



SOCIETY OF ACTUARIES

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## A LIFE SPAN OF 150 YEARS?

by Arthur Pedoe

The heading could well be *Actuaries Beware!* At the October 1967 meeting of the Society of Actuaries, *Mortality Trends and Projections* was discussed and the guest speaker was Dr. Bernard L. Strehler, professor of biology at the University of Southern California and former chief of the gerontology branch of the National Institutes of Health. The Chairman was Mr. Edward A. Lew. Dr. Strehler's closing remarks to the assembled actuaries were: "In my judgment, there are startling implications for you in the results of research relating to aging. Depending on the outcome of such research the results could be very disturbing for those of you who are primarily in the annuity business."

This "annuity business" covers the policy-reserves of the annuity and pension business of the U. S. life insurance companies and the assets of the uninsured private pension plans in the U. S. These exceed one hundred billion dollars and a conservative estimate is that they will exceed two hundred billion dollars by the end of the 1970s. This is exclusive of all pension plans covering government employees and excludes all social welfare measures. In some major life insurance companies in Britain and the U. S. the annuity and pension liabilities exceed those covering life insurance. The present situation is that there are no reliable documented cases of anyone living beyond 109 years. Actuaries have been assuming that annuity and pension mortality has been relatively constant and in calculating their liabilities have been conservative in allowing for some improvement in mortality. But what of a major reduction in mortality at the older ages and a major increase in the

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We welcome the appointment of Charles L. Trowbridge as Chief Actuary for the Social Security Administration.

## FROM A NON-SQUARE

C. H. Hardy (with a foreword by C. P. Snow), *A Mathematician's Apology*. Cambridge University Press, Cambridge, 1967, \$2.95 cloth, \$1.45 paperback.

by James C. Hickman

Each of us is haunted by the nagging notion that his life may be without meaning and his work of no value. Despite the dark doubts that these possibilities inevitably create, few of us have the discipline, the expository skill, and the integrity to construct a defense of our life work. Yet this is precisely what Hardy has done in this book.

The youth of today, in common with earlier generations that lacked the amplification provided by the mass media, have discovered the idea that personal fulfillment may result from doing "one's thing." The value of a person's life, in this view, is not necessarily determined by the institutions he has influenced, by the children he has taught, or even by his contributions to the welfare of others, but rather this value is measured by the degree of his attainment of self-determined goals.

To those of us with more conventional minds, grateful for the benefits of a highly organized society, the consequences of each of us doing his "own thing" seem appalling. Yet this is exactly the position that Hardy defends. For him, the measure of his life was his contribution to pure, that is unuseful, mathematics and his book supports this standard.

For lack of wit or of drive or because of an absence of both of these key ingredients, few of us engage in creative

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## BLACK ACTUARIAL RECRUITMENT

by Robert J. Randall

In the June issue of *The Actuary*, Peter Hutchings presented a report on the new program for recruiting black students to the actuarial profession which was started in 1969 under the sponsorship of seven New York area life insurance companies. This is a report on the progress of the program since Mr. Hutchings' article.

The program is being pursued vigorously by the members of the Ad Hoc Committee comprised of actuaries and chairmen of the mathematics departments in certain black colleges. In the fall of 1969, actuarial lectureship visits were made to six black colleges. This school year visits have been made or will be made to twelve such colleges. Many students and their professors knowing little or nothing about actuaries have now seen live actuaries and have been supplied with our booklets on the profession and its career opportunities. The first Summer Institute at Lincoln University, Lincoln, Pennsylvania has been completed. Thirteen students attended and were drilled intensively on material preparing them for Part I.

Professor James Frankowsky of Lincoln University has rendered outstanding help in all this. He directed the Summer Institute most capably and has attended the meetings of the Committee as a representative of the mathematics department heads of other colleges and has represented them most ably.

Actual passing results to date have been sparse. Of the thirteen students attending the first Summer Institute, only one succeeded in passing Part I in November. Four others, however, performed sufficiently well as to warrant offers of

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## Life Span

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life span where present liabilities amount to hundreds of billions of dollars?

Mr. Lew in introducing Dr. Strehler stated: "There is a great deal of wishful thinking about the increases in longevity that might be brought about by new scientific miracles. You have all seen statements that the span of life will be extended to 120 or 150 years in the not-too-distant future." Mr. Lew then went on to refer to factors tending to increase the death rate: as unfavourable urban environment, growing air and water pollution, drug addiction, rising crime and so on. After Dr. Strehler spoke he added: "We have been remiss in not keeping up with the implications of recent developments in areas such as biophysics and genetics."

