

# PROCEEDINGS

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## NEW TEMPOS IN TECHNIQUES

PRESIDENTIAL ADDRESS BY THOMAS O. CARLSON

Everyone who read in the newspapers on that fateful Tuesday morning about the fate of Hiroshima sensed that that atomic explosion marked the inception of a new era in world history, a major division of historic time. Never has the emotional impact of an abrupt world-shaking incident been so great. It was a sober and a somber day indeed. Many people were immediately inspired to think of the peace-time industrial potentialities in the harnessing of atomic power. Before the week was out the phrase "atomic age" was on every tongue. The international insecurity and ideological warfare of the post-war period have postponed or at least minimized the anticipated constructive applications of this new source of energy, restricting them essentially to medical and research fields. Only this week, the H-bomb reports have reminded us that major attention is still focused upon destructive rather than constructive potentialities. For the time being the atomic age is a political rather than an economic division.

But history is marked by eras within eras. And we have more unobtrusively been entering upon a new industrial era, the basis of which is far more closely associated with our work in the insurance business. The technical developments that were so telescoped in time by the exigencies of World War II highlighted another field of invention, the benefits of which have already become fairly commonplace in our lives, and these developments have launched us into one of those eras within an era. I speak, of course, of electronics, and of what might well be called the "electronics age".

Most of you have by this time attended meetings, exhibits or demonstrations relating to the applications of these new developments to the performance of business machines. They did not burst upon the world overnight, as did the bomb. Many of the underlying scientific principles have been known and applied for years. For example, the flip-flop characteristic of vacuum tubes used in counting has been known since 1919. We have been hearing for a long time about the fantastic brain machines that outdid the combined mathematical efforts of scores of professorial geniuses in the solving of differential equations and other problems in higher mathematics. But these were laboratory giants, each a unique engineering project; and only within the past couple of years have any offspring of these intellectual behemoths been offered on the market for business use.

When I first witnessed the accomplishments of the parent machines I had

the feeling of sharing in the discovery of a new world, like the men of Cortez who, on their first sight of the Pacific Ocean, "Looked at each other with a wild surmise, Silent, upon a peak in Darien."

The expansion of our insurance industry that has taken place in the past twenty or thirty years might well not have been possible without the availability of mechanical equipment for handling punched cards in accounting and statistical work, equipment that is now taken for granted. Certainly procedures would have been far more cumbersome and costly and many of the analyses which we now have at our fingertips would not have been possible at all in their present refinement.

The introduction of punched card accounting procedures was a revolutionary development. It is probable, however, that the introduction of procedures involving the new electronic equipment now coming or soon to come on the market will constitute an equally revolutionary development. While a few individuals in the industry have been maintaining contact with this area of machine development for some time, the industry as a whole has taken little interest in the potentialities involved until quite recently. This inertia was merely an indication of the caution characteristic of good business sense in waiting to be shown. We are now being shown. This is no place for me to try to amaze anyone by reciting speeds of operations or listing in detail the accomplishments of these machines. Their advantage lies first in the greatly increased speed of the various processes they perform and secondly in the fact that instructions for a long series of operations may be read into a machine and those operations will thereupon be performed without the necessity of further human interference. Consequently, an entire series of operations within the capacity of a machine can currently be performed as rapidly as a single operation. Most of you have within the past year or year-and-a-half seen for yourselves, and our eyes are already as large as they can get. We are now conditioned to accept any new marvels as matter-of-factly as Alice accepted her adventures in Wonderland. I was told only this week by a manufacturer that work has progressed far on an adjunctive device to facilitate the now time-consuming job of programming, that is, of preparing the detailed instructions the computer is to follow. That seems to be an invasion of the precinct of the human brain to an unprecedented degree, but with all that has happened to date we sit back calmly waiting to be shown.

I think it is unfortunate that so much emphasis has been laid upon the phenomenal speeds of operation and so little emphasis upon the comparative slowness of the preparation of data for processing and of the input and output, that is, the feeding of data and instructions into the machines for their mechanical manipulation, and the recording of the results. At the present time the speed of processing work through the machines has little relation to the speed of the mechanical operations of addition, subtraction, multiplication, division and comparison performed, but rather is primarily controlled by the input and output speeds. On the giant installations, once the information is on tape, the input is satisfactory, and high speed printers are being developed for the output. On smaller units using punched cards for input and output, the disparity in speeds is still acute.

