



The Actuary

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QAV: THE ACTUARY IN SYMBOLS

by Frederick W. Kilbourne

The definition of an actuary is more than a parlor game. The public has a right to know why we think we constitute a profession, and why it should care. And we need to decide who we are. Our identity crisis will do us in if not resolved; a tiny house, divided against itself and built on a swampy foundation, has a dismal future.

If the actuary is "a unique and necessary professional" (William A. Halvorson, Presidential Address, *TSA XXX*, 2), in what way are we unique, and why are we necessary? If we cannot clearly define an actuary, how can we say who is *not* an actuary?

Several years ago (*Record*, Vol. 4, No. 1, 14) I suggested a definition of the actuary as "that professional who is trained in evaluating the current financial implications of future contingent events." This definition, clearly more melodious to us than to the man-on-the-street, follows from identifying the common thread in all the actuarial examinations. Its heart can be expressed symbolically as QAV

where

Q = the probability of the contingent event,

A = its financial implication,

V = the transition to current value.

Though that heart is technical, its body can be seen to encompass essentially all actuarial work now being done—and much that is being left undone. Yet the definition satisfies Mr. Halvorson's uniqueness test, apart from minor border disputes with economists and risk managers. QAV seems adequately to describe "who we are", though it may better describe "who we might be."

We will be more effective if we can first agree upon who we are and where

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DIGGING INTO ACTUARIAL HISTORY

by Raymond H. Daw, F.I.A.

Since my retirement I have been able to study the early history of certain statistical methods which later became part of actuarial science. These have appeared in a pair of papers, (A) "Smallpox and the Double Decrement Table: a piece of actuarial prehistory" (*J.I.A.* 106, 299-318) and (B) "Johann Heinrich Lambert (1728-1777)" (*J.I.A.* 107, 345-363). Most of paper (B) is a translation from the German of a 1772 paper by Lambert relating to subject (A). On this slender basis your Editor has asked me to outline my "modus operandi", and the findings which have given me the greatest satisfaction.

Following The Trail

My method can be described as studying a subject that interests me and then following up leads which emerge, often from chance events. The initial stimulus came from a lecture at the Royal Statistical Society, London, entitled "The Life Table Is Not Quite Dead." This mentioned Daniel Bernoulli's pioneer work in 1760 devising a double decrement table to investigate smallpox mortality, and reported existence of a translation of his French paper. Had no translation been available I never would have started my work; I have since learnt not to be afraid of foreign languages.

My original submission to the Institute was broadly paper (A), with the translation of Lambert's paper as an appendix. The Editor of *J.I.A.* said this was too long and the translation must form a separate paper. Thus I got the opportunity to study Lambert's life and work in preparing paper (B). I was quite unprepared for the results of this.

Here another chance event helped me greatly. I received an American book circular which included a contents list

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AT HOME WITH THEIR COMPUTERS

Our March Query about home computers garnered replies from a fine range of readers by any measure, including seniority. Responders, from newest in the Society back, were:

R. Garth Hutchinson	1980
Jonathan L. Wooley	1972
Grace V. Dillingham	1971
Larry A. Steeples	1970
Robert E. Reuter	1969
Lynd T. Blatchford	1966
George M. Sherritt	1959
Charles M. Larson	1949
John M. Boormeester	1949
J. Earnest Booher	1944

The model most reported on was Apple II (there were four of these), but we heard also about PET/CBM, TRS-80 (Models I & II), TI 99-4 and TI-58C. Says one contributor: "The potential user should list all the features that will be of value to him. My list, which included number of languages provided for, direct access storage at reasonable cost, potential for communication with a main computer and with other home computers, half-line spacing to allow subscripts and superscripts, and color graphics to enhance games so I could justify the purchase to my family—led me to my selection." (R.G.H.)

Should Non-Users Become Users?

"I can't understand why nearly every actuary doesn't have a micro on his desk just as we all had mechanical Fridens in the past. I suppose most don't have enough background to get started and lack time to learn. I am considering offering seminars to teach actuarial uses; anybody interested, please write to my Year Book address." (G.M.S.)

