



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:

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

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, \$350; Vol. II. Technical Report, \$13.00; Vol. III Global Model, \$800. 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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The Society is not responsible for statements made or opinions expressed herein.
 All contributions are subject to editing.

AN EDITORIAL BY THE PRESIDENT

WHAT DOES THE SOCIETY MEAN TO YOU?

EACH incoming President mulls over this question. We have to know in setting our goals. We have to know if we are to leave the Society stronger at our term's end.

The Society's twin thrusts are Education and Research. We manage a complex educational and examination system, keeping the curriculum abreast of, even ahead of, the issues while maintaining high professional standards. And recent years have seen major progress in offering continuing education to our members. Also, actuarial knowledge is advanced through papers, meetings, statistical studies, and research.

Yet, we individual members tend to take education and research for granted. Although we aren't sure what, we expect something more from our Society.

I have talked to many of you on what the Society means to you, and on two closely associated questions, *What is the Society doing for you?* and *What are you doing for the Society?* The 1979 vote on the Fraternal merger aroused many of you to show that maintaining and enhancing the significance of the F.S.A. designation is one of your primary objectives. But otherwise there remains a general air of complacency within our profession that gives cause for concern.

Just now, there seems little awareness of burning issues confronting us. In fact, looking back, most burning issues have been, to most of us, boring issues. Instances are professionalism and structural reorganization. Yet events, internal and external, are taking place which will shape our futures—to name a few, new valuation and non-forfeiture laws, opinions and recommendations on policy dividends, actuarial certification of statements, the future of private pensions, careening inflation and interest rates.

Amidst all this, it worries me to be told that some of you don't attend the Society's business sessions, that our publications gather dust on your shelves, and that *The Actuary* is discarded after you've tackled the puzzles and looked for the limericks.

We on the Board can make the Society a more vital, stimulating organization. But we need your help and your ideas. I ask you, specially you younger members, to be concerned. This is your profession, your livelihood, your future. Present your ideas. Express your concerns, your dissents, your approvals. If you wish to serve, let us know. Be interested in what the Board is doing. Participate at meetings.

Please write to me or to any Board member. Suggest how our proceedings and our profession may become more dynamic. We'll do our best to respond to your ideas. I'll place Board questions before you in *The Actuary* so you can help us decide in what direction the Society should move, and how fast.

I will be satisfied that I have done reasonably well as President if at the end of my term a good number of you have a clearer picture of what the Society means to you, and a deepened contentment with how the Society is serving you and how you are serving the Society.

Robin B. Leckie

LETTERS

More On Public Expressions

Sir:

Further to the comments by Paul Jackson (May) and John Hanson (September), it appears that statements to governmental bodies are issued on the Academy letterhead with little restraint. One such statement, replying to questions submitted to the Academy, acknowledges that few of those matters are actuarial in nature but nonetheless proceeds to respond. Personal opinions apparently can be included in such statements and thus be given the weight of the Academy's authority. Facts can be stated incorrectly with no apparent review.

Thus there seems to be a pattern to Academy conduct in its pronouncements not in the interest of all actuaries. Possibly it is time for the Society to take formal or informal notice of what is transpiring.

John T. Gilchrist

* * * *

Mixed Blessings From Policy Loans

Sir:

The "Insurance Loan Pros & Cons" in your April issue interested me because I've run into this question with my tax clients. Consider an example touted in our local newspaper, of borrowing \$50,000 at 5¾% and investing it at 8% for an imputed annual profit of \$1,125.

It has been pointed out that income tax in the 40% bracket brings the profit ceiling down to \$675. But that's a maximum—there may turn out to be an annual loss to the policyholder of \$475. Reason—interest received is always taxed, but interest paid out produces full credit, partial credit, or no credit at all, depending on how your "Itemized Deductions" compare with your "Standard Deduction." Because of the ever-increasing Standard Deduction (now called Zero Tax Bracket), fewer and fewer people are getting the full tax credit, 40% in our example; they may get no credit at all, and end up paying out 5¾% while receiving only 4.8%.

