

# TRANSACTIONS

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## ADDRESS OF THE PRESIDENT, DAVID M. HOLLAND

### THE ONCE & FUTURE ACTUARY

#### *“Know Thyself”<sup>1</sup>*

In his address as the first President of the Society of Actuaries, Edmund M. McConney asked: “What are actuaries?”<sup>2</sup> We are still struggling with this question today. Perhaps this is the sign of an identity crisis.

Maybe it’s a response to changing times. In keeping with the retrospective mentality ascribed to actuaries, to help figure out where we’re going, we should first know where we’ve come from. Accordingly, let’s focus on the Once and Future Actuary—the one who was, the one who is, and the one who is to come.

#### *The One Who Was . . .*

People have been interested in actuarial concepts for ages. Moses said in Psalms 90:10:

The length of our days is seventy years—or eighty, if we have the strength; yet their span is but trouble and sorrow, for they quickly pass, and we fly away.

Or consider the words of Solomon writing in Ecclesiastes 9:11:

I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favor to men of skill; but time and chance happeneth to them all.

Solomon’s reference to time and chance long predates Benjamin Gompertz’s observation that:

It is possible that death may be the consequence of two generally co-existing causes; the one chance, without previous disposition to death or deterioration; the other, a deterioration, or an increased inability to withstand destruction.<sup>3</sup>

<sup>1</sup>Inscribed on the Temple of Apollo at Delphi.

<sup>2</sup>McConney, E.M. 1949. “The Responsibilities of ‘Scientific Financiers’,” *Transactions of the Society of Actuaries* 1:1-9.

<sup>3</sup>Gompertz, Benjamin. 1825. “On the value of Life Contingencies, &c.,” Read before the Royal Society, June 16.

The concepts of risk transfer and insurance predate actuaries. The code of Hammurabi, circa 1750 B.C., discusses sharing the risk of robbery among businessmen. In the times of the Roman Caesars, there were death benefit funds (*Collegia funeratica*).<sup>4</sup> Ulpian's Table, dating from around 220 A.D., was intended for valuing annuities relating to legacies.<sup>5</sup>

In the 1530s, churches in England started collecting records of deaths as an early warning system for outbreaks of the bubonic plague. John Graunt became fascinated with what could be learned by studying these records, and in 1662 wrote "Natural and Political Observations Made upon the Bills of Mortality." Anders Hald says the following about this work:

A systematic collection of numerical data on population and economy began again in the Italian city-states, notably Venice and Florence, during the Renaissance. A descriptive statistical analysis of such data occurred first in 1662 when John Graunt analyzed the weekly reports on vital statistics for London, which had been published regularly since 1604.<sup>6</sup>

So who was this person who laid the foundation for statistical analysis and set the stage for the development of a mathematical model of mortality? In *Against the Gods*, Peter Bernstein said:

The author, John Graunt, was neither a statistician nor a demographer—at that point there was no such thing as either. Nor was he a mathematician, an actuary, a scientist, a university don, or a politician. Graunt, then 42 years old, had spent his entire adult life as a merchant of 'notions,' such as buttons and needles.<sup>7</sup>

In 1693, Edmund Halley of comet fame published mortality tables based on the more complete information from records of the city of Breslau. *Actuarial Mathematics*<sup>8</sup> says that some scholars date the beginning of actuarial science from this time.

While statistics were being collected and analyzed in Great Britain, much early correspondence on the origins of probability theory took place in Europe. In the 1600s, correspondence regarding questions on gambling between Pascal and Fermat led to the foundation of probability theory.

<sup>4</sup>*Bilder Zur Versicherungsgeschichte*, pp. 2-3.

<sup>5</sup>Haberman, S., and Sibbet, T.A., ed. 1995. *Life Tables and Survival Model*, vol. 1 of *History of Actuarial Science*. London: William Pickering, p. xxi.

<sup>6</sup>Hald, A. 1990. *A History of Probability and Statistics Before 1750*. New York: John Wiley & Sons, p. 82.

<sup>7</sup>Bernstein, Peter L. 1996. *Against the Gods: The Remarkable Story of Risk*. New York: John Wiley & Sons, Inc., p. 75.

<sup>8</sup>Bowers, N., Gerber, H., Hickman, J., Jones, D., and Nesbitt, C. 1986. *Actuarial Mathematics*. 1st ed. Itasca, Ill.: Society of Actuaries.