Of the ten members of the Society who took part in the Discussion the only comment regarding Dr. Strehler's statement was that by Mr. Lew. It is stated that one thousand teams of scientists in the United States alone, were working on the possibilities of life extension and aging among living creatures, including man. It is time that actuaries gave the matter the thought it deserves. In October 1967 the present writer shared Mr. Lew's doubts.

## Molecular Genetics

Another statement by Dr. Strehler: "The last decade has been an epochal period in modern molecular genetics, because during this time it was demonstrated that the entire prescription for a human being (or a mouse or a fruitfly or a carrot) is written down in a language composed of just four letters . . . just four letters in a sequence . . . The translation of the messages made up of these strings . . . of which each living creature is composed was one of the most elegant puzzles to confront scientists. This puzzle has now been almost completely deciphered."

## Redington's Paper

In February 1969 F. M. Redington, a former president of the Institute of Actuaries, presented a paper to the Institute entitled *An Exploration into Patterns of Mortality*. Part II of the paper is headed *A Physiological Limit to Life*. Since Gompertz's paper in 1825 to The Royal Society on the law of mortality

it is doubtful if his formula has received the analysis and application given it by Redington who expresses the force of mortality  $\mu_x$  as equal to  $c^{x-z}$ . In this new guise  $z$  is the age at which  $\mu^z=1$ , the limit of life. He states: "Clearly  $z$  is at least in part a genetic factor since the age at which  $\mu_x=1$  must be different for dogs, horses, elephants and man . . . And if  $z$  is an effectively constant genetic factor, is  $c$  solely an environmental factor?"

Redington applied his formulas to and analyzed the cause of death of the English Life Tables (population) from 1911 to 1951. He began the work with the belief that there is some form of physiological limit to life. However  $z$  decreased for male lives from 103.20 years to 99.82 and for female lives from 103.47 years to 101.63. Redington states: "My original feeling that  $z$  was constant was therefore numerically wrong and, as will be seen from Part II, was philosophically untenable." In his reply to the discussion of his paper he added: "Somebody invented penicillin and bang went Gompertz!"

Although the results of Redington's investigations did not establish the ideas with which he started the work, the importance of the paper is that it brought the question of the span of life before the actuaries of the world, for about one third of the fellows and one half of the associates of the Institute are domiciled outside Britain. Those participating in the discussion included several British actuaries who have made major contributions to the theory of mortality and four came out with definite expressions of opinion that the human life span could be extended: Perks, R. D. Clarke, Beard and Benjamin. Dr. Bernard Benjamin, a former president of the Institute, was most forthright in his views: ". . . he confessed to being one of the few actuaries (were they so few?) who believed unlimited improvement to be possible . . . It was only necessary to look at human tissue under an electron microscope to find a whole new world. There were so many different bodies to count and measure and classify . . ."

## Dr. Alex Comfort

Among those at the Institute was Dr. Alex Comfort, probably the best known worker in gerontology owing to his books, lectures and articles. He is Director, Medical Research Council Group on

Ageing, University College, London. As a graduate in medicine, with doctorate in biochemistry and gerontology his scientific views on this subject merit our respect. Further, with a literary background equalling his scientific pursuits his views should extend far beyond the walls of a laboratory.

Comfort told the Institute that: the biological gate could be moved in animals by relatively simple procedures—fairly easy to double the life span of rodents with calorie restriction—the survival curve of mice had been changed by administering anti-oxidants. He emphasized that research on the possibility of slowing down the age progress was more likely to succeed, not by curing malignancy but assuring that people got it later. At a university lecture in Canada in 1968 Comfort stressed the likelihood of adding years to the period of adult vigour as an achievement distinct from and more desirable than just increasing the span of life.

## Faculty of Actuaries

The next step in this actuarial saga took place a year after the Institute meeting when in February 1970, the Faculty of Actuaries invited Dr. Comfort to address them on the subject in Edinburgh. The address and discussion are now available in their Transactions. Dr. Comfort told the Faculty members: that direct experiment on the delaying of aging in man is virtually certain to be in hand somewhere by 1975 and probably at more than one center; by good luck some agent colorably reducing the rate of human aging by as much as 20 percent is likely to be known within 15 years; there is reasonable probability that by 1990 we shall know of at least one proven way of extending vigorous life by up to 20 percent and by simple and cheap methods not depending on grafts or elaborate intensive-care units.

The August 3, 1970 issue of *Time* contained a cover-story *Growing Old in America* and specially featured Dr. Comfort's views on ageing. The important point of this article is that it appears that Comfort is now far more positive in his views, stating that within the next twenty years a method to extend vigorous life by at least 15 years will be covered apart from the extension of the average life expectancy of roughly five to seven years when medicine conquers

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cancer and vascular disease.