"A computer isn't for a student or busy executive—both have better ways to occupy their spare time. Once the computer bug bites you, be prepared to burn the midnight oil, and to toss in bed

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Letters

(Continued from page 2)

on the weight to be given to policy factors not quantifiable by algebraic formulas, such as advice about policy ownership, beneficiary designations or tax-related questions. Am I then free to brand his presentations deceptive when he doesn't believe them to be so?

Stuart J. Kingston

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Sir:

Perhaps *The Actuary* would print a list of sales practices and invite readers to rate them in deceptiveness. Those agreed to be so might then be made subject to warnings in disclosure statements and buyer's guides. Examples to be voted upon might include:

1. Selling cancer insurance (by any methods).
2. Illustrating that the deposit under a typical deposit term policy will grow at 10% per year.
3. Advertising the virtues of "owning" permanent insurance as opposed to "renting" term insurance.
4. Stuffing premium notices with materials extolling the benefits of repaying policy loans that earn 5% interest.
5. Collaborating with the government in selling U.S. Savings Bonds.

I'm confident that readers can come up with many more and better examples.

James L. Shearer

Ed. Note: Other possibilities for Mr. Shearer's list are to be found in Ellis D. Flinn's article, "Tests of A Business Life Insurance Proposal" in our September 1980 issue.

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Comfort In Retirement

Sir:

The President's Commission on Pension Policy has suggested that several of their proposals will "maintain (pensioners') pre-retirement standard of living." This claim strikes me as unwarranted.

A Commission graph (Chart 7, p. 41) purports to show how Social Security and the proposed Mandatory Universal Pension System would combine to produce 100% of pre-retirement disposable income up to an unspecified income

Opinion Unshaken

Sir:

The common opinion that Hilary L. Seal questions ("An Attempt to Convert American Actuaries," March issue) seems to me to be correct.

Let "L" lives enter observation at $x + a$, "D" of the "L" die before $x + b$, and the remaining "L - D" leave observation at $x + b$, where $0 \leq a \leq b \leq 1$. Clearly,

$$\frac{D}{L} = b - a \text{ } f_{x+a}$$

If, in general $1 - t \text{ } f_{x+t} = (1 - t) \cdot f_x$,

then $b - a \text{ } f_{x+a} = f_x \cdot \frac{b - a}{1 - (1 - b) \cdot f_x}$

Hence $D = f_x \cdot [L(b - a) + D(1 - b)]$
 $= f_x \cdot [L(1 - a) - (L - D)(1 - b)]$.

By induction, we can extend these formulas to the more general situation where there are net migrations at several points of the interval. The first expression shows that deaths are "exposed" to the end of the year of age. The second, and equivalent, expression shows that the "exposure" is the net of potential and cancelled exposures. The point is that "exposure" has meaning only within a specific mortality assumption, Balducci's in this case. General reasoning is insufficient to derive exposure formulas.

William J. Sohn

level. But since the income line was unlabelled, the chart gives no clue to just where other retirement programs would have to kick in.

A reader is led to believe that MUPS plus Social Security will achieve the Commission's target up to perhaps \$15,000 - \$20,000 of final salary; in fact, the goal is accomplished for but a small minority, i.e., those whose earnings have been below \$7,000.

Further, the Commission's recommendation to move the tax on Social Security from pre-retirement to post-retirement income counteracts its other recommendations by increasing the replacement rates needed. I calculate that even with no such tax change the MUPS & Social Security combination would replace only 68% of a final salary of \$10,000; this percentage drops to 63% if the tax change applies. And, of course, that percentage drops sharply for pay levels above \$10,000. Within the income

range of most employees the Commission package leaves between one-third and two-thirds of post-retirement income to come from personal savings or from pension benefits beyond MUPS.

I hope that debate on the Report will recognize this contradiction between the Commission's expressed target and its recommendations. The large question is whether replacement of pre-retirement standards of living can and should be national policy. If it is to be, mandatory benefits will have to be much larger than those suggested by the Commission.

Edwin C. Husted

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Talk Of Many Things

Sir:

Please extend my heartiest congratulations to Mr. Veerjee (February issue) for having broken my record as the youngest to complete the Fellowship exams. He seems to have me by 21 days.

