GUEST EDITORIAL

A RANDOM WALK IN THE FUTURE

A0	B1	C2
B2	C0	A1
C1	A2	B0

If you expect that a recently retired person will write about the good old days of the past, read no further. If you stay with it, we're going on a trip to a possible future world which the actuary of 2040 will face.

Fifty years ago the world was engaged in a major war, but the insurance business was in a relative calm. Today the major countries of the world are at peace but the insurance industry is in turmoil and in serious jeopardy of extinction. Where will we be fifty years from now? Let's take a walk into that future and look at some of the things we may find.

Ready or Not

At the start we must ask ourselves if we are ready for the 21st century? Are we ready as individuals and are we ready as an industry? This writer will be the first to admit that his view is narrowly that of an American in spite of being involved in international reinsurance and actuarial activities for the majority of his career. Careful nurturing and selfless promotion by one of the all-time giants of the actuarial profession, Laurence H. Longley-Cook, provided me with an exceptional opportunity to develop an international interest far beyond that of other American actuaries. Even with all this, my depth of knowledge and of involvement in international insurance, reinsurance and actuarial matters is shallow. And regrettably, my American colleagues have had fewer opportunities than I and are far more inward directed than our non-US counterparts.

Lest those readers in Europe revel in their international upbringing and approach to the business, let us think for a moment about the implications of the progress that has been made by the European Community. 1992 is now a reality and the Freedom of Services Directive is in effect. If the momentum countinues and we look fifty years into the future, the EC will be very much more homogeneous with respect to the actuarial profession. Variations between counties within the EC will be similar to variations between regions of a large county. EC actuaries will be dealing within one entity, the EC, and will have to ask themselves if they are truly international any more. Do they know Russia, Japan, China, India, Africa, ...? If not, they will find themselves as inwardly oriented as the American actuary is today.

Are any of us really ready for the 21st century, the next fifty years, and beyond? The challenges will be enormous—probably more than any one country's actuarial bodies can cope with. We really must continue to develop the concept of ASTIN well beyond what it is today, so that an internationalization of the general insurance actuaries throughout the world can truly occur. Our meetings must become the primary source of both theoretical and applied actuarial developments since they are the only place where people of widely diverses experiences can come together to discuss actuarial problems and their solutions. They must supplement the meetings of the local actuarial organizations by going beyond them into the global aspects of actuarial theory and practice.

Change, Change, Change

As we walk into this future, company organization will certainly change dramatically. Massive storage devices for computers, processing speeds which continue to increase a thousandfold every twenty years, and fiber optic transmission of information across borders will inexorably move us toward another world of company organization. One real possibility is a network of highly talented individuals, each working in a place—anywhere in the world—of his or her choosing. These individuals will have little or no staff but, thorough the network, will have the entire staff of the organization at their call. At the center of the organization will be a few people who are in physical contact in the corporate village—a place where they live and work within walking distance of everything they need from a corporate standpoint. Headquarters can be located anywhere in the world and can be moved easily if desired. This small cadre of individuals will control the assets of the organization, will make the strategic decisions on the operation of the entity, and will recruit the individuals in their employ. Working in such an environment will not be easy, but it will be comfortable, rewarding and fulfilling.

Today a true challenge to our mental powers—innovation, creativity, imagination—probably occurs in less than ten percent of our working day; maybe as little as one percent on average. In the network environment there will be far less to distract those in the network from the purely productive aspects of their assignment. Little or no time will be spent on personnel matters, committee meetings, budgets, casual chatter and so forth. The people in the network will be able to work nearly any hours (or all hours) they feel like and with total flexibility. Much of today's corporate organization came from the Industrial Age and was needed to control and relay information throughout the hierarchy. There will be fewer layers of management needed to control the future organization so it will be much flatter than what we know today. In an Information Age where everyone has direct access to a centralized mainframe database, the control and relay of information is an anachronism.

Let's ask ourselves if we are ready as actuaries for this brave new world—the Information Age. Is ASTIN moving in a direction that will continue to make it relevant in tomorrow's world? Are we developing the processes and techniques

necessary to keep abreast of the enormous changes? Is ASTIN a positive force in helping our members develop those management skills which will be needed in the future—leadership, motivation, articulation? They will be the skills in demand for the future. Let's make sure that those are the qualities which are being taught today and are the ones which will be rewarded in those who are following us so that the managers of tomorrow have the benefit of an actuarial training as well.

The greatest enemy of future progress is success in the past. We're comfortable with the things that we know and that have worked for us before. It's much easier to apply a familiar solution to a new problem—much easier than analyzing the problem to see what solution technique would best apply and then designing a workable technique and carrying out the solution as needed. Yes, experience in a field makes you comfortable—you *know* the answer even before the problem is fully formulated—and you reject new information, especially those things that challenge the traditional wisdom. On the contrary, you must strive to make change a partner, not an enemy; new input an accomplice, not a rival. You must be willing to turn things on their head and look at them in a new light. You must force yourself to completely, carefully, thoroughly define the problem without jumping to the method of solution before you have a full grasp of the situation. Many of the things we have in our personal actuarial "bag of tricks" were learned early in our career and we are content in the knowledge that they work. What happens when we have to replace some of the old comfortable things with new, fresh, revolutionary ideas. For example, if we find some day that the chain ladder technique of the reserve-estimating actuary has seen its day, are you ready for the upheaval?

