLIS A. DORAN: I have a question for Jim Hickman regarding the students that you see today in the actuarial science program. Could you comment on how they compare with students of past years, in terms of their understanding of the profession, what they see as the reasons why they are there, and what they will get out of it.

MR. HICKMAN: Phyllis, I think what is happening is that actuarial science is perceived as a profession with jobs. As a result, all actuarial education programs have expanded, including our enrollments at Wisconsin. If one could measure the knowledge of the students about the actuarial profession, the mean is probably higher as a result of summer employment and the publicity campaign of the profession. But I think that variance is also higher. The reason is that actuarial students tend to be a more heterogeneous group than in the past -- more foreign students and more women. They come with more varied backgrounds.

MR. DICK LONDON: Jim, you referred to the situation as having a need to recognize "impermanence," and that things change fairly regularly and that we need to keep up with change. However, I've always been struck with the impression in the time that I have been an actuary, that there seems to be a lot of emphasis on the ideas of permanence. I have frequently felt that one actuarial attitude is that this problem has now been solved for all time. I would point to evidence that there are techniques and beliefs we have held onto for a very long time which would seem to reflect that.

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One example which reflects this idea of permanence relates to the recent call for centennial papers. When I first heard about this, I thought they were looking for papers that would reflect things that have happened over the past one hundred years. However, what is being asked for are papers that will remain relevant over the next hundred years. What strikes me is not the question of what topics will remain relevant for the next hundred years. Rather, it is a reflection of actuarial mentality -- that something could remain relevant over the next hundred years. So Jim, I find your comment that we *need* to recognize the impermanence of things a bit at variance with that.

The second comment that I wish to make relates to Mr. Curtis' reference to the college actuarial science program as having three priorities -- math, math and math. The implication is that it should be different in the future, in particular with more emphasis on management and communication skills. I submit that for undergraduate programs the emphasis on math, math, and math would continue to be appropriate. My whole career has been in education, and I'm sure it will continue to be so. I have always felt that management topics and communication skills topics are certainly extremely important. However, I think that math is really the appropriate content of undergraduate programs. I would like to see academic actuarial programs develop at a graduate level. That is where the other skills that you were talking about belong.

Finally, to continue on my favorite soapbox of education, and university-based education, Bob Shapiro gave a definition of an actuary as a person who is professionally trained. Bob made a parenthetical comment that this training is not done in the university environment for our profession. Rather it is done through the Society's education program. I submit that many professional people would be of the opinion that Mr. Shapiro's statement is self-contradictory. If education is not done in a university setting, but instead in the self-studying examination driven environment that we are all familiar with, then it hardly qualifies for the adjective *professional*. That has always been a controversial subject in our profession; that is, the correct nature of an actuarial educational program. Again, I have always been on this soapbox of university-based education and I would like to see it strengthened. I feel that the adjective *professional* is somewhat questionable in light of the program we have. Response from the panel would be appreciated.

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MR. HICKMAN: You are correct; even great ideas change. We prove the central limit theorem differently than Gauss did. Our understanding of it is, I hope, a little bit deeper than in Gauss' time. Despite the fact that great ideas develop, there are some themes that you can identify from the very beginning of the actuarial profession to the present date, such as the value of money. We understand these ideas more deeply and we apply them more widely.

The fact is that accountants did not build their profession on a foundation of ideas from mathematics and economics. I think that what separates actuaries from bankers and accountants is the frank recognition that the world is uncertain, life is uncertain and you have to build probability models to understand this world. We understand probability distributions much better than did the early founders of our profession, like Richard Price. Nevertheless, the continuing theme of building probability models has always been fundamental in actuarial science.

The ideas of adjustment, "experience adjustment," has been here almost from the beginning. For example, graduation involves the blending of past mortality experience with current experience and dividends modify price-benefit structures as experience unfolds. We expanded experience adjustment in other areas. We have improved the philosophical basis of experience adjustment and the tools, but it has always been a key actuarial concept.

