SOCIETY OF ACTUARIES

Article from:

The Actuary

November 1980 – Volume 14, No. 9

The Actuary

The Newsletter of the Society of Actuaries

VOLUME 14, No. 9 NOVEMBER, 1980

COMPUTERS: SOME FORECASTS 1949 AND 1980

by Edmund C. Berkeley

Ed. Note: Edmund Berkeley was a pioneer actuary in the computer field. In 1949 he published a popular book, Giant Brains or Machines that Think. *We have persuaded him to catalogue here the outcomes of some forecasts he made in Chapter 11 of that work, entitled "The Future: Machines that Think, and What They Might Do for Men."*

It has been a delight to me to be surprised many times over between 1950 and 1980 as the computer field appears on its way to becoming the most important industry in the world—and it's a pleasure to add up the score of those predictions made three decades ago.

Chapter 11 in *"Giant Brains"* began:

> The pen is mightier than the sword, it is often said; and if this is true, then the pen with a motor may be mightier than the sword with a motor.
>
> In the Middle Ages there were few kinds of weapons, and it was easy for a man to protect himself against most of them by wearing armor. As gunpowder came into use, a man could no longer carry the weight of armor that would protect him, and so armor was given up. But in 1917 armor equipped with a motor and carrying the man and his weapons came back into service as the tank.
>
> In the Middle Ages there were few books, and it was easy for a man to handle nearly all the information that was in books. As the printing press came into use, man's brain could no longer handle all recorded information and the effort to do so was given up. But in 1944 a brain to handle information, equipped with a motor and supporting the man and his reasoning came into existence—as the sequence-controlled calculator.

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ELECTIONS 1980

The results announced in Montreal are:

President-Elect	Robert H. Hoskins
Vice Presidents	Dwight K. Bartlett III Charles Barry H. Watson
Secretary	Kenneth T. Clark
Treasurer	Robert J. Johansen
Director of Publications	Robert E. Hunstad
Board	John C. Angle Geoffrey B. Crofts Myles M. Gray Joe B. Pharr Thomas C. Sutton John C. Wooddy

The number of votes cast, from among 4,192 eligible voters was 2,359(56.3%).

Colin Jack Is First Executive Director of The Canadian Institute

It's a pleasure to report that Colin E. Jack, one of whose many distinctions has been an Associate Editorship of this newsletter, has been appointed to the newly created post of Executive Director of the Canadian Institute of Actuaries at its headquarters in Ottawa. We extend heartiest congratulations to the Canadian Institute and to Mr. Jack.

DOG LIFE INSURANCE IN SWEDEN

by Carroll E. Nelson

Is it possible to conduct a useful and profitable life insurance business on dogs? In Sweden, definitely Yes! That country has a dog population of about one-half million, of whom 43% are life insurance policyholders.

One company, that I visited in Stockholm last summer, writes more than 85% of Sweden's dog insurance. It is the Jordboukets Försäkringsbolag

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BOOK REVIEW

Global 2000

Reviewed by Geoffrey N. Calvert

The Global 2000 Report To The President: Entering the Twenty-First Century. Prepared by the Council on Environmental Quality and the Department of State. Gerald O. Barney, Study Director. Vol. I. Summary, $3.50; Vol II. Technical Report, $13.00; Vol III Global Model, $8.00. Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

This major report was commissioned by the President in May 1977, and completed in July 1980. Many government agencies contributed projections of population, resources and the environment. What emerge, therefore, are mainly projections, not predictions, showing what will happen if present policies and trends continue.

"Our conclusions are disturbing," state the joint authors. "They indicate the potential for global problems of alarming proportions by the year 2000. Environmental, resource, and population stresses are intensifying . . . the earth's carrying capacity is eroding. The trends . . . suggest . . . a progressive degradation and impoverishment of the earth's resource base." Responses that are underway fall far short of what is needed, states the report. Necessary changes go beyond the capability of any single nation. An era of unprecedented global cooperation is essential. "Sustainable economic development, coupled with environmental protection, resource management, and family planning are essential." . . . Finally, our federal government requires a much stronger capability to protect and analyze long-term trends . . .

Among the report's specific findings:

- Population growth from 4 billion in 1975 to 6.35 billion by 2000, the growth rate slowing only from 1.8% to 1.7% a year. In sheer numbers, world population will be growing faster in 2000 than today—100 million

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Ahead Of His Time

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Our warmest thanks to Ronald S. Skerman, F.I.A. and Kenneth A. Usherwood, F.I.A., who furnished information and guidance for this article. Also to Alexander J. Gale, F.I.A., who supplied the following reminiscences on William Phillips' personality:

"My first contact with him was when he interviewed me at the start of my actuarial career in 1931. One remark I treasured throughout my working years—'Don't forget, we will take the best days of your life and the best hours of each day and if you are not enjoying it—go elsewhere.'