Ingenuity under the impact of competition being what it is in this land, we

can be certain that this retarding of the preemptive rush of electronic equipment will be only temporary. Science has already solved many of the basic technical problems. But there are also problems of manufacturing and marketing cost, of adaptation to a wide enough market to bring costs within reason, of adaptation through optional gadgetry to meet the specific requirements of smaller areas of business endeavor, and the continued maximum utilization conjunctively of the millions of dollars worth of equipment already in the field. The greatest gap seems to be in the area of machines for recording and preparing the raw data for processing. But even in this area, the scientific hurdles have been cleared and what remains are problems of design, adaptation and marketing.

We hear of other machines which are already in the experimental model stage. We hear of new types of units, the theory underlying which is not yet fully understood, that may soon replace the now familiar electronic tubes with resulting economy of cost and space and elimination of a serious heating difficulty. The papers only this week carried extensive articles on tests of these units in various equipment. We are having hurled at us a new vocabulary to master if we are to listen intelligently to salesmen and demonstrators: diodes, triodes, transistors, binary system, et cetera, et cetera, et cetera, as Lady Anna's King of Siam would say. We breathe the ozone of shared discovery, of pioneering. We stand upon a peak in Darien.

Lest this reaction sound rhapsodic, let me quote from a highly esteemed friend in the life actuarial field and a member of this Society, Henry Jackson, who wrote: "An actuary—may be defined as a practical Utopian, and if the word *Utopian* has come into disrepute as being a sort of synonym for *visionary*, it is well to remember the ancient admonition, 'Where there is no vision, the people perish.'"

These developments should constitute a challenge, and a fascinating challenge, to us as actuaries. We are on the threshold of a new era in accounting procedures and it is up to us to grow with the developments of that era. There is no segment of our economic structure that should have a greater use for such equipment than the insurance industry. Various industry committees have already been organized and some of them have taken long strides in exploration of the areas thus opened to research. It has been suggested to me that this Society might well establish a committee on electronics. Consideration of that suggestion will be one of the first items on the agenda of the new Council. The Society of Actuaries established such a committee four years ago, and the proceedings of their recent meeting in the Commodore Hotel constitutes the best introduction to an understanding of the potentialities of these new machines that has yet appeared. It may be decided that since there are a number of committees involving members of our organization that are already functioning in this field, it is sufficiently well covered to obviate the necessity of such a committee in this body. Regardless of what the decision may be, however, no member of this Society will be living up to his responsibilities professionally if he does not familiarize himself with these developments as they come along and study them so as to know how best to avail himself of the potentialities they open.

We have at hand a new tool, phenomenal in its accomplishments. Let it be

emphasized, however, that neither now nor in the future can any machine be developed which will have the adaptability or the flexibility of the human brain or which can replace the judgment functioning of man.

An incident occurred recently which strongly emphasizes this point. On the evening of Tuesday, November 4, a television broadcast was made which I consider as having significance for our actuarial profession, although perhaps few of you looked upon it in that light. An electronic computer was set in operation to produce predictions of the outcome of the presidential race as the returns from the various states were reported periodically throughout the evening. While the work of that computer is now commonplace in scientific circles, this was perhaps the first time that millions of people witnessed its operation in a field that they could understand and appreciate.

In the minds of most watchers, the debut may have seemed a fiasco. No one who knows the proper limitations of the machine will agree with that conclusion, but in any event the incident produced object lessons which are pertinent to our actuarial work. In order to emphasize these, let me review briefly the story of that evening, a review which I admit is on a hearsay basis but which I have checked rather carefully with several who listened in and with newspaper reports.

The corresponding periodic reports of election returns for the two preceding elections were read into the machine in advance and the machine was called upon to compare and project the results as they came in this year. Its initial prediction, produced at an early hour, came within four electoral votes of the ultimate result. But the scientists directing the machine could not believe such a landslide prediction and refused to put it on the air. They changed the directions and produced for broadcast a prediction of a close race. Unfortunately this modification was made public at about the time that expert news commentators in the studio had concluded that a landslide really was on the way. So once again the directors modified the instructions so that the machine came up with a prediction more in line with the views of everyone throughout the country who was listening to the returns. This was followed by a demonstration of its predictive efforts in a single state, the result being prediction of a Democratic victory in that state that was contradicted only a few minutes later when the Democratic Chairman in the state conceded victory to the Republicans. It is my understanding that that concluded the performance.

At first blush, the average observer might conclude that this confusion in its first major public performance discredited the machine. The impression of many TV watchers would probably coincide with that of a friend of mine who said "I prefer the news commentator who has fewer tubes to go wrong." My ferry-boat colleagues on the following morning were somewhat ribald in their comments and observed that insurance executives should be hard to convince of the efficacy of electronic computers after such a performance. I let them have their fun and then made the point that the incident demonstrated only that the popular term "mechanical brain" is an utter misnomer, and that no machine knows more than the minds directing it. All that the machine can do is to perform the mathematical operations of addition, subtraction, multiplication, division and comparison, with phenomenal speed, but as directed by a human.