(Continued on page 4)

Letters

(Continued from page 3)

Guess I also belong among those actuaries who have become involved in unusual occupations ("Actuarial Nomads," same issue). (Ed. Note: Yes, but in this case "reached the summit of," rather than just "involved in".)

Incidentally, I seem to be starting a second childhood. Am suddenly playing all games with more skill than earlier. Just can't play as long as I used to.

Oswald Jacoby

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Value Of Society's Curriculum

Sir:

In response to Richard L. Segal's views (March issue), may I present the thoughts of an Associate of 5½ exams.

As a high school sophomore I had many of the same doubts about the

course material. "Why should I bother with History or English or even Science? I never plan to use them in the real world." That attitude, since discarded, seems to have left me with an educational void difficult to fill now. The importance of history in particular shouldn't be overlooked in developing new products or fully understanding current products.

Michael A. Gallagher

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Sir:

After reading Mr. Segal's lament about the exam process, I am gratified that there are actuaries who in ten minutes can read and presumably understand Irwin T. Vanderhoof's study note on immunization.

Godfrey Perrott

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Survival

Sir:

On the Angle/Bladen theme (January issue), we all, as citizens and voters can support public policies that offer reasonable prospects for taming inflation.

Those of us who share responsibility for life company management must, in any case, pursue *survival*. Such a strategy requires more liquidity in the asset structure, greater reliance on non-guaranteed premium products, adoption and creative use of a flexible policy loan interest rate, and significantly higher levels of surplus.

John R. McClelland

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Overlap Theory

Sir:

James H. Hunt's "significant actuarial innovation," within-class homogeneity, (February issue) isn't an innovation at all. If sufficient non-homogeneity is detected in a class to justify separating it into smaller classes, that separation is customarily made.

True, lines of insurance in which contingencies may occur more than once require specially frequent re-classification. But even for the death contingency, re-classification occurs frequently in the course of dividend scale revisions on participating policies. Therefore, the distinction Mr. Hunt makes between auto and life insurance is not a fundamental of risk classification—just another detail to be recognized.

Stuart J. Kingston

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Iniquity

Sir:

Allan B. Keith's comment (April issue) calls for clarification of my point in describing the "FICA-II" recommendations as iniquitous manipulation. Employees weren't told that they would suffer likely lowered Social Security benefits. Some articles by the "FICA-II" sponsors never even mentioned this!

Analogy with sick-pay exclusion from Social Security taxation is not valid; the law *requires* that it be excluded, and it is proper, even desirable, for consultants to point this out. Nonetheless, I advocate that the law be amended so that sick pay and sick leave will be covered in the same manner as annual leave or vacation pay.

Robert J. Myers

Why Non-Smoking Leads The Pack

Sir:

Robert L. Whitney (December 1980 issue) points out that while non-smoker discounts have become common, the number of companies that offer a fit persons' discount is small.

One analysis of Dr. Paffenbarger's data that he cites is to hold "life style" and "blood pressure" constant, and vary only the smoking criterion, viz.:

	<i>Sedentary Life Style</i>	<i>High Blood Pressure</i>	<i>Cigarette Smoking</i>	<i>"Heart attack rate" per 10,000 person-years</i>
1.	Yes	Yes	Yes	201
	Yes	Yes	No	102
2.	Yes	No	Yes	66
	Yes	No	No	35
3.	No	Yes	Yes	80
	No	Yes	No	42
4.	No	No	Yes	50
	No	No	No	26

In each of the four combinations in which only the smoking criterion is varied, the "heart attack rate" is always almost exactly doubled by the smoking. The same type of analysis in which only the life style characteristic is varied shows that the ratio of sedentary to non-sedentary varies from a maximum of 2.4 to a minimum of 1.3.

Numerous prior studies have shown this same doubling of mortality rates for smokers, other things being equal, so Dr. Paffenbarger's figures are a corroboration.

