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COMPUTERS AND TECHNOLOGY: WHERE ARE WE HEADED?

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This session addresses the impact of computers of all sizes and types on the environment in which actuaries conduct business. While technology is changing rapidly, attention will be focused on those changes which could feasibly be implemented during the next ten years. This subject will be explored from the following perspectives:

- Internal Environment
 - Actuarial tools
 - Office administration
 - Product and service distribution
- External Environment
 - Consumer expectation and information
 - Regulation
 - Other financial institutions

MR. GODFREY PERROTT: This panel is twinned with one moderated in Chicago by Mr. A. Anthony Autin, Jr. Mr. Autin and I agreed that the panel in Chicago would concentrate mainly on the internal environment, and this panel would concentrate on the external environment. Accordingly, we have not prepared any remarks on the internal environment. We are going to try to look at what computers and technology are going to do to the marketplace in which life insurance companies compete.

There are three people on the panel. The person on my immediate right is Andy Evans, Chairman of Evans Llewellyn, a stockbroker in Seattle specializing in high technology stocks. Mr. Llewellyn is a graduate of Whitman College, and before that, his main qualification is that he grew up in the Silicon Valley with Jobs and Wozniak. He has been a research analyst of high technology stock since 1975. In 1980, he formed Evans Llewellyn with his wife and partner. Mr. Evans will address changes in the financial needs of the consumer, and how purchase decisions are made by him or her. This is going to be a dramatic area of change.

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In the middle is Emory Merryman, Associate Actuary at First Colony Life in Lynchburg, Virginia. He will address regulatory changes that we might expect in the next five to ten years, especially in the valuation area.

Our third panelist is Geoffrey Packwood, President of Design Professionals, a Seattle consulting organization specializing in data processing and planning. Mr. Packwood has extensive experience in the banking industry. He is also Vice President of Development for IFC Systems Corporation, the nation's largest supplier of financial terminals. Mr. Packwood will address how non-insurance financial institutions will take advantage of new technology to market their products.

MR. ANDREW L. EVANS: I will start my discussion by recommending a book that I believe would be of interest to those who are following where computer technology is taking us over the next ten years. The name of the book is Megatrends, written by John Nesbitt. I hope it does not become too topical to bring up a couple of things from Megatrends. I have noticed lately that a lot of editors are writing, quoting, and talking about what Mr. Nesbitt has said as if they had just said it themselves.

The most important point in Megatrends is that we have progressed from a community or society of agriculture to a labor society (the Industrial Revolution), and are now becoming an information society. By an information society, I mean that we are dependent upon people collecting, analyzing, and disseminating information. The tool they use to disseminate information is the computer technology that we will discuss today. The fact that we are becoming an information society means that our time, energy, and how we purchase the right tools to collect and analyze information is critical to anyone in a word processing group or in the actuarial business. Anyone in the financial services must pick some form of computer technology: local area network, databases, spreadsheets, and word processing packages. These things are now being collected in certain computers and imbedded within the operating system. A lot of these things are now being collected in a single machine in a single local area network.

The information society that we are moving into is going to take us well into the 21st century. This is something that we have got to understand and get into perspective. The steel industry, automotive industry, and the forest products industry took us through the 1960's and 1970's. The microprocessor revolution and the ability to put that microprocessor to work, the writing of software to make that microprocessor a useful tool, and the microcomputer industry that is selling the microcomputer into the educational, industrial, and financial systems as well as into the home is what John Nesbitt talks about in Megatrends.

I think it is important that everyone in this room get a perspective on where we are headed in the next 10 to 20 years and how important it is to make the right decisions for their business as it revolves around the microprocessor revolution. There are hardware and software considerations. One thing that I was asked to speak about is how you are going to make a purchase decision, how to help your client make a purchase decision, and most important of all what kinds of purchase decisions your competition is making with regard to the different microcomputer technologies.

As you are well aware, we are moving to more and more powerful microprocessors and more powerful random access memory devices. We are now on the verge of 256K of RAM in a device the size of your fingernail. The combination of RAM technology, microprocessor technology, the I/O ports that are inserted into these microcomputers, and the application software are, for the first time, constructed around generic operating systems. Instead of having Apple disk operating systems, Tandy disk operating systems, Commodore, and IBM, you now have two primary software companies, Digital Research and Microsoft, with generic operating systems. They are MS/DOS (Microsoft Disk Operating System) and CPM/86 for 16-bit microprocessors. These operating systems are being designed into most of the microcomputers sold by the Japanese, the Europeans, and the major microcomputer manufacturers in the United States. If you look at an IBM PC or DEC Rainbow, you are going to have a generic operating system: CPM in the case of Digital and MS/DOS in the case of IBM. The independent software vendors, for the first time, are writing applications programs using generic operating systems. This applications industry shipped \$1 billion worth of products in 1982, will ship \$3 billion worth of products in 1983, and is estimated to be a \$20 billion industry by 1990.

For the first time, you can put a microcomputer at your desk, a stand-alone Rainbow, IBM PC, Victor technology, or Altos using a generic operating system from Digital Research and Microsoft, and a local area network within your company so that machines can talk one to the other. Intel microprocessors or Motorola 68000, 16-bit microprocessors are being put together with other semiconductors on a single board, and you have the power of a minicomputer that use to run \$50,000 to \$500,000 available now for less than \$10,000.

The local area networks - Ethernet, Wangnet, and soon IBM-net - that allow your microcomputers to talk to one another are just around the corner. Applications are being written by people in their homes, in their garages, even within IBM, and Digital Equipment. They are being written by the operating system companies themselves. The key to you, your client, and your competition is that you must have the productivity tool, the microcomputer, at your fingertips. You may have one microcomputer at your desk, that is a CRT, a standard keyboard, a printer, a modem, and a hard disk. You can then have a transportable microcomputer that runs all of your generic software, if it is based around CPM or MS/DOS, that you can take back and forth to home, the office, or on a vacation.