A few more points that borrowers need to understand. (1) You put up 100% security for your policy loan. Is the security as good on your investment? (2) How about relative liquidity? (3) What about the variable market value of

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Letters*(Continued from page 2)*

the bond in which loan proceeds may have been invested, in these days of drastic interest rate fluctuations? (4) Then there's the broker's commission to buy a bond, and again to sell it. (5) If the policy has been assigned irrevocably to your spouse, beware of these transactions becoming intermingled with your funds, with unhappy consequences for you as executor. (6) Lastly, for trusts under the 1976 Estate Tax laws, the simpler your asset portfolio, the easier it is to make your plans and to have them carried out after your death.

T. Arnol Crowther

* * * *

A — Minus

Sir:

In his column, "Mainly For Seniors," John T. Watts of the Copley News Service writes, "A major new actuarial study does show surprising gains in life expectancy for men, as well as women." I'd like to think that misspelling was a typo, but fear the problem is one of identity.

Robert R. Lynch

* * * *

A 1494 PROBABILITY PROBLEM

Ed. Note: This is adapted from a few paragraphs in a paper by Prof. Hans Bühlmann, the leading Swiss actuary, that was presented at the 1978 Tel Aviv Insurance Seminar. The paper appears in the seminar booklet, New Frontiers In Insurance, Yehuda Kahane, Ph. D., Editor.

The scientific form of insurance was made possible by the emergence of probability in the 15th century. The first probability problem appeared in a book entitled *Summa de Arithmetica, Geometria, Proportioni et Probabilta* (1494), written by Fra Luca Paccioli, a Franciscan monk.

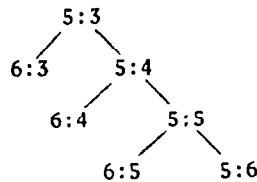
Ques.: A and B play a fair game called "gioci de Balla." They agree to continue until one has won six rounds. But the game stops when A has won five and B three. How should the stakes be divided?

Fra Luca's answer, 5:3, is, of course, wrong, but interesting. He apparently

argued by use of proportionality, without even recognizing the probabilistic character of the problem. But still, it is fair to say that probabilistic thinking began with this problem. Many learned men tried their luck with it and only missed by very little to break through to the correct basic thinking.

We now believe that two Frenchmen, Pierre de Fermat, lawyer and judge in Toulouse, and Blaise Pascal, physicist in Paris and later religious thinker in Port Royal, were the first to solve the problem—150 years later! The solution proposed by Fermat is based on the realization that, in order to determine who gets the stakes, the maximum number of games which still need to be played is three. So simply by listing the eight possible outcomes of three games, Fermat arrived at the answer 7:1.

In his enthusiasm about his solution, Fermat wrote to Pascal. It is not clear whether Pascal believed Fermat's solution. In any case, he tried another approach, what would be called the tree method:



Now Pascal, too, was excited, and he wrote back to Fermat, "N'est-ce pas merveilleux que la verité à Paris est la même qu'à Toulouse?"

E.J.M.

NOTICE TO OUR SUBSCRIBERS

If you send your 1981 renewal before December 31st in response to this notice, the cost to you will be the same as heretofore—\$3.50 for students, \$4.50 for others. If you wait to be billed, the amount will be a dollar higher.

Pay to the Society of Actuaries; mark your check "1981 Subscription to *The Actuary*"; mail it to the Society, 208 S. La Salle St., Chicago, IL 60604.

Deaths

Eloise K. Goodrich, FSA 1926
Geoffrey F. N. Smith, FSA 1952
Charles A. Taylor, FSA 1928

AHEAD OF HIS TIME

In January 1936, William Phillips, a London actuary, presented a paper to the Institute in which, after paying his respects to the Rhind papyrus of the second millenium B.C., he recommended that (a) life insurance companies proceed to convert all their internal figures for premiums, reserves and face amounts from the denary scale of notation (s.n.10) to s.n.8, (b) a simple machine be designed to convert those s.n.8 figures to the binary scale, s.n.2, (c) a light-ray machine, capable of using only the digits zero and one, do the arithmetic then customarily performed by desk calculators and Hollerith cards, and (d) clerks be taught to convert the results mentally from s.n.2 back to s.n.8. He had thus set himself two tasks, both formidable: first, to convey an understanding of why all this would be worthwhile; second, to arouse enthusiasm among those who grasped the idea.