It should take some years before the results of these experiments and investigations into aging could be tested on and applied to man. The important thing is for actuaries to be aware of and keep in touch with this work. As D.W.A. Donald, President of the Faculty of Actuaries, closing the discussion in Edinburgh and addressing Dr. Comfort said: "... this is a subject in which the actuarial profession ought to interest itself if purely in a defensive way for the sake of our own offices or the people whom we are advising. I don't know whether the research that is being carried out is hampered by lack of funds or lack of people, ... in self defence ... the life insurance industry (should) take a hand in it if purely to get, as it were, an early warning of the disasters which your well-intentioned efforts might be bringing."

## Social Consequences

Even today the population of the United States over age 75 is increasing at  $2\frac{1}{2}$  times the rate of the total population and with an increased life span and a drop in the birth rate this gap would be much aggravated. Actuaries are aware of the enormous increase of disability with age which is a current social problem. In spite of optimism that increased vitality will be associated with an increased life span, there is the danger that we may fail to arrest the deterioration which accompanies old age. We must also bear in mind the trends of modern society: lower pension age, increasing pensions, and a longer period of schooling and education before changing the consumer into a producer. This all betokens social change of a magnitude difficult to contemplate and of consuming interest to the world at large. There is a White House Conference on Aging scheduled for November 1971. □

## Adjusted Authors

In accordance with generally accepted editorial principles *The Actuary* is amortizing the publication of co-authors of *Adjusted Earnings — Mutual Companies* (December 1970) over two issues. The other author was Edward H. Colton

## Actuarial Meetings

- Feb. 11, Baltimore Actuarial Club
- Feb. 15, Chicago Actuarial Club
- Feb. 16, Actuaries Club of Philadelphia
- Feb. 17, Seattle Actuarial Club
- Feb. 17, Nebraska Actuaries Club, Omaha
- Feb. 22, Chicago Actuarial Club
- March 11, Baltimore Actuaries Club
- March 15, Chicago Actuarial Club
- March 17, Seattle Actuarial Club
- March 18-19, Canadian Institute of Actuaries, Toronto
- March 25, Nebraska Actuaries Club, Omaha

## From a Non-square

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activity. Most of the time we do things and think thoughts that others before us have done or have thought. At times we may reorganize and modernize the existing stock of ideas, but few of us have personal acquaintance with their creation. In this book, Hardy gives us a rare but fascinating glance into the creative process.

Hardy's *Apology* book first appeared in 1940. It was written shortly after he suffered a serious heart attack and only seven years before his death. There is a pervading mood of sadness in the book that results from Hardy's singular commitment to the creation of new pure mathematics as the primary justification for his life and his awareness that this activity was, by then, behind him.

The book is much more than a personal summing up of G. H. Hardy; it is a literary gem in which the defense for pure creative, but nonutilitarian, activity of all kinds is stated with greater force than anywhere else.

The book is little more than an extended essay, and may be easily read in an evening. Despite the fact that it is the author's sole venture into popular writing, the uniqueness of the ideas and the clarity of the writing have attracted to Hardy a group of readers far larger than perhaps any other scholar who has elected to restrict his activity to the rarefied domain of pure mathematics.

Excerpts from the book appear in Volume 4 of the popular collection, *The World of Mathematics*, edited by James R. Newman. Since its original appearance many scientific and literary journals have reviewed it and, because of Hardy's rather disdainful view of useful mathematics, these reviews have often been colorful.

Those interested in a balanced criticism of Hardy's somewhat extreme position on the proper role of mathematics and mathematicians are referred to a recent review by L. J. Mordell in *The American Mathematical Monthly*, October 1970. Mordell's comments carry great weight because, like Hardy before him, Mordell is a distinguished mathematician who has made numerous contributions to that most useless of topics, number theory, and is a member of the distinguished mathematical community at Cambridge.

## Not a Moderate Man

Moderate men are seldom as interesting as those whose eccentricities have not been buffed off by daily contact with society. Hardy was not a moderate man. He loved intense competition both in cricket and in mathematics. He was an uncompromising atheist who had the honesty not just to ignore God, but to carry on a good natured feud with all earthly manifestations of the Deity. Many of these delightful insights into the character of Hardy are provided by a lengthy foreword in the current reprint of the book by the British scientist-administrator-author, C. P. Snow.

I would conjecture that most actuaries will find reading the *Apology* a mildly distressing experience. Actuaries are deeply committed to applying what Hardy labeled "ugly" mathematics to very real and pressing human problems. However, this "distressing experience" will bring many benefits, for reading Hardy will deepen one's insight into the nature of mathematics and the creative process. What is more, it is an elevating experience to share with a man of great integrity his effort to construct an explanation and justification for what he did with his life.

*Editor's Note: We welcome this review of an "old" book and we would be glad to have suggestions on other not-too-recent volumes that would interest our readers.* □