The very constancy of this ratio throughout widely disparate and unrelated studies, and the increasing objectivity of responses to smoking status questions, may explain why life insurers have been readier to introduce smoking as an additional risk characteristic. As other favorable characteristics become more readily identifiable, and as increasing proportions of the population are associated with them, insurers doubtless will incorporate them into their underwriting and pricing, either separately or in combination, to the extent economically feasible.

Michael J. Cowell

PRESIDENTIAL PENSION COMMISSION REPORT

by Douglas C. Borton

After two years' work the President's Commission on Pension Policy has recommended major changes in the U.S. private pension and Social Security systems. These run the gamut from a highly controversial proposal to require a Minimum Universal Pension System (MUPS) to various less significant changes. The immediate weight, however, that proposals of a body appointed by a President now out of office will have on legislation is much in question. Initial reaction has been mixed and, predictably, has tended to reflect the interests of the commenting individual or group.

The Commission proposes a goal of having every retiree receive, from pensions, Social Security and savings, total disposable retirement income equal to his or her pre-retirement disposable income. At least one Commission member doubts that this goal is realistic, no matter how desirable.*

Possibilities: MUPS & PERISA

Under the universal system proposed, each employer would be required to maintain a defined contribution pension plan covering full-time employees who have attained age 25 and completed a year of service. After a 3-year phase-in period, the employer would contribute 3% of payroll. Contributions would be fully vested immediately. The required new provisions could be incorporated into an existing plan; an employer with no plan could use either traditional funding vehicles or a portability clearinghouse to be established within the Social Security Administration. Because of the low contribution level, it would be well into the 21st century before MUPS would develop substantial benefits even though its immediate impact on the economy would be material from the outset.

Other changes that the Commission believes desirable to improve private pension benefits include:

(1) Death protection of vested benefits, through either the pension plan or associated life insurance;

*Ed. Note: Readers' attention is directed to Edwin C. Husted's letter on this subject elsewhere in this issue.

(2) Requiring spouses to agree to waive the automatic joint-and-survivor pension option after retirement;

(3) Prohibiting taking benefits over \$500 in cash except for transfer to an Individual Retirement Account or a new employer's plan.

No changes in ERISA vesting minimums are recommended, but the Commission urges employers to adopt faster vesting voluntarily.

The Commission favors simplification of Social Security integration rules, but doesn't address the central question whether these should be more or less restrictive. It suggests interpreting ERISA's fiduciary standards so as to permit the broader social interests of participants to be recognized in construing prudent investment standards.

Adoption of a Public Employee Retirement Income Security Act (PERISA) is recommended. Unlike the PERISA legislation that was introduced in the last Congress, this one would have minimum funding requirements.

Social Security

Recommendations about Social Security include:

(1) Accelerating the 1985 scheduled tax rate increase, and permitting inter-fund borrowing;

(2) Gradually increasing the normal retirement age from 65 to 68 over twelve years beginning in 1990, and correspondingly raising the early retirement age (the effect of which would be to restore about the same typical retirement period as existed in Social Security's earliest days);

(3) Bringing everybody, including government and non-profit groups who have withdrawn, into the system, by requiring new employees to be thus covered;

(4) Removing the present minimum benefit subsidies enjoyed by employees with limited coverage; and

(5) Computing benefits by an earnings-sharing approach in cases of separation or divorce or death of one spouse in a two-earner couple.

Other Matters

The Commission does not recommend inflation protection through mandatory indexing of pensions, but does favor establishing a separate pensioners' Consumer Price Index. It proposes several tax changes such as applying pension plan

tax treatment to savings earmarked for retirement, and allowing tax deductions or credits for employee contributions to private plans and Social Security. It favors phasing out the Social Security earnings test, making Social Security benefits taxable, and granting a special tax credit to small employers on their MUPS contributions. And it suggests that after more experience has been gained, removing the maximum retirement age under the Age Discrimination in Employment Act be considered.

Comment

In so wide a range of topics, it isn't surprising that many recommendations are general or incomplete. Moreover, the Commission deliberately by-passed issues such as socially desirable investments of pension assets or an appropriate all-resources structure for disability income.