To illustrate his step (c), Mr. Phillips had brought to the meeting the essential parts of a mechanism of his own invention which, although not a light-ray machine, served to demonstrate the process of using figures in binary form.

The actuaries present on that historic occasion were witnessing no less than the precursor of today's computer, whose prototype was then less than a decade away. Today, when actuaries can be classified into (i) a minority of us capable of getting maximum value from automation,* (ii) most of the rest of us, who have at least a working knowledge of computers, and (iii) dinosaurs, it's worth reflecting on the reception accorded in 1936 to Mr. Phillips' paper entitled *Binary Calculation*.

To begin with our own *Transactions*: that paper was routinely listed in *T.A.S.A. XXXVII*, but, subject to rebuttal from readers' recollections, it seems fair to assert that the paper created no stir on this side of the Atlantic.

In London, discussers of the paper gave some intriguing accounts of past and current aids to arithmetic, but, understandably, Mr. Phillips' proposal sparked more scoffing than support. One speaker (not an actuary) questioned whether a machine that could work so

*See L. J. Lohmann's letter, *Masters or Dabblers*, in our June 1980 issue.

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Ahead Of His Time

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fast could be kept occupied! The then President, Mr. Coutts, felt it necessary to encourage the author to pursue his idea despite "any cold water thrown on it this evening."

Jumping forward a quarter-century—

(1) In January 1962, the Institute was told that the Phillips apparatus that had been on display that 1936 evening had come to occupy a place of honour in the South Kensington Science Museum, where it may be seen to this day.

(2) In November 1964, Mr. Phillips was awarded the Institute's Gold Medal for his life of accomplishments. That 1936 paper was described as his outstanding achievement, marking him "many years ahead of his time."

(3) In a letter published in the *Sunday Times* (London) in September 1965, William Phillips described the mental processes, extending through more than twenty years, that had brought him to the idea that he had unveiled that evening in 1936. Said he:

"After completing actuarial examinations in 1913 I turned back to boyhood interest in (Charles) Babbage's 1834 dream of an Analytical Engine, a self-operating, self-recording calculating machine . . . and during the 1914-18 war I was still thinking (of this) in terms of gear wheels. Then began the chain that led to the idea of the binary electronic computer.

"1919 to 1924: connected existing ideas with punched card accountancy—two rival systems then of 'reading' the holes, i.e., electric contacts or spring-loaded pins—but why not rays of light? . . .

"Normal denary scale uses digits 9 down to 0, but binary arithmetic uses only digit 1 and 0 ('hole' or 'no hole'). Whole multiplication table consists only of $1 \times 1 = 1$.

"Snag! Though multiplication simple, addition devilishly difficult. In binary scale $1 + 1 = 0$, and carry 1 (as in denary $9 + 1 = 0$, and carry 1). Death of grand idea?

"Half asleep in deck chair on transatlantic liner, 1925, suddenly 'saw' a worked-out binary 'long multiplication' turn of *its own volition* anticlockwise through an angle of 45 degrees—a diamond-shaped area of as-

sorted 1's and 0's. Solution of 'carry' problem: alternately add simultaneously on all even-numbered columns while 'carrying' to the odd-numbered columns.

"How to add electric pulses? What is wanted is a flip-flop, something which shuttles form 'off' to 'on', and from 'on' to 'off', in the latter case simultaneously sending a 'carry' pulse to next column. Still thinking in terms of mechanism until in 1928 or 1929 learned that in 1919 Eccles and Jordan had demonstrated that a thermionic valve could be in either of two stable states, and made to change with the speed of light.

"1931: Wynn-Williams produced designs for electronic valves as counting units—all the binary electronic computer needed was a battery of such 'counters.'

"1934: plan of electronic computer working in binary, but with octonary (digits 0 to 7) input and output completed to make the human operator's task easier. Babbage's 1834 sleeping beauty had awakened—after the proverbial hundred years."

(4) William Phillips died in March 1968 at age 75. His obituary in *J.I.A.*, Vol. 94 spoke of his "creative faculty which flows from the ability to see the familiar from an unfamiliar angle." It mentioned also his characteristic directness of expression which "did not always commend him to his listeners."