You may be asking yourselves what bearing this has upon our actuarial work. The use of the machine on election night involved a predictive effort analogous to our predictive efforts as ratemakers. The prediction resulted from mathematical operations performed by the machine but the story of the evening signifies that the direction of those operations was very human indeed. The initial result was so startling and unbelievable that it was rejected by the brains behind the operation. Do I need to draw attention to specific analogies in our ratemaking developments? After some experimentation the directors of the machine readjusted their formulas so as to produce approximately the same results that had already been produced by the judgment of individuals watching the returns as they became known.

Actuaries should in fact derive great comfort from this demonstration, particularly in view of the pressure from supervisory officials and others to develop more mechanical or automatic and presumably more nearly infallible procedures for the prediction of insurance experience trends.

Consider in greater detail the analogy between election predictions and insurance experience predictions. The pollsters who make a profession of predicting elections amass a great amount of detailed information right up to the day of election. Actuaries in the ratemaking field on the other hand have to deal with statistics developed through a period that terminates some months prior to the period for which they are attempting to predict. Yet despite the difficulties introduced by this time lag element in our work, which is a serious handicap, are there any among us who do not derive encouragement from a comparison of the results of our actuarial efforts with the predictions of election pollsters in past national elections on the basis of their much more up-to-date information?

Coming back to the machine for a moment, there are a number of points to be noted. The final successful results of the machine's predictive efforts were based upon what could be termed as on-the-spot formularization of human judgment. Ratemaking procedures are similarly based upon formularization of human judgment. Further, the machine was unable of itself to recognize or reflect such peculiarities as the situation in those states where the early returns came from rural areas instead of cities while in past elections the early returns came from cities instead of rural areas. Similarly, in ratemaking, exceptions have to be made to reflect developments which would modify our conclusions based upon past experience. Even in that line of insurance in which ratemaking procedures have been crystallized to the greatest degree, workmen's compensation, the so-called "permanent" formulas of two decades ago proved to be little more permanent than sand dunes, shifting of necessity before the changing winds of varying economic factors and situations in successive years.

In our field of insurance, where contracts are customarily for short terms because the costs under those contracts are highly susceptible to the impact of changing economic conditions, such a need for flexibility is not only normal but completely reasonable. If we permit ourselves in these lines to become entangled in the folds of rigid formulas, they will inevitably strangle us. The natural inclination of the individuals who have the responsibility of reviewing our rate submissions is to attempt to mold them into a form which will make

that review as simple an operation as possible. While such a tendency is desirable to a degree, if carried to extremes it cannot produce proper results. I have many times quoted from Emerson in this connection: "A foolish consistency is the hobgoblin of little minds."

We have in our membership representatives from all viewpoints in the insurance business, companies, rating organizations, consulting firms and supervisory authorities. Regardless of affiliation, we should all be alert to this danger and keep our sights fixed upon the goal of equitable rates that properly reflect all of the factors contributing to costs that we feel can be reflected. The regulatory laws in most of the states were carefully drafted to make this goal attainable. While dissatisfaction has been expressed in many quarters with regard to certain aspects of these laws, this one aspect which seeks equity in the results should never be fundamentally disturbed.

It should not be forgotten that the realization of this goal depends also upon maintaining vigilance against any trend from regulation to direction under our regulatory laws. Both supervisory representatives and industry representatives should be equally vigilant in this regard if they are true to their responsibilities. The influence of developments in our federal government has percolated inevitably to state levels. Although the November 4 results are widely interpreted as a personal victory for President-elect Eisenhower, perhaps they will also be interpreted to give encouragement to those who believe that governmental regulation should remain regulation and not become direction of business affairs.

The final lesson for us to draw from the appearance of the electronic calculator on TV is its demonstration of the phenomenal speeds now possible in computation processes and the implication that it is only a short time before we shall have these potentialities harnessed for application in our everyday business.

But the important demonstration of the evening was that no machine can predict except upon the basis of formulas which have been devised by a human brain and is subject to error to the extent that the human brain directing it is subject to error. So much has been written about machines becoming masters of mankind that this incident is salutary in its emphasis to the contrary.

As the complexities of our social and economic structure increase, so will the scope of the actuarial field increase. The student who takes our examinations today is convinced that he has to know considerably more than the student who took the examinations twenty-five years ago. Far be it from me to disabuse him of this impression, and the student twenty-five years from today will have to be familiar with fields of knowledge in this economic sector which perhaps are as yet unconceived. If that prediction is true, its realization will depend upon refinements in analysis which will be made possible only by the extent to which actuaries will become the masters of these amazing new tools for research and analysis.