If you are going on a short trip and you want to work on the airplane, you can now buy briefcase portables. There are no floppy disks, but you have software imbedded in a read-only memory chip with as much as 32k of ROM available. This allows a database and a text editor. Once you are finished with your project (let us say you saw a client and thought you made a good presentation) you write a letter on the airplane and download that information into your personal computer when you get back to the office.

The key is that instead of being locked into one kind of operating system from a particular manufacturer, you are now able to buy a generic operating system designed around an Intel or Motorola microprocessor. Thus, you are able to take advantage of this incredible library of application

software solutions, whether they be spreadsheets, word processing, or databases. This is going to enable every individual within your company to talk to one another on their personal computers. They will be able to go home on the weekends and take a piece of data out of the database, work on a problem, insert the data back into the database, and their partner or the team that they are working with can see the work that was done overnight or on the weekend.

For the first time, the microcomputer, the microprocessor, and the software that are being combined are bringing a productivity tool to our fingertips for as little as \$900 for a small portable for your briefcase, and as much as \$10,000 for the Apple Lisa. Apple has developed their own proprietary operating system because they have so many installed dealers and people using an "Apple" disk operating system. There are so many people writing software for Apple that they were able to imbed the spreadsheet, the word processing, the text editor, the database, and the scheduling in the Apple disk operating system. Now on one screen you can have your schedule up in the right-hand corner, your letters that you want to fire off by 9:00a.m. on your left, and your spreadsheet down below as you are doing calculations to put into the letter.

That type of technology and software is going to be available on the IBM PC's, the Digital Equipment Rainbow, the Altos, and the Victor Technology 9000. These are the four major microcomputer companies that are going to be here ten years from now. The reason, again, is because they are using generic operating systems and generic microprocessor technology that was not available in 1975. It was just becoming available in large quantities in 1980.

Again, the software revolution with the microprocessor revolution is giving each and every one of us a productivity tool that we did not have five years ago. What you do with that productivity tool, how you make it work for you and your client, and the price breaks as it comes down in the next ten years is going to be critical. Your client, in their office or home, will have access via two-way cable, satellite, or microwave to a number of databases. He will have a number of choices and be able to do a lot of "what if" scenarios that formerly were done on a one-on-one basis by you. Your clients are going to be able to do a lot more on their own projects within the next ten years.

If you can communicate solutions and packages for your clients, using the new technology and your understanding of the new technology, what you present to your client is going to put you ahead of your competition. I can guarantee that in the financial services industry, whether it is Merrill Lynch, Bank of America, Prudential-Bache, or any one of the major insurance companies that are getting into brokerage, savings and loan, or the banking business, companies will have the local area networks and microcomputers on their professionals' desks. Without them, you will not have, or be able to analyze, the information you need. Instead of doing three potential possibilities, with these new tools you study dozens of possibilities. You can literally slice a piece of information apart, work with that information, insert it back into your data, and see with a single keystroke how it effects all of your other predictions and your other analyses. That database capability is being brought to the end user, to the professional, to the education area, and to the homeowner in software packages that are selling for less than \$500.

I would expect in the next ten years to see more and more application software that becomes easier and easier to use. Right now, we have what is known as static software. The program is almost imbedded in stone. You can change the variables, you can set up certain attributes, and certain relations, but the software still works the same way one year after you bought the software package.

In the next three to five years, I expect to see voice recognition, voice synthesis, and what we are calling dynamic software (soft software, learning software, the whole world of heuristics). You will see application software begin to learn your habits until it recognizes that more likely than not you are going to ask for file XYZ after working with file ABC. It literally throws up on the screen the three most likely things that you would ask for. Making a choice will be a keystroke, or you are going to have a mouse that simply directs an arrow and says, "I would like to see file B." That dynamic software and the ease of use of that software is going to make the microprocessor more and more powerful and the microcomputer more usable and in demand at every level of our society.

It is important to read about it, to own one, and to use one. You do not have to know how to program. That is not going to be a criteria any longer. Software is literally now in English commands. Expert systems are coming out from many of the small software companies which allow you literally to say, "I would like to see file ABC." Instantly, up comes ABC and the program does not say you cannot use "I would like," you have to say "please show." Language not going to be a problem in the next couple of years because the amount of storage capability within these microcomputers will allow them to search and understand the words "I would like to see."

Finally, it is important to understand that what has been a mainframe, data processing, minicomputer environment is rapidly becoming a microcomputer environment. There is a book that I just finished called Fifth Generation. It is about a project that the Japanese have funded with a minimum of \$1 billion that hopes to ship by 1987 to 1990 what is truly going to be a revolutionary microcomputer. It is going to be the kind of tool and partner that literally, through voice recognition, synthesis, and dynamic software, you cannot be without.

To my way of thinking, and from the analysis that has gone on by Wall Street of the microprocessor and of the microcomputer companies, every 12 to 18 months there will be a leap in technology. The Japanese are going to be there in a big way from a hardware standpoint, and I believe the United States will continue to lead in the software area. Reiterating, we are in an information society. The ability to collect information, to analyze it, to do "what if" scenarios, to fire off a letter or report, and to graph the results (in color) is going to be critical in the presentations you make in the next three to five years. The sooner you learn how to use one of these tools at your desk, at home, and on an airplane, the more effective you are going to be in industry.

MR. PERROTT: Geoff Packwood is now going to talk about how non-insurance financial institutions are going to compete with us.

MR. GEOFFREY W. PACKWOOD: Good afternoon. I want to talk briefly about the financial industry. I want to bring us all up to a common level of understanding about where that industry is going, where it is today, and what has happened to it over the last five years. From that, we launch forth into the future.

The financial industry up until about five years ago, and even today, is a very heavily regulated industry. About five years ago, governments started changing the regulations to allow the savings and loan companies to move closer towards commercial banking, and to allow the banks to move closer towards savings and loans. As a result, there is a great blurring of distinction between those groups.