This example was cited:

"Who present (at a Staple Inn Hall discussion, not about the binary system, when Phillips had been an *F.I.A.* only eight years and wasn't yet thirty) can forget his rebuke to a very senior member who had displayed difficulty in accepting statistical evidence counter to all his experience. . . . The gasp at the actual words (of which no printed record remains) can be remembered, with relish, after nearly half a century."

This account of Phillips' tenacious pursuit of an idea may—indeed is intended to—encourage actuaries when they find that the way of the innovator seems, at the time, to be as hard as that of the reformer. And to warn the rest of us to be cautious about haste in dismissing, or deriding, an absurd idea.

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W. RULON WILLIAMSON

An Appreciation by James E. Hoskins

The recent death of Bill Williamson, shortly after his ninety-first birthday, impels me to offer comments about him of a more personal nature than the formal obituary that will appear in the *Transactions*.

When I entered temporary employment at The Travelers in the summer of 1914, Bill immediately took me under his wing, showed me the workings of company life, and introduced me to a small group who frequently lunched together. Bill had become a specialist in pensions and group insurance, but although my assignment was to individual life insurance I had the occasional opportunity to work under his direction.

Bill was fond of outdoor life, and I frequently joined him on hikes and an occasional canoe trip. After he moved to the Washington area, almost all my visits there resulted in a hike along the Potomac or to some historic site. On those occasions, and in my visits to his home after his marriage, I learned that he read widely, and often interjected an appropriate quotation into the conversation. And I remember that when I expressed curiosity about a detail of a painting on a Christmas stamp, Bill promptly sent me an account of the work and its artist.

His foremost avocation was mountaineering. He was an avid member of the *Appalachian Mountain Club*, and took part in establishing some national trails. I recall his telling of climbing some lesser known Alpine peaks which he regarded as more difficult than some that were more famous. When asked why he nevertheless climbed one of the popular mountains, he replied that it was easier to climb it than to explain why he hadn't done so.

When The Travelers was asked to recommend an actuary to help set up the fledgling Social Security system, Bill's experience and temperament made him the logical nominee. Those who knew him only later, when his writings and public statements had a distinctly conservative tinge, may be surprised to learn that in those early days he was regarded as a liberal.

The last part of his career was devoted largely to urging changes in the Social Security system which he came to feel

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Global 2000

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- people added that year compared with 75 million in 1975. And 90% of this growth will be in the poorest countries.
- While gross national product per capita will rise substantially in some third world countries (notably Latin America), it will remain below \$200 a year in the enormously populous nations of South Asia. The large economic gap between rich and poor nations will widen.
- World food production will have increased but the bulk of the increase will have gone to countries already having high food consumption levels. The less developed countries (L.D.C.'s) of South Asia, the Middle East, and Africa will scarcely improve, or even decline below present inadequate levels. Meantime, real food prices will have doubled.
- Arable land areas will expand by only 4%. Projected higher yields will therefore depend on fertilizers, pesticides, power for irrigation and fuel for machinery—all of which depend heavily on oil and gas whose availability is not assured.
- For the one-quarter of humankind that depends on wood for fuel, the outlook is bleak. Needs will exceed supplies by 25% before 2000.
- The quarter of the world's people that inhabit industrial countries will continue to absorb three-fourths of all mineral production, but will become increasingly dependent on imports from the L.D.C.'s. Demands from the L.D.C.'s for a New International Economic Order (i.e., for more) will determine availability and price.
- The world's forests are disappearing at the rate of 18-20 million hectares a year (half the area of California), mostly in the tropics. By 2000, 40% of the remaining forest cover will be gone.
- Regional water shortages will become more and more severe, as demands double in half the world, and deforestation makes supplies erratic. Water and air are the two substances most fundamental to the existence of man, to life itself.

- World agricultural soils are deteriorating. An area the size of Maine becomes barren wasteland each year.
- The era of readily available cheap fossil fuels is closing. A whole new energy resource base requiring long lead times must be developed, and fuel use restraint will become ever more imperative.
- Atmospheric concentrations of CO₂ and ozone-depleting chemicals are increasing steadily as more coal and fossil fuels are burned and forests (which remove CO₂) destroyed. Acid rain is damaging lakes, soils, crops. Radioactive and other hazardous materials are accumulating.
- Hundreds of thousands of species—perhaps 20% of all species on earth—will be irretrievably lost by 2000, as their habitats vanish.
- Grim as this picture is, it may understate the impending problems, due to its taking insufficient account of the interaction among its parts.