So, I have no apology for asking, at our centennial celebration, for both a review of the great ideas that have been developed in the past one hundred years, a statement of where we stand, and at least some conjecture of where we might go. Of course, you are right that when you start to apply these basic ideas, the applications change over time. My point is that actuaries have to create an educational system that can do the best job communicating the changing applications. I believe that institution is a professional continuing education system. My examples were software, tax law and regulations versus the big ideas, the foundation ideas, which I listed.

MR. SHAPIRO: I'm not an educator, but I do have a couple of kids in college. It seems the issue is whether or not it is better to have a mathematical undergraduate program or something broader. Judging from what I see, in my limited

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sample, I guess that I would go the other way, that an undergraduate degree heavy in mathematics and light in liberal arts can create a pretty narrow mind-set. A narrow mind-set often leads to thinking there is a right answer, and once we get it, we're done. I would prefer, at least for my own kids, to have them comfortable with the concept that there rarely is a right answer. Half the problem is defining the problem.

As Jim says, computations are easy; principles are tough. Having students able to think through the principles may be better because it would make learning mathematics, or anything else that they are faced with, a lot easier. But again, that's just my opinion. I was a math major and it was more difficult for me to pick up some of the other things. I have a feeling that if I would have been less narrowly educated, I probably could have learned mathematics a little better and applied it a little broader.

MR. HICKMAN: As an addendum to what you just said, Bob, one has to make a distinction between inductive and deductive science. Deduction, of course, is the method of mathematics. This is where you assume some axioms and deduce theorems, and you hope the results are related to the real world. Deduction is important, a lot of fun, and it's the way Euclid thought and how mathematicians continue to think today. Induction clearly is more difficult because the results can never be certain. Induction is when you make many observations and attempt to draw a conclusion. One of the problems in teaching statistics is that students think it is mathematics, and it is not. It is induction, rather than deduction, and there is no single undisputed answer. So part of the problem has been that theology, law and mathematics have tended to dominate early education. Most of us have been trained in deduction. Induction is much harder, and we don't teach it well.

MR. CORBETT: I'm a little concerned that if we don't teach some of the more business and management-oriented subjects in the undergraduate years, the young prospective actuary just is not going to get them. With our lengthy examination process, we are asking for an extended period of time before an actuary can become fully qualified. Also, I believe many of the subjects that actuaries are deficient in today are not learned well from books. I don't think many management subjects lend themselves to self-study. You must get interaction with people through case study, or other similar methods.

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MR. THOMAS A. BICKERSTAFF: Having spent eight years of my professional career in the regulatory arena, I have heard very little that has been addressed to this specific area of the profession. From those eight years, I believe there is a high degree of stigma associated with becoming involved in regulation. What would you envision as being the future for the regulatory actuary? Also, how do you overcome the stigma that is normally associated with that particular aspect or subset of our profession?

MR. HICKMAN: Let's take the first question first, because it's the only one that I know how to answer. The future of regulatory actuaries is bright, and it is bright because of the nature of the world. The 1980 Standard Valuation Law was probably the maximum you could capture in terms of statutory complexity. Yet the world continues to get more complicated. When the world gets complicated and you can't capture it in a statute, what do you do? You get a well-informed professional or someone in civil service to work with you to achieve the public's goal. The regulatory actuary is one such professional who can help write and interpret complex statutes and go beyond what can be written in laws.

How can we overcome any stigma that is attached to regulatory work? I'm not sure. Certainly other nations have done a somewhat better job than we have. The prestige of regulatory actuaries in other countries is higher, Canada and the United Kingdom being two good examples. It appears to be primarily a United States problem, and I'm not sure that I know the solution. I hope my colleagues can shed more light on it. I do think, however, that your future is bright, because I think that all of the economic forces lead us to a greater reliance on experts rather than on the statutes to carry out the public interest.

MR. CURTIS: I think our attitude towards regulators would change if some of the regulators might be a little bit more human. Take the enrolled actuary as an example. Some of the discussions between actuaries and the enrolled actuary group have been almost dictatorial. While we all can work hard on it, I think it's going to require better communications between the two groups. I share your concern. It is a very obvious concern today.