Since the cost-benefit relationship is such a key test of proposals involving large deferred benefits, and since the Commission has not quantified the costs and the savings that would result from its recommendations, actuaries can render a public service by estimating the dollar impacts of those proposals that come up for serious consideration. □

A TIP FOR PART 7 STUDENTS

Several chapters of a pending new Pension Mathematics textbook are being issued as a Part 7 study note for 1981 which will *replace* the present Trowbridge & Farr text for the Society's own exams. But students who have started to study Trowbridge & Farr may rest assured that your time hasn't been wasted; that text does give what you need to know. In fact, Trowbridge & Farr will continue to appear on the Joint Board's list of suggested texts for its EA-2, i.e., the Society's Part 7-E (U.S.), Section A.

... And For Part 9 Students

A supplement to the 1981 Requirements for Admission booklet is being sent to all Part 9 students who have ordered study notes. It contains the Course of Reading for Part 9C (Group Life and Health, and Individual Health), and for Part 9P (Employee Pension Benefits). Others wanting a copy should write to the Society office.

For the E. & E. Committee
Linden N. Cole

Home Computers

(Continued from page 1)

wrestling with why your program didn't work." (J.E.B.)

"My answer would be 'yes', specially for those in technical work. Time in learning will be more than repaid in later time savings, and the user will step into new areas previously denied by the effort required." (R.G.H.)

"Actuaries with an interest in any field or hobby on which they are now maintaining hand records should buy a microcomputer. Also actuaries wishing to enter new areas of research." (C.M.L.)

"The computer is a great consumer of time and money, but worth it, to me, for the intellectual satisfaction as well as the practical results. In general, I have more program ideas than time to work on them." (G.V.D.)

"I know not how I survived without my computer in my BC (before computer) years. Its value for performing studies is inestimable. . . . I am now able to spend more time at home; also I can investigate methods, e.g., Monte Carlo, that limits on time and money would otherwise have prevented. . . . I believe there's a place in every home for a home computer. Little, if any, experience is required for either word-processing or electronic worksheet software; these alone make the investment worthwhile." (L.T.B.)

Uses By These Ten Actuaries

Distressingly, space limitations prevent going beyond outlining just a selection from among many uses reported.

"Education — teaching eighth-grade church school pupils (attendance records, Bible games, lessons, announcements). Other church-related functions (capital fund appeal projections, annual budgets). I can now communicate to audiences of up to 600 persons using either multiple TV sets or a video beam unit." (R.E.R.)

"My machine has been a home management, educational, recreational, hobby-oriented and actuarial tool. It serves well for financial forecasting and analysis and many, many, other such projects. It can be virtually all things to all people." (J.L.W.)

"One of my many uses has been as an element of a doctoral thesis, making

a pension model of the entire American work force distributed by age, years of service and salary, by each of five funding methods. I also gather and publish extensive data on 500 life insurance companies using the microcomputer at all stages up to invoicing." (G.M.S.)

"My computer reconciles and analyzes bank accounts for both my wife and me. It revealed several bank errors, one of which would have cost me \$400. My personal income tax program not only computes the tax but also calculates next year's estimate, altering it automatically as the year progresses." (J.E.B.)

"I have become associated with an Educational Computer Society, and am engaged in training programmers and finding uses for the computer in education." (R.G.H.)

"My computer helps me with stock market research, horse race research, and poker research. It's hard to believe, but if one ignores the time it eats up, all these are making me money." (C.M.L.)

"My machine keeps financial records for me and for the church of which I'm treasurer. Without prior programming experience or training, I wrote my own bookkeeping program and tested it by reproducing the prior year's church books. It produces my monthly reports to the vestry, and my own income tax return. After a little more aesthetic editing I expect to submit the program to the 99-4 Users' Exchange; meanwhile I'd be glad to send a program listing to any reader who sends me a large stamped envelope." (G.V.D.)

"The principal uses for my home computer are (1) word processing; (2) actuarial research and projects; (3) routine actuarial work; (4) parallel system development; (5) systems documentation." (L.T.B.) (Ed. Note: Mr. Blatchford compiled details of all these which interested readers would do well to request from him.)