Over the past 12 weeks, as a function of my task as a Vice President of Development for IFC, I have gone around Canada and the United States asking bankers and people in the savings and loan industry where they think the future of banking will be three years, five years, ten years from now. What we are seeing is a general acceptance of the fact that the old way of doing business, which in banking is known as "managing the spread," is going away. In the past, they took my deposit, charged me for a checking account, did not give me any interest, and then loaned me my own money back at 12%. That was a good business. With the advent of the money market certificates and funds, the cost of money is now very expensive. As a result, there is great emphasis within banks to minimize costs, to try and screw down operational costs, and to offer a variety of services. Anything that will generate a fee is the way to go.

There are approximately 14,500 commercial banks in the United States today. The estimate is that within 4 years that will be down to 6,000, and within 10 years it will be down to a 1,000. This is going to happen through mergers and acquisitions. Seattle-First National Bank has just been acquired by the Bank of America, for whatever reason. We are going to see more and more large financial institutions in America such as you have everywhere else in the world. In Canada, there are six or seven major banks. In Britain, there are six major banks. In Australia, there are six major banks. In France, there are about six major banks. Those banks have nationwide networks and delivery systems which allow them to get to the farthest reaches of their marketplace and deliver services. The banks we have talked to are not concerned about their banking competitors. They are not interested. They feel they can compete very well with banks and savings and loans. They are terrified of Sears and Penneys, and the delivery systems that come with those people.

In order to move forward and make money in the financial marketplace, most of the banks are starting to think about the products they offer and the way in which they charge for services. They are specializing the services by location. We hear now of the "hub-and-spoke" concept where you might have a head office of the bank and regional offices of the bank that offer a full range of services, but local branches might not offer the full range of services. The local branches would open new accounts, but they would not, for example, do commercial loans, or only do some degree of installment lending. Then there would be convenience stores out from those local branches with a series of automated teller machines or customer activated devices that merely dispense cash and take deposits.

Everyone is focusing their attention on how to be more efficient in getting that delivery service out to the consumer. Some of the services that bankers think they are and will be providing within the very near future are, for example, all the traditional banking services, leasing services that they are doing today, insurance services that they are doing today, mortgage lending, brokerages, discount brokerages (every bank has an association with a discount brokerage house), and travel agency services. If they have a delivery service, they have the facility through computing to get into a network that allows them to get to American Airlines Saver-System. Why shouldn't they book your airline flight and charge you a fee? These are the sorts of things they are doing.

There is a great movement afoot. Everyone believes that home banking is the next significant step. Interestingly enough, no one in the banking business believes that bankers are going to control home banking. They believe that the people who run the networks, AT&T or whoever, will offer services, part of which will be an ability to tie into your local bank or your local insurance company or whomsoever else you choose. We have a tremendous information gathering and dissemination exercise going on in the country. There is a well-known paper that was written by a man from Arthur D. Little. The final comment of his paper was "he who controls the network controls the world." I think that is probably true.

One of the things the banks are doing that they have never done before is to get into a situation where they can price relationships. Instead of charging by product as they do today, for example, charging me \$.20 for every check I write, they want to look at my relationship with the bank. They want to look at the fact that I also have a commercial loan, two installment loans, and I use the automated teller devices. Whatever that total relationship is they want to gather all of the data together, price that relationship, and charge me on that basis. This is already happening. Citibank is now refusing to cash checks in two branches in New York City for anyone who has less than \$5,000 in their checking account. That is a fairly significant move. Citibank can afford to do that, most banks cannot. It shows the trends that are coming. A New York City bank installed one or two gold-plated teller machines in an apartment block they owned. The apartment block is used only by their customers. The interesting thing about those gold-plated machines was that the minimum amount of money you can withdraw from them is \$1,000.

The market is polarizing. People are slicing the marketplace to give preferential treatment to those people who bring a lot of business and money into the bank. A bank will look much more favorably on me if I have \$10,000 in my checking account on which they are paying me no interest, whether or not I have a loan or write checks, than if I am Joe Blow who has \$100 in a checking account and I constantly bounce around on the margins of float. They are going to charge me like crazy if I have \$100, but not if I have \$10,000. That is changing.

When we talk to these bankers, the thing that they are most concerned about is moving technology out to the user, and letting the user, through customer activated devices of one description or another, do the work of a teller. Teller machines are the classic example. Banks thereby reduce the need for labor and reduce their operational costs. An industry survey has just shown that the average teller machine transaction costs a bank \$.08. The average check costs a bank \$.50 to process. Most banks today charge \$.20 cents for a teller transaction, and they charge \$.10 or \$.15 for a check. That is wrong and it will change.

Selectively, people are now starting to charge lots of money for cashing a check and giving away the teller transactions, the ATM transactions. This will force the user to use the machine, which is cheaper for the bank. We will be seeing more of that. In the lobbies, instead of six tellers at six windows, you are probably going to find within the next year or so two tellers and two cash machines. Five years from now you are not going to find any tellers. What you are going to find are customer service representatives who sit at a desk and have a microprocessor in front of them which acts either as a teller machine or as a new accounts platform-type machine. It will be able to produce loans for you right there. It will do any of the banking functions that you need to do that are allowed within that level of branch.

Back to the "hub-and-spoke" thing; some branches will have the capability to open new accounts and others will not. I have just come back from the ABA show in Miami, and one of the great things we saw there was all of the nice glitter of hardware with touch sensitive screens which are extremely friendly to users. That is all very nice, but more than ever, we saw the small software companies writing application software on generic operating systems. I absolutely agree with Andy that the future is in using those systems to bring applications to market, to allow customers and users of the equipment to very easily customize that stuff themselves and help them be more productive in the way in which they deal with their customers.

Now if we think about nationwide networks, we think of the Bank of America having branches all over the country, which will happen within a short amount of time. If you plot technology price/performance over the last 25 years that the computer business has been in existence, there has been a 20% per annum compound improvement in the price/performance characteristics of systems. What that says is that something that you bought in 1960 for \$1 million, you can buy today for \$2,000. It also says that something that you can buy for \$2,000 today, 10 years from now will cost you \$250. This means home banking will very soon be here with us. Not because you are going to buy personal computers and take them home, but because houses that are being built in the next five to ten years will, in order to save energy if nothing else, have microprocessors built into the heating and air conditioning systems.