"An outstanding personality—a legal advocate when he wished (he became a qualified Barrister), in modern idiom a computer-memory-store of facts, extraordinary energy and stamina, and capable of continual original thought and new ideas, but I thought tiring of the follow-through stage and not a great arithmetician.

"He delivered two actuarial papers in the 1930's. The first which gave him his standing as a technical actuary was 'The Curve of Deaths' (J.I.A. Vol. 66). It put him right on the path to the inner Institute of Actuaries' recognition.

"Not long afterwards, rumour had it that he was doing another paper to the Institute—and the name Babbage became part of his conversation, usually coupled with references to binary notation. We also learned of a largish stringed machine in a primitive state. which blossomed into the 'Differential Analyser.' At the meeting in 1936 it was, I recollect, beyond most of us, hardly surprising really, particularly to those who, like me, as students, had been looking for clues to examination solutions in our meeting attendances.

"His machine returned to our office, took up a good deal of our modest basement space and evacuated itself eventually with the rest of us to Surrey where it remained until it surfaced as part of the new revolution.

"He was a serious photographer and painter; he was not a games player, but did not denigrate those who were; infuriating with minor mistakes, superb in major problems. He was not an acquisitive man, despite his early career as an Investment Actuary, but did talk seriously to me about inflation as early as the mid-1940's!"

E.J.M.

Computers

(Continued from page 1)

At the end of that chapter appears this:

> We can even imagine what new machinery for handling information may someday become: a small pocket instrument that we carry around with us, talking to it whenever we need to, and either storing information in it or receiving information from it. Thus the brain with a motor will guide and advise the man just as the armor with a motor carries and protects him.

I did not foresee chips of silicon (or germanium) on which 64,000 computer circuits could be imprinted, nor very large-scale integrated circuits (VSLI). This is on the order of an entire computer in the space of a quarter of a postage stamp.

But a human brain with its biochemical construction is able to store probably close to 100 billion (10^{11}) bits of information. The silicon chip, or some other device, still has a long way to go, but I am sure it will go there—and beyond, up to the relativity limits.

Those 1949 Predictions

Table 1 summarizes what has happende in the development of 12 predicted devices, and also translates my terminology of former days to the jargon of 1980.

Enormous numbers of applications of these electronic "brains" have been and will be made. A list we published in 1974 enumerated over 2,600 of these. In the future the number of applications of computers will be like the number of applications of books.

Some 1980 Forecasts

Recently some of my associates and I have found new ways for automatic translation by computer with due regard for meaning. This system applies to automatic computer programming using natural language, automatic documentation of computer programs, automatic conversion of programs from one language to another, and automatic summarizing of texts.

This system, which we call DJINNI, applies in a limited context of about ten to a thousand words. For example, seven lines of English "instructions to a clerk" will change into 67 lines of COBOL program, right the first time. (See footnote—Ed.)

Many other workers in this field of "artificial intelligence" are producing interesting, remarkable and seminal results.

I close with three forecasts:

(1) More than 50 percent of human programming will vanish as computers take over.

(2) Every defined intellectual operation will be performed by computer, faster, better, and more reliably than by a human being.

(3) All the language of thought will become calculable like mathematics.

Ed. Note: Mr. Berkeley offers a reprint of a report on DJINNI *on request to his* Year Book *address. Possibly he might supply also a copy of his magazine, now called* Computers and People *which he has been producing ever since* 1951.

Table 1. Predicted Devices and Their Present Status

No.	1949 *Prediction*	1980 *Status*	*Its Name Today*
1.	Automatic Address Book	Done.	Automatized mailing lists.
2.	Automatic Library	Done.	
3.	Automatic Translator	Done.	World Translation Co. of Canada, e. g.
4.	Automatic Typist	Largely done.	Word processor.
5.	Automatic Stenographer	Beginning.	
6.	Automatic Recognizer	Several elements done, but not most.	
7.	Automatic Controls	Done.	
8.	Weather Brain	Not yet done.	
9.	Psychological Testing	Done.	Automatic diagnosis, drill, . . .
10.	Psychological Trainer	Done.	Computer-assisted instruction
11.	Automatic Production	Done.	
12.	Automatic Modelling	Done.	Models of economies, societies, conflicts, etc.

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