Yet there is reason for hope, states the report, since its projections are based on unchanged present national policies and trends. Policies are beginning to change, as reforestation and soil conservation, for example, are getting more emphasis, and alternative energy sources are attracting more research funds. But these encouraging developments are far from adequate.

An Actuary's View

The study is presented as "no more than a reconnaissance of the future." Perhaps its most striking aspect is what it omits. A severe picture of the world at the turn of the century is presented, but there's not much reference to what lies beyond the year 2000—a period of great concern to actuaries. Time will not stop, and the processes of deterioration will not suddenly be arrested in twenty more years. With unforgiving relentlessness, whatever continues from this century's trends will go on into the next century, further affecting mankind's living standards and economics. No country will be able to insulate itself from these effects. Nor is any allowance made for the potential effects of war, even though the world is presently spending \$1.5 billions *each day* on weapons and defence, and directing one-half of all scientific research to this field.

As actuaries, we must consider this long-term outlook, and weigh the realism of expecting reversal or cessation of its negative aspects, and the chances that enough new positive developments will arise to offset them. Further, we must project and translate all of this well into the next century, in terms of inflation, productivity, demographics, and the wisdom of promising vast programs of benefits, some of them indexed without limits.

With a report such as this to ponder, one that is broadly in agreement with other global studies, one must consider very carefully, for example, the opening statement in the Report of the 1979 Advisory Council on Social Security that "all current and future Social Security beneficiaries can count on receiving all the benefits to which they are entitled." Perhaps, a future Council will give thought to the source from which all these benefits must come, and the ethics of unlimited indexing, using a hyped-up index, in the context of the potential lowering of material living standards so clearly foreshadowed in the Global 2000 report.

To be considered also is the widening gap between society's treatment of (a) employees covered by civil service pension plans similarly indexed without any limits, far into the next century, but supported by funds having cavernous unfunded liabilities, and (b) those who pay taxes but have no pension coverage at all, or non-indexed pensions. In the context of Global 2000, this difference may reach epic proportions. Should we be silent about this? □

How far are we, as actuaries, able to contribute to the "stronger capability to project and analyze long-term trends" called for by this government report, and perhaps even to the solution of certain of the major problems which it lays before us all? □

Rulon Williamson

(Continued from page 4)

had expanded unduly beyond its original concept. Without rancor against those who disagreed with him, he pursued his crusade as long as his health permitted.

Bill's interests were too wide for me to cover properly. But I can confidently say that our profession will remember him with respect, affection and pride. □

CANCER INSURANCE = TODAY'S WHIPPING BOY

by E. Paul Barnhart

Cancer Insurance is among the latest products singled out for assault. Consumer advocates, Congressional committees, Federal agencies, State insurance departments: all have had their well-publicized say. Some of the last-named have wielded the executioner's axe, prohibiting its issue.

The product is usually found wanting on three counts:

(1) Incomplete coverage. Only one cause of loss is insured: comparable to auto insurance covering only collisions with cars colored red. And if expense for treatment is incurred, benefits are scheduled and limited.

(2) The "loss ratio." The benefit return in relation to the premium is too low: 40%, 30%, or even less.

(3) Scare tactics. The product is huckstered by unscrupulous salesmen preying upon a weak and gullible public.

Rebuttals to These

(1) It would be wonderful if all of us could enjoy adequate insurance protection against every economic hazard. But we can't afford that, or else we can't be persuaded to allocate enough of our discretionary spending money to that worthy end. Cancer insurance is mostly sold as an inexpensive non-underwritten supplement to basic health insurance, group or individual, that presumably already protects the buyer against general hospital and medical expenses.

Furthermore, at least four other types of insurance serve a supplementary purpose similar to that of cancer insurance, i.e., (1) major medical insurance, (2) hospital daily indemnity insurance, (3) catastrophe expense insurance, (4) accident policies. Of these, the first and third are getting hard to find, the second is relatively limited, and the fourth is open to the same criticism as cancer insurance.