There is little doubt that in 50 years, actuarial methods and technology will be vastly different from today. It's difficult for us to imagine how that could be true since things are so top-rate right now. Yet, the computers at your fingertips and at those of your underwriting, claims and marketing colleagues will be unbelievably more powerful than today. A thousand times? No, that will be achieved within 20 years based on the record of the past. By 2040 computing power may be a million times what it is today. That is too much for us to imagine but it will be as great a leap as from the old hand-operated adding machine to the 25 megahertz 386 computer found on so many desks today. Try to imagine putting together a loss reserve projection with only the use of punched cards with 80 columns, mechanical sorters operating on one column at a time, tabulating machines which could add but not multiply, and mechanical calculators which were marvels because they were electrified and could perfom the four arithmetic functions... there were no storage registers, you understand. Actuarial work was a lot simpler in those "good old days."

To say that we have a million times more data processing power today than 50 years ago is probably an understatement, so think about the actuarial world 50 years from now and how mass storage of unimagined capability will make the CD-ROM seem primitive, new words will have be invented to describe how fast one will be able to access the information, and optical fiber cables will

transmit data around the world with great fidelity and at undreamed of speed. In this world of 2040, our loss reserve projections may be based on individual transactions as they occur in the field being instantly fed into the system which updates the entire process in a matter of seconds. The newly developed cumulative frequency ogive methodology is modified on a credibility weighted basis to reflect the most likely shape of the settlement curve and the frequency of losses in the category based on the past history and this latest transaction. It evaluates where we went wrong in the past and points to strategies designed to avoid that in the future. Confidence intervals in the true statistical sense are also displayed and the probability of being insolvent at this moment is prominently featured along with a projected probability of insolvency within the next five years. It is this latter figure which regulatory officials will concentrate on, otherwise leaving management a good deal of freedom. If all this seems unimaginable, remember the good old days of 50 years ago and the 80 column punched card. ASTIN must capitalize on its ability to bring together talent from around the world to lead the advancement of such significant projects. ASTIN must provide the forum and encourage the development.

Anchored in Fact

In closing, I would like to remind you of a truth which we sometimes lose sight of. Conjectures or half-truths are not true just because they have been repeated over and over again. This is often the method of the politician who seeks to solve the problems of the day by postponing them to the future. By repeatedly telling the voters what they want to hear, they believe that it is true. While actuaries are not prone to accept things without proof, the realm of mathematical proof is becoming more and more complex. We will have to accept some proofs that we cannot replicate or, in some cases, understand. On the other hand, we cannot be led to accept something as true just because it has been repeated many times. To illustrate this I would like to tell the story of the 10 × 10 Greco-Latin Square.

Greco-Latin squares are pairs of values in a square array such that in every row and every column, each value appears once and only once. These squares are of considerable importance in the design of agricultural and other experiments where it might be desired, for example, to use three different types of fertilizer and three different levels of watering to test the crop yield from a particular type of seed. The farm plot is divided into nine squares and the nine fertilizer/water combinations are assigned randomly to each square. However, to avoid the chance that a horizontal or a vertical strip of soil might have more clay, for example, in it than its neighbors and affect the result, the experimenter only wants to have each treatment appear once in any row and once in any column. To construct a Greco-Latin square of order 3 is equivalent to trying to arrange the alpha-numeric pairs A0, A1, A2, B0, B1, B2, C0, C1, C2 in a square which will meet our conditions. If you would like to try to make

such an arrangement, complete the sqaure below:

A0   ——   ——

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One correct solution is shown at the start of this article. The rows and columns may be interchanged in a variety of ways to produce permutations of this basic solution.

No such square of order two is possible; orders four and five are known. In 1782, the great Swiss mathematician Euler *proved* that squares of order n can always be drawn if n is odd or if n is divisible by 4. He *conjectured* that the others (that is, $n = 6, 10, 14, 18, ...$) could not be constructed. That conjecture stood for 120 years, neither verified nor disproved, until G. Tarry showed by exhaustive enumeration that Euler was correct for $n = 6$. We still had no general proof of the conjecture. It was estimated in the 1950's that for $n = 10$, it would have taken the fastest known computer at least a century to check out all possible combinations.

In April 1959, E. T. Parker of Remington Rand Univac reported to the American Mathematical Society that a 10×10 Greco-Latin square had been found.

A0	B1	C2	E3	F4	G5	H6	I7	J8	D9
B2	C0	A1	G4	H5	I6	J7	D8	E9	F3
C1	A2	B0	H8	I9	J3	D4	E5	F6	G7
D3	J4	F8	I5	A7	C9	G1	B6	H2	E0
E4	D5	G9	F0	J6	A8	C3	H1	B7	I2
F5	E6	H3	J2	G0	D7	A9	C4	I1	B8
G6	F7	I4	B9	D2	H0	E8	A3	C5	J1
H7	G8	J5	D1	B3	E2	I0	F9	A4	C6
I8	H9	D6	C7	E1	B4	F2	J0	G3	A5
J9	I3	E7	A6	C8	F1	B5	G2	D0	H4

He had used certain mathematical proofs and some " guided " trial and error procedures. It has since been established that Euler was not correct in his conjecture except for the case of $n = 6$.

After 177 years of thinking an assertion was true, it was shown to be false. Let it be a reminder to all of us that no matter who makes an assertion or how often it is repeated, statements are not true until they are either proven or fully tested. Let's have that be one of the steady anchors of actuarial studies as ASTIN goes into the 21st century.

LeRoy J. Simon