Those microprocessors will be so powerful that they will just stick a smart keyboard on them and dial them into the local telephone network which will allow you, sitting at home, to call up data from, let us say, seven insurance companies. If I want to buy \$100,000 worth of life insurance, I can go into seven different databases five years from now and find out which one has the best deal for me. I can do that sitting at my little portable. That is a frightening thought.

I will be able to do all my retail shopping by using video text. This is happening as a trial project right now in Toronto and is very successful. You do all of your shopping across a screen. Machines are going to be so cheap that when you walk into a bank in the future as you open your new account, they will give you your portable to take away with you. That is a fact, it is happening right now. You can buy a portable today for \$900 that has 256K of memory. You can do a tremendous amount of work in that. When I started computing, a long time ago, I had 2K of memory to work with.

One of the other things I have been doing over the past 12 to 13 weeks is looking at chip technology, simply because I am involved in some research projects that are looking five to ten years hence. I am looking at 17 different microprocessor chips. All of these minimally are 16-bit processors and are incredibly quick. The Motorola 68000 is a superb chip, as is the Intel 286. We are not only going to find standardization in operating systems, we are also going to find standardization in chip technology. That means that application systems that are being written will also be written in standard high level languages. Languages that are easier to use, that make more productive use of programmers, and have the added ability of being transportable. I will be able to pick them up off one machine, and given that I have the same generic operating system and chip on another machine, they will drop in and run. That is very powerful. We have never been able to do that in the past.

I know nothing about the life insurance business, I pay my premiums like everyone else, but I think you need to recognize that your world is changing. I used to be in charge of a very large systems development environment in a bank. The one thing you will find as actuaries is that the one place you cannot get a lot of support, generally speaking, is the data processing department in your own environment. The reason for that is, if you think about it, you are a real pain in the rear-end to them. You run the sort of jobs that they cannot easily assimilate. They have production jobs to do. They want to get out all of the policies; they want to crank out the bills. Then you come along with some relatively esoteric problem that is going to sit in their machine and just quietly soak up all the CPU time for 2-1/2 hours. They do not want you folks, and I am sure you know that. It is very difficult to get them to help you run those things. It is very difficult, also, to get them to help you design systems because they do not understand your business. They understand cranking out bills. They do not understand actuarial things. What that gets us to is, with 16-bit and 32-bit technology, you are going to have the capability (you have it today) to have on your desk a machine that will be able to crank out the sort of things you want. They may take four hours or six hours instead of two, but you can do it yourself using languages like APL, with which I am sure a lot of you are familiar. By writing in FORTRAN, PASCAL, C, Fort, ADA, or any one of these higher level languages, you can do the work yourself and be independent of your data processing department. Boy, is that ever removing the shackles from you. If you do not do it, your competitors will. The banks will do it. The banks will do anything to generate money, anything at all. So you had better do it.

What I therefore suggest you do is aggressively compete and be innovative in the use of this technology. It will help you reduce the administrative costs within your organization and thereby, hopefully, reduce my premiums. I have got a wonderful Welsh phrase here that says, "Heartily embrace the future." It is a very exciting time. I am amazed by the things I see happening, and I have been in the business a long time. One of the things the insurance companies will have to do is form relationships with people who have these nationwide or international networks so that you can bring your product to the marketplace. The marketplace is not going to come to you, you are going to have to go to them.

I would like to wrap up by saying it is a very exciting time. We have seen nothing in terms of technology, yet. We have just scratched the surface. The next ten years are going to be much more exciting than the last ten, which were in turn much more exciting than the ten before. To use a good old American phrase, "Go For It."

MR. PERROTT: Thank you, Geoff. Now to come down to earth. You have heard the non-actuaries on the panel. Mr. Merryman is going to talk about what might happen in the regulatory area, particularly as the insurance departments get hold of the same power that Andy and Geoff have been talking about.

MR. EMORY H. MERRYMAN: The insurance industry has changed greatly over the past decade. Much of this change has been made possible by advancements in computer technology, both hardware and software. This change will continue.

Regulation of the insurance industry had changed over the past decade and will change greatly over the next decade. Much of this change is in response to changes in the insurance industry, but much of the change can be traced to demands of the general public. From this point of view, the computer does not cause change either in the industry or regulation of the industry, but makes the desired change feasible.

Regulators are concerned with at least the following areas:

1. Protecting policyholders.
2. Assuring equity among various classes of policyholders.
3. Solvency of the life companies.
5. Solvency of the governments and how, by taxing insurance companies, they help themselves. This last point requires that our view of the regulation be broad and include the tax agent, and to a certain extent, the legislators.

From the point of view of protecting policyholders, one of the first concerns of the regulator has been and will be nonforfeiture requirements. In times past, with a fixed premium product, a company could file an actuarial justification with sample calculations for one age. For a whole life policy, the regulator could refer to his Society Commutation functions and verify that set of calculations almost by direct comparison with the published values. With the increase in graded premium products, it is not as simple to check out values. As such, regulators will most likely use software so they can input the premium string, interest rates, etc., to assure compliance with the nonforfeiture requirements. Even when the regulator is convinced that the values produced by formulae used in the actuarial justification will satisfy the minimum nonforfeiture requirement, he may need to use a computer to verify that the formulae-driven values are in fact what the company says they are.

The regulator has, in the past, required more readable forms. We are all aware of the joke about the coverage of the policy being taken away by the fine print. When a regulator was concerned with readability, it often had

to do with color of the paper and size of print. More recently, our attention has been focused on letter-size paper versus legal-size paper and counting the words and syllables in a form. In the future, more emphasis on readable forms should be expected. New techniques may be demanded which before did not seem feasible. However, computers make things seem feasible; feasible for the company to do and feasible for the regulator to double-check.

On the subject of disclosure, quite a few states already require policy summaries. Universal life products usually need illustrations to policyholders at issue and regularly thereafter. With the computer making it possible for the industry to produce new and different illustrations, we should expect the regulator to be involved. This is both from the point of view of stopping illustrations that the regulator deems to be potentially deceptive and misleading, and of requiring illustrations which the regulator may deem informative and useful. The products of today and tomorrow share different risks with the policyholder than those of yesterday. The regulator will most likely require illustrations which focus on a comparison of these shared risks. Illustrations which seemed appropriate to compare non-participating whole life products may not be as adequate for interest sensitive products.