"My programmable calculator with companion printer just arrived six weeks ago. I've been teaching myself, and find it has amazing capabilities, producing hard copy for many types of complex computations. As an exercise I set out to reproduce the A-49 Table for males (TSA I, 386-7) which it did beautifully. I expect my machine to do useful work for my job as consultant to the E. & E. Committee." (J.M.B.)

Other Comments

"My wife has become a 'computer-widow' in much the same way as spouses of Sunday football addicts. But my addiction is 7 days a week." (- - -)

"Today's home computers have the power, speed and capacity of the very largest computers of about fifteen years ago, and cost from \$800 to \$3,000." (G.M.S.)

"I would recommend a microcomputer with disk storage and 64K memory for actuarial work—cost, about \$4,500 to \$6,000. The less expensive dot-matrix printers are very reliable." (L.A.S.)

"The periodicals I get say that all home computers use BASIC as programming language. It is very simple and widely illustrated in books." (J.E.B.)

"Availability of a word processor is one of a home computer's most valuable benefits. Our knowledge is of little value unless we can communicate it; a word processor represents a quantum leap from the typewriter in the art of communication." (L.T.B.)

"My computer lets me fit continuance functions for disability income to algebraic functions which are variants of those described by E. Paul Barnhart (TSA XXV, 119), reducing the time needed to quantify such functions." (R.G.H.)

"I recommend that any potential enthusiast subscribe to BYTE magazine." (L.T.B.)

"Using a tape recorder for storing memory is impractical and a waste of money. VISICALC software makes most programming simple." (C.M.L.)

One contributor, speaking no doubt for all, warns readers that all these enticing opinions come from dyed-in-the-wool computer buffs—"freaks" was the word he chose.

E.J.M.

Deaths

Henry S. Beers, F.S.A. 1923
 Su-Tu Chen, A.S.A. 1932
 Charles B. English, F.S.A. 1953
 Alfred N. Guertin, F.S.A. 1929
 Annie M. Motheral, F.S.A. 1925
 Barton S. Pauley, F.S.A. 1940
 Frederick W. Stephens, A.S.A. 1962

Contributions to the Actuarial Education & Research Fund, 208 S. La Salle St., Chicago, IL 60604, in memory of a deceased member are acknowledged to the donor and member's family. □

**MIGHT WE USEFULLY ADVOCATE
A U.S. GOVERNMENT ACTUARY POST?**

This is an abstract of five welcome comments on the above question, raised and discussed in our March and May issues.

Gordon C. Boronow: We have an Attorney General for the lawyers, a Surgeon General for the doctors, . . . why not an Actuary General for us! The incumbent might require a message on every cancer policy, medicare supplement, whole life policy, or whatever type is out of favor: "Warning, this policy may be hazardous to your financial condition."

An Actuary General may serve a useful role, though, if limited to areas such as social insurance and public pensions. Let's not push for another government post merely for professional glorification.

Shepherd M. Holcombe: There are many actuarial and related government areas that need attention from an actuary with freedom to implement or influence changes. Examples are Universal Social Security and limits on cost-of-living increases in pensions and wage contracts. I favor a high-level actuary able to influence policy and legislation; it would help if the person also became involved in the programs of our actuarial bodies.

Edwin C. Husted: I oppose setting up a government actuary to approve and oversee actuarial reports of government agencies. Our Federal government undergoes periodic consolidations and dispersions. If all pension activities were put under one agency, someone a generation later would complain that each of the affected agencies functions poorly because part of their program is operated elsewhere. Actuarial decisions in an agency's operations are supportive and shouldn't be independent; if there's an irreconcilable difference between an actuary and his boss, the actuary should leave the agency.

My experience in the Office of Personnel Management was that conflicts between the actuary and agency head were few. The latter recognized that, as is true of accounting, legal and other professional work, actuarial work must be left to the professional; policy decisions, on the other hand, rest with the agency head. Just as there's no need for a super-authority to set assumptions for all insurance companies or all consulting

firms, there's none for a government actuary to oversee the work of the several government actuaries and to act as a buffer against an agency head.

