SOCIETY OF ACTUARIES

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Centennial cont'd

Finally, a challenge that seems especially appropriate to address in our centennial year is to make sure all our members – no matter what their field of activity or country of residence – feel represented in the leadership of the Society and that the Society is responsive to their needs. Our meetings and seminars have increasingly recognized the needs of pension and health actuaries. That has been a positive trend and must be continued. Now we need to find ways to make sure that non-company and non-life insurance actuaries have full and complete involvement on the Society Board and Executive Committee. The result will be better decisions and programs even more responsive to the needs of all members.

The year 1989 will be exciting for all actuaries. We will properly and enthusiastically honor our heritage while working on a diversity of issues that should make our future even brighter.

Ian M. Rolland, SOA President for 1988-89, is President, Lincoln National Corporation.

New retirement history survey proposed for U.S.

Comments are welcome on a National Institute on Aging proposal for a periodic survey to obtain needed data on retirement, health, and economics among retirement-age persons (ranging from as young as 50 or 55 on up). This U.S.-government survey would revive and expand the Retirement History Survey, which was conducted every two years from 1969 to 1979. The planning is directed by Dr. Richard Suzman, Behavioral Science Research Office, National Institute on Aging, Building 31, Room 5C32, Bethesda, MD 20205.

At the September 9 meeting of the Council of Professional Associations on Federal Statistics (COPAFS), Dr. Suzman said that comments on the proposed survey would be considered if received by him within a few months. Some background information on the subject, received through COPAFS, may be obtained from Daniel F. Case at his *Yearbook* address or phone number.

Expert explains expert systems

Features Editor Deborah Poppel spoke with Stephen F. Siegel, Director of Knowledge Engineering at Applied Intelligence Systems, Inc. (AIS). AIS is a New York City-based vendor of expert systems, predominantly in Life Insurance Underwriting. Dr. Siegel has a Ph.D. in Experimental Psychology from Brown University.

***Poppel:** What is an expert system?*
Siegel: An expert system is a computer program that processes information at a level equal to or near that of human experts. It consists of a set of rules, also called the knowledge base, and a computer program to process the rules, also called an inference engine.

***Poppel:** Are the terms "Expert Systems" and "Artificial Intelligence" (AI) interchangeable?*
Siegel: No; expert systems are a susbset of AI, which is the study of how computers can simulate functions of the human mind. Other subsets are robotics, machine vision, machine learning, and natural language understanding. The piece of AI that's the most viable in business right now is expert system technology.

***Poppel:** Who builds expert systems?*
Siegel: A knowledge engineer builds them. This differs from a programmer, who generally works from a well-defined set of specifications. For a knowledge engineer, the biggest challenge may actually be determining the specifications.

***Poppel:** How does someone become a knowledge engineer?*
Siegel: You can't go to school for it, at least not yet. Knowledge engineers are often former programmers. However, as expert systems become more sophisticated, it's becoming more important for knowledge engineers to have an understanding of human cognition – how people think.

***Poppel:** How is an expert system different from a conventional system?*
Siegel: Some people don't think they're different. For me, as a psychologist, the difference is that an expert system is trying to emulate a human problem-solving process. Some people's definition is that it's written in a particular AI language.

One key difference is that the expert system's rules live separately from the rest of the system. An advantage of designing a system this way is that instead of having a long period of defining specifications, you can build the system and change it later, more quickly and efficiently than you can change a conventional system.

***Poppel:** Can you give an example?*
Siegel: Let's say you have a system for underwriting life insurance. It may have a rule that says, "If the proposed insured participates in a dangerous avocation, refer the case to an underwriter." That's a very simple, yes-no rule, which might be sufficient for a first-cut system. If you want to make the system smarter, you can build more choices into the yes answers – "If the avocation is skydiving, how many hours?" You can keep adding possible outcomes, or nodes, to the decision tree.

***Poppel:** Other differences?*
Siegel: Another difference is that our systems are built primarily by the experts, rather than the knowledge engineers and programmers alone. Since the rules don't have to be explained to systems analysts, who in turn explain them to programmers, who then translate them into computer code, you avoid losing something in the translation, and the end product is more likely to do what you want it to.

Normally, you build computer systems to do things involving a lot of computation that people aren't very good at. These systems are algorithmic – they use an explicit set of instructions for calculating solutions. Expert systems are heuristic – they use rules of thumb, which means they will be right most of the time, but not necessarily all the time, sort of like human experts. You might say that in conventional systems, the computer is told how to solve the problem. In expert systems, the computer is told what the problem is, but not how to solve it.