The public's choices seem to be: (a) Spend a lot for supplemental coverage adequate for any need; (b) Spend less for limited, inadequate supplemental coverage, but against any loss; (c) Spend perhaps still less on economically useful protection against selected losses that worry the buyer; (d) Buy no supplementary protection at all. Our paternal

protectors evidently opt for (a) or (d) only, and if too many of us choose (d) they will seek to have supposedly adequate coverage provided for us, under government mandate where, like it or not, or even know it or not, we shall all indeed pay for it.

(2) The "loss ratio" question is a more legitimate ground for argument, if that test is intelligently applied. But the nature of the loss ratio pattern needs to be understood. It tends to be select and to mature slowly toward its ultimate level. I often worry that the loss ratio on cancer plans that I analyze for clients (both sellers and buyers) will get so high that the premium will ultimately prove deficient. Regulators looking at early returns often fail to appreciate where the trend is headed.

And also, what really is a fair benefit return for a product that is individually sold, whose premium is low, and that entails a comparatively high risk, i.e., a large potential benefit of low* expected frequency? For a product of this kind, many states realistically recognize that a loss ratio benchmark at perhaps 30% or 40%, rather than the commonly favored 50%, is reasonable. What is the usual loss ratio on short-term life insurance, or accidental death insurance, or the travel insurance sold at the airport booth? Insurance products cannot always be fairly measured against the 90% loss ratios typical of large self-administered employer-paid group insurance. Yet that's what ignorant consumer advocates and too many legislative committees do.

(3) How legitimate, after all, is the criticism of "scare tactics" if the product itself is legitimate? We've all heard about insurance, sold by the high-pressure agent originally, which was deeply appreciated later when it was there and needed. Many products are sold by scare tactics — cosmetics, burglary alarms, American Express traveler's checks (What will you *do*? What *will* you do?). Certainly there's a limit somewhere, but the question has more to do with particular companies and agents than with products generically.

The Product's Merits

Are all the millions who've bought cancer insurance victims of scare-tactic salesmen selling worthless contracts? I

*except at high ages, particularly among men.

think not. As long as a particular cancer policy meets three criteria, reasonably applied, namely,

Real economic value against the loss insured;

Fair economic value, comparing expected benefit to price;

Honest representation of what the plan will pay and for what price, even if the salesman adds a dose of scare;

I find no grounds for objecting to it. □

THE WILSON REPORT

Ed. Note: A committee, chaired by former Prime Minister Sir Harold Wilson, has made public its findings after a three-year study of the functioning of British financial institutions, and their value to the economy. This article, written from (i) material generously supplied by a London actuary, and (ii) an article in the June 28th issue of The Economist, attempts no more than to alert readers to five of the Report's topics that are of special interest to actuaries.

It seems that the Society would do well to find out whether either or both of the two F.I.A.'s who were among the architects of the Report—Messrs. Gordon V. Bayley and Peter G. Moore—might be persuaded to speak at one of our meetings about this Report and its implications for actuaries.

(1) Life companies and pension funds in Great Britain have increased their assets ten-fold during the past twenty years. These and other institutions now own more than half the shares on the London Stock Exchange. They are labeled as timid investors, inclined thus to neglect the needs of small, new, innovative enterprises.

(2) The Report lists general arguments for and against issuing index-linked securities and mortgages, and recounts the experiences of other countries (including France and Finland where such experiments are reported to have failed). The Committee favors experimentation with index-linked securities and proposes that average earnings be the index adopted.

(3) The Committee does not favor creating the equivalent of the U.S.A.'s Security and Exchange Commission as a regulatory body. Instead it proposes a review body—what *The Economist* calls "an SEC without teeth."

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Dog Life Insurance

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(Farming Insurance Company), a mutual company organized in 1890 that has written this coverage since 1923. The facts for this article were generously given me by Mr. Arne Magnuson, a company officer and indeed a hospitable gentleman.

For many years this company's dog insurance was a small portfolio with unfavorable loss ratios. But since redesigning their coverage, they have reaped 20% of their premium income from it, and results have been satisfactory.