The regulator will be involved in factors used to determine rate classes. Computers not only aid in the storage, maintenance and updating of information, but also the analysis of this information. As such, factors which at one time were ignored for rate making will be considered in the future. Currently, the use of sex in calculating rates is both common and under attack. One justification for this attack is that other more significant factors are not being considered. Thus, it seems plausible that in the future not only will the regulators want proof that the factors that are used for rate classes are significant, but that other more significant factors are also considered.

As more factors become involved which are under the control of the insured, it seems plausible that the insured's rate class might vary with time. It is much easier for a nonsmoker to change his smoking habits than for a person to change sex. If regulators start to expect reduced rates because of a favorable life style, future laws and regulations might also allow rates to change for an insured when that life style changes. That is, the insured might be expected to be on the risk for changes he can control. If a person is given a special rate for not smoking, he may lose the special rate if he takes up smoking. In the future, an insured with a special nonsmoking rate might be expected to submit with renewal premiums a statement that he has not smoked since the previous premium was due in order to keep his nonsmoking rate. Otherwise, he would be expected to pay the rate for smokers to keep his policy in force.

Solvency is a concern of the regulator. The most recent changes to the valuation law provide for automatic changes in the valuation interest and give the NAIC the power to adopt new mortality tables. The 1941 Commissioner's Standard Ordinary table lasted roughly twenty years as the valuation mortality table. The 1958 CSO table also lasted roughly twenty years. Both were adopted by action of the various state legislators. Because of the length of time they were expected to stand, the difficulty to implement a new table, and the application of the valuation table to

all standard insureds for ordinary insurance, the margins had to be more than they might have been if data for a new table could be gathered, and the table calculated and approved quickly. With the computer enabling more tables to be calculated from data quickly and the pressure of consumers to consider relevant factors - such as smoking habits, family health history, physical condition, recreational and occupational activities - the future mortality tables are apt to have smaller margins built into them. When these tables are revised, the industry may be expected to get on the new basis quickly and without the long transition period which we had when the 41CSO and 58CSO tables were adopted.

One price for the smaller margins may be the requirement that the smaller margins be justified. For example, to use the dynamic valuation formulae for interest on single premium immediate annuities, the state of New York requires an actuarial certification. Among other things, this certification could involve association of assets with the reserve for the single premium immediate annuities and certification that the cash generated by these assets will support the annuities. This certification would be difficult to prepare without the aid of the computer. In the future, we may see alternative calculations where the calculation producing the smaller margin has to be justified by a process that cannot easily be done without the aid of the computer.

Note that the regulator's push in one area may well go against his direction in another. Many regulators feel that insurance companies collect too much personal information. Much of the public thinks information on an applicant's life style, moral character, income, and other life and health coverage in force is improper for insurers to collect. Thus, we may well see a push in some states for factors to be considered in determining rate classes which in other states might be illegal or, at best, of doubtful legality for the insurance company to collect. In any event, as computers enable more sophisticated information to be gathered, what may be required to be used in rate classes one year may be optional and/or illegal to collect, much less use the next year.

Also, with more states using computers in auditing, the states may be more inclined to do their own audit. The regulators may want a computer tape copy of the annual statement to run through their computer program to see if their requirements are met. At least one state already does this. The states might be less inclined to rely on the audit of an insurance company's state of domicile. In this way, the regulator could be sure that if a company's annual statement was short in one area, the statement had enough fat in another area so that the valuation requirements are met overall.

Since the early days of the industry, reasonable approximations have been accepted in valuations. With the powerful computers and computer technology of the future, especially for new products where traditional approximations are not already standard procedure, the regulator might call for an exact calculation. If the regulator deems it almost as easy for the company to supply the exact number, why should he settle for an approximation? In other cases, why should the regulator insist on an approximation?

An example of an approximation more or less insisted on by the regulators is that in renewable term type products, sufficiencies cannot offset deficiencies in calculating deficiency reserves. With the power of advanced computer technology, it would be feasible in the calculation to allow sufficiencies to offset deficiencies which occur at later durations. This calculation may well have been rejected because the regulators felt either it was not feasible for the company to perform, and/or too difficult for the regulator to properly audit. With powerful computers and software, this calculation could be done, and the regulator may feel this test could be used.

A second example of an approved approximation is the 818C election for estimating net level reserves given preliminary term reserves. In times past, it was not practical and would have been almost impossible for a company holding preliminary term reserves to get exact net level reserves for Federal income tax purposes. At this time, for most companies, it is definitely possible if not very practical. In the future, the Internal Revenue Service might require it. In any event, we should expect that various taxing authorities, when revising taxes in the future, will do their projections under multiple assumptions so that under most circumstances their desired revenue goals are met.

One caution for the industry is with increased data being available and quicker analysis of the data, there will be increased pressure on the regulators to regulate based on "old facts" which previously were not proven. Often this pressure will come from people who only think insurance and who do not fully appreciate that different types of insurance insure different types of risk. Regulation which is proper and appropriate for one risk might not be appropriate for another type of risk. Because of the speed that the computer gets information out and pressure from consumer groups, the regulator may well be able to implement new regulations before the industry has time to study the potential favorable and/or adverse consequences of the new regulations. The industry will need to be able to react quickly. Even better will be to anticipate and act, not react.

In conclusion, as time goes by we should expect more states to use computers in various areas of regulation:

1. This should allow the regulator to look at insurers licensed in his state - both those domiciled there and elsewhere - to be sure those companies comply with his state's regulations.
2. Because of the speed with which things can be and will be revised, required margins might well be smaller. More elaborate calculations will be required to justify these smaller margins. In the absence of this justification, the smaller margin might not be permitted.
3. As various groups become more aware of potential discrimination for and/or against them, there will be more pressure on regulators to, in some cases, permit or demand rate distinction - in other cases frown upon or forbid discrimination.
4. The regulator will be under pressure to revise regulations more quickly and as such, the industry will need to be able to react quickly.