***Poppel:** What's the hardest part of developing an expert system?*
Siegel: The hardest part is coming up with the rules. In many cases they're

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Expert explains cont'd

not written down anywhere, but are handed down through some master-apprentice relationship, which means you need to elicit the knowledge directly from the experts. The trouble is that experts usually can't correctly articulate the rules they use to solve problems.

Another problem is that human experts do not typically reason using the "if...then" rules that are used by many expert systems. At the same time, one of the typical methods of human problem solving, reasoning by analogy, is currently unavailable in expert systems.

Poppel: *How else can you come up with rules, if you don't ask the experts?*
Siegel: One way is by induction. This method uses specific cases to induce a general rule. If you're building a system for loan approval, you might plug in a bunch of loan applications and whether or not they defaulted, and try to induce what would have been good criteria for loan approval.

One problem with induction is that even though it seems objective, someone is still making the judgment as to what the important items are to plug in. Another problem with induction is that if you took, for example, all the underwriting decisions made in your company over the past year and tried to induce whatever rules were used to arrive at them, you'd get by definition an expert system that was as good as your average underwriter.

Poppel: *So how do you make rules?*
Siegel: We make the rules by having the experts write them within our software shell, which we call Decision Master. The shell is designed to be simple enough for a nonprogrammer to operate. In addition, someone like me helps them try to figure out the rules from their own knowledge sources, such as manuals. Then, through an iterative process of testing and revising, the rules are fine-tuned until they work the way we want them to.

Poppel: *Is it fun being involved with something new?*
Siegel: One of the reasons I got out of mainstream psychology is that I thought all the good stuff had been discovered already. That's probably not true, but there is something to getting in at the very beginning when there's less background to know and a lot to discover, such as the best ways to elicit knowledge from experts.

Poppel: *How can someone decide if a particular business application is suitable for an expert system?*
Siegel: Expert systems make the most sense in areas with only a few experts. If everyone is an expert, it probably doesn't pay to have an expert system. If there are no experts, you can't really have an expert system.

Poppel: *Actually, it seems that an expert system would be very useful in an area where there are no human experts.*
Siegel: True, building one would be an interesting challenge. You might try to induce the rules, or you might take bits and pieces from a lot of people who each can solve part of a problem.

The prime application is one where there are only a few experts, they make a lot of money, and you're afraid of losing them. Any job where people are referring frequently to manuals, looking up what they're supposed to be doing, is a likely target.

Poppel: *Are expert systems cheaper than people?*
Siegel: In many cases, an expert system would be cheaper and more efficient than people, although not every department would be able to cost-justify a system. Human experts have bad days and take time off; expert systems can work almost constantly. Besides, if a key expert leaves, replacing that person may be expensive or impossible. Expert systems can help alleviate this problem.

Expert systems also can produce a higher quality, more consistent product. Sometimes there are so many underwriting rules, and exceptions and changes to the rules, that the underwriters can't keep up with them. Different underwriters obey different subsets of the rules and interpret them differently.

Poppel: *What criteria should someone look for when choosing an expert system vendor?*
Siegel: One thing to look for is flexibility. You'd like to be able to generate your rules in the way that makes the most sense for a particular application, be it induction or writing the rules by hand. It's also nice if the system can run on many different machines. You'd also like the shell to be written in such a way that it's easy to follow what it's doing – this makes it easier to work with.

Poppel: *If you found yourself at a party with a bunch of actuaries, what would you want to tell them about expert systems?*
Siegel: One reason actuaries should be interested in expert systems is that the rules developed by actuaries will be followed with more consistency. It will also be possible to have more complex rules. Right now, the actuary is forced to develop rules and procedures that can be followed by human beings. For example, the rule may be, if the proposed insured is older than 40 and the amount of insurance exceeds $100,000, order a paramedical exam. The "right" rule would probably factor in the PI's family history, the cost of an exam, and the agent's track record. An expert system could handle a rule like this, while a person underwriting 50 cases a day would find it unwieldy.

Expert systems also produce a lot of data for actuaries to work with, allowing them to test many "what-if?" scenarios.

Finally, I'd say, "Those tests aren't really that hard, are they?"

91% say they're pleased with *The Actuary*

Readers are pleased with the redesigned *Actuary*, according to responses received on a membership questionnaire mailed out with the June newsletter.

Of the 308 respondents, 91% checked yes to the question, "Are you satisfied with the content and types of articles?" Asked, "Do you find *The Actuary* easy to read," 93% answered yes. *The Actuary* was redesigned with the September 1987 issue in hope of making it a more effective communications vehicle.

Many readers had suggestions for further improvement, including shorter articles and more humor. Others want to see more articles on pension issues, FES/FEM, and Society activities. Many had suggestions for specific articles, which are being considered by *Actuary* Editor Linda B. Emory for future issues.