MR. RICHARD G. SCHREITMUELLER: I agree regulation is a dirty job but someone has to do it. I think it will become more important as people with the right backgrounds want to make a career of regulation. Today this is very

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difficult unless you have someone who has already made his mark and can stand the "slings and arrows" of the profession.

I do see more need for actuaries to be involved in public policy, preferably before laws get passed; but if not, afterwards. Only actuaries are inclined to use a scientific approach, where you start with some data and then work through to get an answer. In the public policy arena, you often start at the other end and work your way back to something that will get you to the answer.

I think that we have something to offer to those willing to take an objective view. We are able to counter more effectively those who do not have a base of data to start with. It is especially important that we are now in an era where people who don't have our skills can use computers to come up with the same answers without necessarily having a firm basis to start with. So, I think if we have actuaries who have credibility and who have a public presence, we need to use them.

We need to stress those things that can build the credibility of the profession. Something like the 100th anniversary is a good example. I really don't see that actuaries, working as they now do, are going to have a high degree of visibility. But through other people who are appropriately placed, it can be a very short route to the public arena. I guess I would close by also quoting Mark Twain who seems to be in vogue. "Let's start with the facts, we can distort them later."

MR. KENNETH J. CLARK: All four of the panelists made abundant use of the words *management* and *leadership*. What's the difference between them?

MR. SHAPIRO: You have got to be kidding! The only definition of leadership that I can think of is the "creation of followership."

MR. HICKMAN: I think there is a difference. Franklin Roosevelt was a magnificent leader and a terrible manager. During two great crises (the Great Depression and World War II) in United States history, he developed the political consensus to get some things done that had to be done. No one could ever applaud the kind of management he displayed. He was unable to run the

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executive department of the United States with any degree of order, consistency or economy.

MR. SHAPIRO: Actually, I will give you another answer. The way that I would define the difference is that a leader has the capabilities of defining what needs to be done, whereas a manager will take those things that are defined and get them done efficiently. I think that it's defining the right path and the things that need to be done that would differentiate a leader from a manager.

MR. CLARK: Well, there is the conception that actuaries are lousy managers. I am encouraged to think that leadership is the top characteristic now. Maybe we will have a shot at the other in the 21st century.

MR. THOMAS C. FOLEY: I would ask you to consider what current middle managers and senior managers are doing to train young actuaries on the job in terms of management and leadership. Instead of training robots, which we have been doing for a long, long time, maybe we should train managers. Is there anything that the Society is doing in the continuing education process to train the people in this room?

MR. CORBETT: Well, as I commented, we are doing a lot. There is a session on negotiations. There have been all-day management sessions. We have been sponsoring two-day seminars on management. This is the area I commented on before. I have been one of the people who have said that I don't really think we should be in this business, and I'm rather persuaded otherwise. I still believe that it is better if the proper education could be obtained some other place, but it isn't that easy. It is an open subject that requires much volunteer time.

How much can the Society do? I do think that we are attempting to do some things. Certainly there are some very valuable management courses where, in some companies, people are sent away for two or three months -- very extensive and intensive training such as Harvard and Stanford. I'm never impressed too much with the two or three day sessions. They seem to have a very short-term impact. My own preference is to encourage actuaries to get much more general education, including business and management. It is easier to handle the later actuarial exams when you already have two years of accounting, a year of

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business policy, and extensive case study experience. It makes it harder to pass the initial exams, but I think that in the long run, you are better positioned with that type of education. Unfortunately, it is still in the minority today. I would guess that 90% of our people coming into the actuarial profession today still have a very heavy math orientation.

MR. HICKMAN: We don't really know how to train leaders. But we do know one thing. Simply standing in front of them and telling them to be leaders is not good enough. What we have got to do is discuss hard stuff, explain hard stuff, and bear up under criticism from colleagues. This seems to be the best training that one can get. I would love to see great book discussion groups among actuaries. I want actuaries to read difficult literature and I want them to argue great issues.