MR. PERROTT: At this point, if anyone has any questions or comments, I am quite sure the panel will try to answer them. Having lunch today, it was obvious that they are not at a loss for an answer to any question.

MR. EVANS: How many people already have personal computers? How many of those people bought IBM's? Digital Equipment? Altos? Victor? Everybody bought IBM then!

MR. PACKWOOD: There was a statement made the other day by a man from Intel which was one of the most profound things I have ever heard. He said, IBM had recently done some surveys and 70% of all the software that is currently being written in the U.S. is being written for the IBM PC. Not 70% of all the personal computer software, but 70% of all the software being written in America. That is incredible. If you were to standardize on any PC right now, for that reason and that reason alone, you would be foolish not to think about the IBM PC.

MR. COLIN E. SOUTHCOTE-WANT: One comment first of all about the IBM PC. I was recently experimenting with it; I wanted to accumulate \$1 million at 9% for 50 years, and the thing did not calculate it correctly. I could not believe it. I put in \$1 million times 1.09 to the 50th power and the answer was wrong. This was using Microsoft disk operating system.

MR. EVANS: There are two versions of Microsoft Operating System. There is the 1.1 that came with the original PC when it was shipped in August of 1981. Now there is a 2.0 version because some of the calculations did not work.

MR. SOUTHCOTE-WANT: How recent is the new version?

MR. EVANS: It was just released three months ago, and you should spend the \$60 and buy Version 2.0. Take my word for it.

MR. SOUTHCOTE-WANT: Besides that calculation, I put in some variations of that calculation using the exponential function and the log function. I put in six different versions of the calculation and got six different answers, all of which were wrong. It turns out that the reason for this is that the functions in that particular version of the disk operating system are single precision functions as opposed to double precision functions. The error, by the way, was about \$4 in \$10,000. It was not incredibly big, but it was there. I do have one question which I would like to direct to Mr. Evans. I am wondering, with regard to third world countries, what the impact of these kinds of computer systems is going to be? Countries that have really never gone through the industrial age, will they perhaps move straight from an agricultural environment to an information environment?

MR. EVANS: It is interesting that in today's Wall Street Journal, on the front page, is a great discussion about how the personal computer in schools might bridge the gap between the wealthy and the poor. That would leave me to believe, certainly in third world countries where they have not had the tools to teach and educate their people, that the personal computer will bridge the gap much more rapidly between wealthy countries, western countries, and third world countries. That is, the personal computer together with the training aids and educational tools that are coming out.

MR. STEVEN D. BRYSON: You mentioned that you do not need to be a programmer any more. Does that mean it is no longer going to be necessary or even important to be able to write your own applications? Will there be enough variety in the software available that you might as well not even bother being able to program?

MR. PACKWOOD: The answer to that is that with the advent of more and more sophistication in processes and more available memory, the people who are going to write application software are going to do many and wonderful things. Not the least of which is that they are going to be able to allow you to "talk" to the machine. This will mean "talk" to it just as I am talking into this microphone or converse with it through a typewriter or touch screen in the English language. One way or another, you will not need to go through the form, structure, and procedure of writing a program.

About four years ago, I was working on a very large system called a Multex System and someone demonstrated to me the use of a language called English. That is funny, because I am Welsh.

In the demonstration I saw four years ago, I sat down at a machine and the man told me he had put some general information in a database about New York. One of the things that was in there was distinction in terms of sex, male or female, on all these records on people in New York. He told me to ask a question of the machine, so I sat down at the keyboard and I asked the machine literally, "How many women are in New York?" The machine immediately came back and said New York City or New York state. So I started to type again, "How many women are in New York City?" The man stopped me and said, "No, don't do that. Type in city." I typed in "city," and it gave me the answer. The man asked, "Would you like to find out how many there are in the state?" I said, "Yes" and started to type again, "How many women are in New York state?" I am a very structured person, right. I make my living by writing programs, or I used to. He said, "No, no, just type 'and state.'" So I did, and it gave me an answer. That is the sort of thing that is coming along.

There is another Silicon Valley, and it is in Spokane, Washington. Keytronics, a small company in Spokane, Washington, is the largest producer of keyboards outside IBM. They just introduced at the NCC (National Computing Convention), a voice synthesizer. You can go up and talk into the machine. I can well imagine that the system for which I typed in those questions on a keyboard can now answer me; it can listen to my questions, decide what I am talking about, structure an answer, and spit it back out to me in an English-speaking voice. That is the sort of thing I see happening. I do not think people need to be programmers. The generation of systems I am working on right now have a desired goal that they do not need anyone with any data processing experience to not only use them, but to tailor them. That is perfectly feasible.

MR. BRYSON: I guess part of my question relates to my own background, having been in a data processing department of a large insurance company as part of my actuarial rotation. Is there going to be any way that I will be able to take advantage of that, or will I just be on a par with everyone else who does not have that experience? Another way of saying the same question is, if I go out and buy that IBM PC, should I even bother looking to see what kind of compilers are available or should I just pick up on the software that is available?

MR. PACKWOOD: There is not enough software available today for you to do that, but two or three years down the road there will be. The other thing that is interesting about software is that over the years, I have had the occasion to sell and to support computer sales in various types of industries. You can pick up an accounts receivable program that works in a manufacturing environment and go from customer A to customer B. They will say we cannot use that because we are different. The time has come when the companies are going to have bend, rather than have the applications bend. If you find a 90%-95% match, grab it and go with it, because it is much more cost effective than rolling your own. That is the way things are going to be. The people who have actuarial knowledge and computing experience will be the people who will write the software that the actuaries will use. As such, you will have enhanced value because you will be a rare breed. But most actuaries will not need to know. The machine will converse with them in terms that are familiar to them, and they will have the power to crank this stuff out very quickly.

Mr. DALE R. OLDHAM: The IBM has the Intel 88 microprocessor and several computers have what I believe is the more powerful Motorola 68000. How do you explain the more popular IBM, since it is not on the leading edge?