Haberman and Sibbet's ten-volume *History of Actuarial Science*<sup>9</sup> contains copies of seminal papers on the founding of actuarial science. In discussing the scientific origins, they say:

Some of the pioneers in the 1700s and 1800s were eminent scientists and mathematicians who became interested in actuarial problems. Thus, we find Leonhard Euler, James and Daniel Bernoulli, Carl Friedrich Gauss, Abraham de Moivre, Benjamin Gompertz becoming involved in the science and making significant contributions.<sup>10</sup>

The practical and theoretical lines merged in England in 1762 with the founding of the Society for Equitable Assurances on Lives and Survivorship. The founding of the Equitable was led by James Dodson, an "accountant and teacher of mathematics." Dodson was incensed at his rejection by the Old Amicable dividing society because of his advanced age of 46 (note he died at age 47). Dodson showed how premiums and reserves could be set up for permanent insurance, and the Equitable is said to be the first life insurance company founded on scientific principles.

Following Dodson's death, Edward Rowe Mores took over as the promoter of the Equitable. Mores picked the term "actuary" to refer to its chief administrative officer. The term had been used for clerks who recorded acts of the court, but it actually dates back to the time of Julius Caesar when the *actuarius* recorded the acts of the Roman Senate. As Robert Mitchell said in *From Actuarius to Actuary*<sup>11</sup>:

Whatever qualifications Mores may have had in mind in choosing the designation, it is evident that mathematical ability was not one of them. In fact, none of the Equitable's first four actuaries had the technical ability to function as actuaries in today's understanding of the designation; when the directors who made all the major decisions thought computations were needed, they had an outside mathematician make them.

Dr. Richard Price was the Equitable's consultant, and some consider his "Observations on Reversionary Payments" the first major work on actuarial science in general. Price managed to get a job for his nephew, William Morgan, as assistant actuary. Morgan eventually became the chief administrative officer with the title actuary. One of Morgan's scientific contributions was "The Doctrine of Annuities and Assurances on Lives and Survivorships," published in 1779. It is said Morgan disliked the title of actuary. Nevertheless,

<sup>9</sup>Haberman, S., and Sibbet, T.A. 1995. *History of Actuarial Science*, 10 vols. London: William Pickering.

<sup>10</sup>Haberman, S., and Sibbet, T.A. *Ibid.*, Vol. 1, p. xix.

<sup>11</sup>Mitchell, R.B. 1974. *From Actuarius to Actuary: The Growth of a Dynamic Profession in Canada and the United States*. Chicago, Ill.: Society of Actuaries.

his skills and mathematical abilities led to the title of actuary having its present-day meaning. Again quoting Mitchell:

Morgan was the first actuary who could be called a professional actuary in the sense that the term is understood today. Before he came on the insurance scene there were men like Dodson, Mores and Price, who were actuaries in all but name. And there were actuaries in name only, like the four who preceded Morgan at the Equitable. Morgan combined the designation and the function. In creating the actuarial profession, he imbued it with two of his own characteristics: a scientific outlook that insisted on mathematical and statistical research as the basis for decision-making; and an unmuzzled integrity that made him ready to risk his job rather than go along with potentially disastrous proposals from unwisely optimistic directors and policyholders.

With this evolution of the modern "actuary," is it any wonder that the general public is confused about this obscure but influential profession? At times, even actuaries have tunnel vision about what is a truly broad and multifaceted profession.

#### *The One Who Is . . .*

Today is a great day to be an actuary.

- Over the past several years, *The Jobs Rated Almanac*<sup>12</sup> has twice ranked being an actuary the no. 1 profession.
- Actuaries are respected and rewarded for their intellectual capacity and technical ability. Computational power has been growing in accordance with Moore's law, making it easier to concentrate on more interesting and challenging problems.
- The Canadian Institute of Actuaries has long enjoyed the prestige and benefits of a federal charter.
- In the U.S., the American Academy of Actuaries is becoming more influential as both Congressional and NAIC decision-makers recognize the actuarial profession as a valuable source of unbiased information on significant issues facing the country.
- Actuaries make a difference by what they do.

#### *The SOA Today*

You should also be proud to be a member of the Society of Actuaries.

- The SOA is the largest actuarial organization in the world, with approximately 16,500 members.