Frederick W. Kilbourne: The time may indeed be ripe for establishing this position as part of the government's advisory apparatus. Politicians seem no longer able to attract votes by making benefit promises that disregard long-range costs. Yet our new Administration may find its support waning during an austere recovery unless authoritative voices convince the public that the results of some other remedy would have been far worse.

Robert J. Myers: The efforts in 1957 to centralize actuarial activities of the U.S. Government in an Office of the Government Actuary resulted from desire to improve actuarial services, not from any serious perceived shortcoming. But the idea was at odds with the then efforts to avoid proliferation of new agencies, and there was the problem of

where to locate it in view of our separation of powers between Executive and Legislative branches. And the agencies that already had actuaries on their staffs took the position that they needed these at their immediate beck and call.

I believe the concept to be highly desirable in theory but probably unachievable because its logic is unpersuasive to agencies that would have to relinquish their valuable human actuarial assets. The only hope I would see for success is to have an FSA or FCAS elected President of the United States!

DO YOU HAVE COMPUTER EXPERIENCES TO NARRATE?

If so, you might present a paper at the Society's Winnipeg Conference, August 27-29. For details, ask Prof. H. J. Boom—address and phone number in Year Book.

ACTUARIES: CLUSTERED AND SOLITARY

Courtesy of Linden N. Cole, we have from a recent seminar mailing a picture in numbers of where actuaries are on this continent. The areas shown are commuting areas, not state boundaries; Academy and Casualty Society members are in with us.

Boston (325), Rest of Mass. (125), Maine (46), Rhode Island (17)	513
Hartford (566), New Hampshire (27), Vermont (24), Rest of Conn. (43)	660
New York City & Newark (1,611), Rest of New York State (60)	1,671
Philadelphia (375), Rest of Pa. (63), Delaware (22)	460
District of Columbia (181), Baltimore (104), Rest of Va. (59), W. Va. (6)	350
North Carolina (95), South Carolina (19), Georgia (175)	289
Tennessee (100), Alabama (43), Florida (179)	322
Mississippi (19), Louisiana (34), Arkansas (19)	72
Kentucky (64), Ohio (239), Indiana (200), Chicago (612), Rest of Ill. (91)	1,206
Detroit-Ann Arbor (108), Rest of Michigan (24)	132
Wisconsin (198), Minnesota (207), Dakotas (17), Iowa (130)	552
Missouri (151), Kansas (40), Nebraska (104), Oklahoma (19)	314
Dallas-Fort Worth (195), Houston-Austin (144), Rest of Texas (2)	341
Colorado (68), Idaho (6), Utah (17), Montana (2)	93
Arizona (43), New Mexico (3), Nevada (5)	51
Southern California (394), Northern California (214)	608
Washington (109), Oregon (47), Hawaii (9)	165
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Total U.S.A.	7,799
Maritimes (23), Montreal (286), Quebec City (132)	441
Ottawa (52), Toronto (630), London-Waterloo (143)	825
Winnipeg (76), Saskatchewan (6), Alberta (29), British Columbia (53)	164
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Total Canada	1,430
Total, United States & Canada	<u>9,229</u>

Actuarial History

(Continued from page 1)

from the periodical *Historia Mathematica*. In it I noticed an article about J. H. Lambert; its references opened for me a whole new field of publications by and about him.

When developing a subject it is not easy to work forward. A better starting point, I find, is a later publication that reviews the subject, or one related to it, giving references to past works. In this case I had long ago read Karn, M. N. (*Annals of Eugenics*, 4, 279-326) which gives, with full references, the history of the rise and fall of inoculation against smallpox and describes the related statistical investigations. That paper gave me an excellent start, and living near London I hadn't much difficulty finding the books and papers I needed in the excellent libraries we have.

Handling Translations

Most of the early papers relevant to paper (A) were in French and, to my surprise, my schoolboy French, with liberal use of a dictionary, was usually sufficient to get a good idea of a paper's contents. I needed, however, to refer to an expert in French before quoting a translation of any passage.

Lambert's 1772 paper was written in German and I delayed looking at it because my knowledge of German was almost non-existent (two terms at school and 4% in the examination!). To my astonishment I found that with the aid of a grammar and dictionary, looking up every word, I was able to get a fair idea of what that German paper was about. The mathematical formulae of course helped immensely. Having satisfied myself that a translation would be useful, I found an obliging linguist; between us we produced a satisfactory translation for paper (B).