MR. EVANS: If you look to the 286 or the 186 that Intel is now delivering with advanced micro devices as its secondary source, it is going to be very competitive with the Motorola 68000. You are going to see continued choice of design around the 8186 and 8286 from Intel because of all the peripheral chips. The operating system that interfaces with the 68000 for Microsoft or from Digital Research is not as well developed and you do not have the applications being written for the Motorola family. It is not so much the difference in power, but it is the peripheral chips that are available, and the applications that are written around the 8088, 8086, 8186, and 8286 using MS/DOS and CPM/86. That is critical because the IBM PC, the Digital Research Rainbow, and the companies that I mentioned must have the large independent software base of solutions for the end user that are very easy, very useable. Otherwise that box will just sit there.

MR. OLDHAM: Do you feel that a lot of software will spring around the 8087 and the number cruncher that I can plug into my PC?

MR. EVANS: Oh yes, right now you can add a board that has the 8087. The operating system, especially MS/DOS 2.0, makes good use of all those peripheral devices.

MR. PACKWOOD: From a chip point of view, you must think about the people who are going to be writing the systems of the future. They are the people who are called the OEM's (other equipment manufacturers). What they look for in making the decision on a chip is not the power of the chip itself, because one chip is just about as powerful as another. The Motorola 68000 is an incredibly elegant design. It is delightful. The programmers who work for me love it because it is elegant. The managers who work for me, but have to make business decisions, do not like it too well because it does not have the support around it making it easy to integrate and quick for us to implement applications.

For the IBM PC, the chip decision was made in the full knowledge of the fact that it was something that could be implemented quickly, although it was a limited type of device. It has an internal operating speed of

16-bits, but an external bus width of only 8 bits. It is, however, completely compatible up the range, through the 186, the 286, and so on. The software that is being written today on the IBM PC will be able to use the 286 or the 186 when IBM decides to put that chip in that device. So, that is the reason.

MR. OLDHAM: One other quick question, you said to spend the \$60 on the 2.0 version. Were you serious, and if so, why?

MR. EVANS: Absolutely.

MR. OLDHAM: I do not have the hard disk.

MR. EVANS: No, no. The Operating System 2.0. It has a lot of integrated features and corrections from Version 1.1. I am not certain whether the problems in calculating have been overcome, but I certainly expect that if there was a serious flaw, 2.0 has taken care of that. There is no comparison between 1.1 and 2.0. Version 2.0 is a much better operating system.

MR. PACKWOOD: The answer for the calculations, incidentally, is that it is a single/double precision problem. If you plug in an 8087 chip to do your arithmetic and floating-point functions, that problem goes away. I do not know whether it is covered by 2.0. But, if you plug in an 8087, it will also run 20 times faster.

MR. HARVEY SOBEL: I have a question for Mr. Evans. You mentioned in your talk that ten years down the road you foresee all professionals having their own work stations using micros. I am just curious today, as you look at various industries, what you see as far as work stations. The insurance industry has been a bit slow in this area.

MR. EVANS: I think the key is that distributed data processing coming out of the minicomputers of the '70's is now going to be superceded by the 16/32-bit local area networks: Ethernet, Wangnet, IBM-net. You will be able to communicate from machine to machine sharing peripherals, printer, hard disks, and a series of add-ons that will be available during the next few years. That local area network, that work station environment, is going to be much more economical and easier to train all of your assistants and yourselves on. The reason why I see that local area network and an IBM or major microcomputer manufacturer installing these systems in every financial institution (insurance companies, banks, et. al.) is because it is going to be so easy to use these systems and their productivity and their efficiency rate will be so high you will not be able to do without them.

MR. SOBEL: You are talking about the future. Are you saying that you have not seen much happening until now and that very shortly it is going to be breaking?

MR. EVANS: No local area networks to-date have been satisfactory, but it is imminent. The office of the future where machines can talk to one another and to all of the peripherals is the breakthrough for 1983-84. All the bugs will be worked out, I am sure, in 1984.

MR. PACKWOOD: It is very interesting. A very good friend of mine is a senior engineer for Boeing. He said that when he went out and recruited people out of the universities last April or May and they arrived for work in August, 50% of them brought their own machines. That is an incredible thought. It means the man walking through the door is instantly more productive than anyone you have there. It is very difficult for people who are already in the Boeings of the world with their hand-held calculators (there are still some people using slide rules) to compete on a productivity basis with these fresh people out of college. The arrogance of youth. I love it.

MR. EVANS: In fact, there is a university that is contracted with Apple Computer on the Macintosh System to be shipped in January of 1984. It will have Lisa-like qualities, a Motorola 68000 Apple/DOS, and be transportable. They are requiring that you purchase, for \$1,500, a Macintosh upon entrance to this university.

MR. GEOFFREY CROFTS: We just recently joined the business school at the University of Hartford, and I had heard a lot of these comments about being able to use software and do all kinds of things with it. I did not really believe it until I observed every day in the business school the business majors, not computer science majors, using these computers all day long. I am absolutely amazed at the ability of people to go in and use computers today without needing to program. I have one question for Geoff. Why do you not like APL?

MR. PACKWOOD: Because I am not a mathematician, I suppose. It is something with which I am not familiar. No other reason.

MR. MERRYMAN: APL is available on the personal computer, as a matter of interest.

MR. EVANS: One problem with APL is that it is not very transportable. If you write an application in APL, you have trouble getting it from machine to machine. Of course, the independent software vendors want their software to run on all of the different kinds of operating systems and chips that are out there. Thus, they are tending to write in C, FORTRAN, or PASCAL because it is much easier to bring those applications up on a different operating system once they have the capital to do so.

MR. J. MICHAEL HARRINGTON: I have a question. If I were to purchase an IBM PC, how soon would it be outdated from a hardware standpoint? When it was outdated, if I wanted to have the state-of-the-art, would I be forced to purchase a new machine or could I upgrade?