Coverage

Protection consists of a package of life insurance and veterinary care coverage, available after the dog reaches 6 weeks of age. After the dog is 7 years old, there is a reduction each year of 20% of the amount insured (but not below \$250), and the coverage terminates after the dog's 10th birthday. All types of disease and injury are covered, injury after the first day and illness after 30 days. Compensation is payable at full sum insured when the dog dies or becomes so ill or injured that it must be destroyed, or when it goes astray. A lower amount is payable when injury or illness has lastingly reduced the dog's value for breeding purposes.

One unusual feature is that in lieu of cash payment the company may give the owner a new dog of the same value as the insured animal.

Veterinary care is paid for costs of examinations, treatment and care of sick or injured dogs subject to a deductible of 1% of base amount for each treatment period of 60 days. For 1978 the base amount set by the National Insurance Act was 13,100 Swedish kroners (\$3,200). Fees are limited to those set by the Swedish Veterinary Society.

Safeguarding Provisions

Coverage is not effective in event of gross negligence or cruelty by those in charge of the animal. If information provided at time of application is incorrect, the insurance is subject to reduction or cancellation. Payment on a claim for the dog having gone astray is deferred 3 months.

Data

The company keeps statistics by type of dog and by cause of claim. Veterinary care experience shows that dog bred

for performance-oriented characteristics enjoy better health than those bred for aesthetic characteristics, but the claims due to accidents show just the reverse.

A Question for Canada and the U.S.A.

Could dog insurance be successfully transacted here by following the Swedish model? We do not have a national licensing of veterinarians on whom a successful claim administration would depend. As the market for such coverage would be on registered dogs, development of dog insurance presumably should come through organizations of registered dog owners. □

ACTUARIAL NOTATION— IAN, LAN & CAN

A Study Group of the Institute and the Faculty of Actuaries, chaired by David E. Purchase, has just distributed an account of its work, of which the following is, one might say, a synopsis of a synopsis. Any interested actuary may request a copy of the full report from the headquarters of either the Institute or the Faculty.

IAN is the symbol for the present International Actuarial Notation which has existed with very little change since the end of the 19th Century. Over the last 20 years or so, growing dissatisfaction has been expressed with the IAN, albeit from only a minority of actuaries. Among the major reasons for this is the incompatibility of IAN with computer use.

LAN stands for Linear Actuarial Notation, the word Linear meaning the expunging of all the prefixes and suffixes, half a line up or down, on which generations of us have cut our eye-teeth. In addition to linearity, a basic feature of LAN is that its character set (its range of symbols) conform to the restricted range that computers normally permit. The Study Group also set out to construct a LAN that, unlike some previous proposals, would be easily recognizable to the majority of actuaries.

CAN means Computable Actuarial Notation. This is a set of symbols that only actuaries who work directly with computers will need to use, or indeed be able to read. Its essential, as seen by the Study Group, is that LAN be translatable into

CAN by a purely automatic, routine process.

The Study Group has evolved notations designed to accomplish the above and other objectives, but emphasizes that the development of its notations is far from complete, and in no sense are they put forward as formal proposals for recommendations for change. The Study Group would, though, like to see its notations used in practical situations so that they can be refined and extended as a result of experience rather than theory. The Group hopes also to make available, in due course, a set of User Notes for actuaries who help the project along by carrying out experiments with LAN and, particularly, CAN.

In a follow-up article we will describe the Study Group's LAN in more detail.

E.J.M.

Wilson Report

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(4) Pension funds, says the Committee, should be required to make full regular disclosure to their members, including the results of the latest actuarial valuation. Thought was given to proposing some movement away from advance-funded to pay-as-you-go funds in view of the enormous assets and resulting economic impact of the former; but no such recommendation emerged. The view was expressed that the chief anomaly in private pensions is the freedom from tax that lump-sum benefits at retirement enjoy.

(5) The Committee recommended that the traditional tax relief given buyers for payment of life insurance premiums—a significant aid to selling policies with savings elements—be extended to some other forms of saving, even if this necessitates scaling down the size of the tax break given to life insurance premiums.

E.J.M.

Scoring Multiple-Choice Actuarial Examinations

The multiple choice examinations have created their own problems in scoring the answers to the questions. How the mystery, if any, is solved is the subject of the Supplement to this issue for which we are indebted to Messrs. Radcliffe and Nicodemus. □

Ahead Of His Time

(Continued from page 4)

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 happened 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.

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.

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.

□