An Exciting Discovery

Lambert made contributions to many branches of science; I have described in paper (B) his "actuarial" contributions which include several "firsts". The one that most surprised and delighted me was his fitting a polynomial of the fifth degree to a series of observed values of l_x . This fitting is done so as to reproduce some, but not all, of the observed values and also to reproduce the slopes of the tangents to the curve (determined graphically) at each end of the

age range. Thus this polynomial would "hang together" with the corresponding polynomials for immediately preceding and succeeding age ranges — in other words, osculatory interpolation over 100 years before T. B. Sprague's work! Some authors writing about Lambert's work just regard this polynomial as a function approximating the "law of mortality"; I cannot recall anyone who has recognized it as osculatory interpolation. This illustrates the value of carefully reading original sources.

Anyone writing a historical paper must be prepared to be told that he has got it all wrong or has missed some vital contribution; that is part of the fun of the game. But one also gets suggestions for further work—I have made no promises, but who knows, one day . . . □

DANGER 0, 0, 0, . . . ¹⁰

If you generate a series of 10^{10} random numbers, you are almost certain to get a run of 10^6 zeros (or 1's for that matter). Attention has been drawn to this ominous prospect by G. Brian Hey, F.I.A.; we observed his report in FIASCO, March issue.

On behalf of our anxious readers we asked Mr. Hey for his source. He has kindly cited it: *Journal of the Royal Statistical Society*, Vol. CI, Part 1 (1938), a paper by Kendall and Babington-Smith.

Random numbers users, please don't say *The Actuary* didn't warn you.

E.J.M.

CAN WE DO BETTER THIS YEAR?

Fellows who voted in recent Society elections were 61% of the electorate in 1978, 56% in 1979 and again in 1980. □

YOU SHOULD HAVE RECEIVED . . .

Check now to see whether you have the *Record*, Vol. 6, No. 4, covering our 1980 Annual Meeting, Montreal. If not, make a note to ask Society headquarters if that number doesn't turn up soon.

This newsletter acknowledges with thanks the suggestion by James E. Hoskins, FSA 1920, that we routinely announce Society mailings that don't emerge on a predictable schedule.

NOTES FROM ACTUARIAL OFFSPRING

In our January editorial we mentioned, just as a curiosity, that the first of all actuarial examinations (London, 1850) asked candidates to find the fractional value of the recurring decimal, $x = .27272727$. A member's 7th grade grandson (B. MacKinnon) then told us (February issue) that you just eliminate the recurring element by subtracting the value of x from the value of $100x$.

Now we report messages from the sons of two Society members.

Tom (son of J.M.) Loftis, an actuarial student at University of North Carolina, points out that when the method described by MacKinnon is applied to $x = .9$ recurring, it furnishes "algebraic proof that 1 is equal to something other than 1!"

In the same vein, Raam (son of P.V.) Gokhale, a Rutgers sophomore, observes that, in general, the recurring decimal 9 cannot be expressed as the ratio of two integers. He proceeded to explore how the various recurring decimals are produced.

We heard also from Howard Wachpress. He consulted the venerable British algebra text, Hall & Knight, and reports that it gives (p. 43) a general rule for reducing any recurring decimal to a vulgar fraction. He says: "I do recall with some pleasure the discovery of this little gem, and having put it to good use on a Part 2 examination." E.J.M.

DISABILITY TERMINATION RATES BEING PUBLISHED

To meet requests, the Committee to Recommend New Disability Tables will have some experience termination rates printed in mid-June in the *Disability Newsletter*, No. 29 (John Haynes Miller, Editor).

William J. Taylor, Chrmn.

QAV

(Continued from page 1)

we belong, and then set about convincing our neighbors and lower-case societies in Canada and the U.S.A. that we can be more worth than we are trouble.

Ed. Note: This is an excerpt from the author's concise essay, "What Is An Actuary?", which we believe he will cheerfully send to any enquirer to his Year Book address. □