MR. PACKWOOD: Why would you bother about whether you are state-of-the-art or not? My answer is, does it solve your business problem? If it does, great. If it does not, do not buy it. But, do not wait. Technology is changing so quickly that when you buy it, it is out of date. It is out of date now. Does it solve your business problems?

MR. HARRINGTON: The reason I ask is that in your talk you mentioned some of the problems that maybe you could solve now in two hours on a large machine would take six hours on PC. If a new small micro came out that could do the job in two hours, I think it would be wise to go to that. Could you upgrade, or would you have to start completely over with a whole new machine?

MR. PACKWOOD: Last week someone who works for me, and this is getting technical, replaced a Z80 chip, which is an 8-bit chip out of a machine that we run at 4 megahertz, with a Z800 chip. The application now runs four times faster. Nothing changed, just the chip. You are going to be able to do the same thing by unplugging boards and plugging boards in. So go buy it. Do not wait. Never wait. It will cost you \$2,500 today, and you will be so much more productive in the next six months that your company ought to buy it for you and throw it away in six months.

MR. TERENCE W. SAUER: I am wondering what is going to happen to the large mainframe computers now that we are definitely going to microcomputers for our own uses. Will they still be used for all the other premium processing purposes, or are they going to be phased out in the future?

MR. PACKWOOD: The very large mainframes will continue to grow at the same pace in terms of price/performance that the micros are growing. Their uses will essentially be to run very large operational tasks that handle huge volumes of data. The limitation with micros today, and it will be a limitation for three or four years to come, is that you cannot hold enough data and manipulate that data quickly enough to be able to churn the things you want to churn over; to invert matrices or whatever you want to do. The large mainframe will do all the very large, voluminous grunt work and, this is the important thing, maintain the accuracy and security of the data on your behalf. What the micros will do is provide a gateway into that database by use of very, very intelligent programs on the mainframes.

For example, you might ask a question on the micro which has to go to the mainframe and collect data out of a relational database. A relational database is something that stores data in a way in which it can relate to itself easily. It can ripple through the database and pick up things on the way. Normal databases in today's environment tend to be either hierarchical or network. Hierarchical means they start off with a customer record; underneath the customer record (in a bank) will be a checking account record and savings account record, underneath the saving account record you might have two types of savings; one which is 5% and one without interest and so on. It comes down like an organization chart or hierarchy.

A network database is the other way. It is all strung together horizontally rather than vertically. A relational database is neither. In fact, it is both. It is a circle and all links one to the other. Relational databases will be on the big machines. You will have a gateway into that which will be able to suck out of that database either summary data or a snapshot of detail data which you wish to work on. You can bring it back to your machine, manipulate it, evaluate, change it (maybe), and then put it back. When it goes back it can affect the entire database. So, what the big machines are going to have to do is manipulate huge quantities of data and that is what they will be used for.

MR. EVANS: That database capability is available right now, especially the relational database capability. You can actually take that data home on the weekend, alter it, and put it back into the mainframe. You now have transportability and communications going between micros and mainframes. That is the key to the success of a micro at your desk.

MR. SAUER: Thank you. I have another question about the banking business. You see a trend towards home banking. Does this also mean that we will soon be getting rid of paper dollars?

MR. PACKWOOD: People have been talking about getting rid of checks for years. Check growth in the banks in the Pacific Northwest has been a constant 7% for the last 20 years. Seattle-First National Bank processes 2.5 million checks per day. They have an extensive teller network. They have links to the automated clearing house. They use swift networks and chips and all sorts of electronic things and check volumes keep growing at 6% to 7% a year. I do not see any change in paper dollars or checks for the next ten years. Everyone says there will be, but I do not see it.

MR. S. T. MULCRIM: Mr. Packwood said that the key to the future is the distribution system. I would like to think of this in terms of insurance selling. In the United Kingdom, our distribution system is a sales force of men and women who go around visiting the clients in the homes and explaining the complexities of the product face-to-face. Over there, we are beginning to start to use computers in the home. The agent takes his portable computer along, he plugs into the television set in the client's home and gives a demonstration of what the benefits of the product might be. Do you see that as the future, or do you see more along the lines that Mr. Packwood was talking about? That is, a move to a direct distribution system which actually cuts out that agent and in which the client himself will be dealing directly with the insurance company over the telephone lines.

MR. EVANS: Being in the brokerage business, and we sell straight term insurance at Evans Llewellyn Security, I think you have to sell insurance, you have to sell stocks and bonds. I do not see the salesmen being cut out whatsoever. Despite the fact that a database may be available on a cable communication or satellite for the client to get a better feel for his alternatives, he still will rely upon his investment advisor and his insurance advisor on which package to select. Certainly to the extent that the computer can be brought into the home and a demonstration on the television CRT made available, we will have an additional selling tool for the insurance advisor. I would look for that to happen rather than someone simply selecting from seven different packages the one that looked best from his calculation.

MR. PERROTT: I would like to add to that. On the other hand, databases that Mr. Packwood is talking about will be available. The agent is going to be selling in a high disclosure environment in which the client presumably knows what all of the competing rates are. This has not traditionally been the case.

MR. PACKWOOD: I know nothing about insurance. However, I remember about ten years ago people saying that there was no future in automated teller machines because everyone wanted to talk to the teller. That has gone away folks. I do not know what will happen in the insurance business, but I have a suspicion that when people can do it themselves, there will be a lot of people doing it themselves.

MS LINDA B. EMORY: Would you compare the capabilities of TSO (timesharing on your own mainframe) with a personal computer where you can download information? Which would you go with if you need access to the data on that mainframe?

MR. PACKWOOD: Absolutely, the personal computer. TSO, whether you use SPF or not, is incredibly cumbersome. The micros have been written to be user friendly. TSO is not even friendly to the data processing professional. Absolutely on the micros; no question about that.

MR. EVANS: I would agree 100%.

MR. PERROTT: I would like to especially thank Andy and Geoff, who are not Society members, for taking time out from their busy schedules to come and talk to us. I know that Andy flew up here at lunch in a seaplane because he was busy at his office this morning. I would also like to thank Emory for his presentation. I thank all of you for being an attentive audience.