<sup>12</sup>Krantz, L. 1995. *The National Business Employment Weekly Jobs Rated Almanac*. New York: John Wiley & Sons, Inc.

- The SOA has members in over 50 countries. U.S. members comprise 72% of the membership; 19% live in Canada; and 9% live outside Canada and the U.S. Today there are more SOA members outside North America than there were total members when the SOA was founded in 1949.
- Seventy-five percent of our members belong to at least one of 13 Special Interest Sections. The largest are Investment, Pension, Product Development, Financial Reporting, and Health.

Lest you think otherwise, the SOA is big business.

- The SOA has an annual budget of more than \$15 million.
- In a year, the SOA administers about 57,000 examinations at more than 300 centers worldwide. The SOA produces almost 700 study notes and materials for the examinations. Approximately 550 volunteers participate in the SOA's E&E process.
- More than 800 speakers are recruited annually for four major meetings serving about 4,000 attendees. The SOA also organizes about 25 seminars, university programs, and video conferences per year. This year two CD-ROMs were developed, and they are available from the SOA. Several more CD-ROMs are scheduled for release early next year.
- The SOA manages approximately 85 research projects and experience studies involving over 350 volunteers and a budget of almost \$2 million.
- The SOA publishes the *North American Actuarial Journal*, *The Actuary*, *The Future Actuary*, *Actuarial Mathematics*, the *Yearbook*, *Directory of Actuarial Memberships*, *ARCH*, numerous monographs, and newsletters for the 13 Special Interest Sections. This year, the *Record* became the first of our publications available only in electronic form on the SOA's web site. Distributing it via our web site resulted in significant savings and improved publication turnaround time.
- The SOA staff consists of 85 people, including actuaries, Ph.D.'s, and other association professionals. We have an outstanding staff, and I very much want to say what a pleasure it has been working with them over the past year.

The actuary of today is often defined in terms of practice areas: investment, pensions, life, and health. In fact, the SOA organizational structure focuses on staff support by practice areas.

### ***Implementing Mission***

The SOA Mission Statement, however, indicates:

The Society of Actuaries is an educational, research, and professional organization dedicated to serving the public and Society members. Its mission is to advance actuarial knowledge and to enhance the ability of actuaries to provide expert advice

and relevant solutions for financial, business, and societal problems involving uncertain future events.

Note that the SOA mission is defined in terms of actuaries; the SOA seeks to advance actuarial knowledge and enhance the abilities of actuaries regardless of current or future practice area.

Today's actuaries want the SOA to help them do their job better; employers want actuaries to add value to their organizations. Meeting these needs is why the SOA expends vast resources on educational programs, meetings and seminars, research, publications, web sites, and so on.

As a professional organization, the SOA also has a responsibility for the conduct of its members. We have adopted a Code of Professional Conduct and By-Laws dealing with discipline. The SOA aspires to meet the following definition of "profession":

a calling requiring specialized knowledge and often long and intensive preparation including instruction in skills and methods as well as in the scientific, historical, or scholarly principles underlying such skills and methods, maintaining by force of organization or concerted opinion high standards of achievement and conduct, and committing its members to continued study and to a kind of work which has for its prime purpose the rendering of a public service.<sup>13</sup>

### *Today's Changing Environment*

Even though today's actuarial profession is vigorous, "The Times They Are A-changing," to quote the singer/poet, Bob Dylan.<sup>14</sup>

- Twenty years ago, the top two sources of income for life insurance companies were life and health premiums.
- Today, the leading sources of income are annuity considerations and investment income.
- Bancassurance is well established outside the U.S. Banks are already in the insurance business in Canada and are pushing hard for insurance powers in the U.S. Last year witnessed a record number of mergers and acquisitions in the life insurance industry.
- Insurance companies in recent years have suffered a one-two punch from well-publicized company failures and market conduct problems.
- Managed care has resulted in a revolution in health care and health care financing.
- Pension legislation is more complex, and government policy is still favoring defined-contribution plans over defined-benefit plans.

<sup>13</sup>Webster's Third New International Dictionary.

<sup>14</sup>Bob Dylan, 1964 song title.

Such changes must be frightening indeed, if the future is a simple extrapolation of the past. Thus, the SOA faces the same challenges as modern management: it must meet the needs of current members and their employers while simultaneously preparing to meet the changing needs of future actuaries. And it must have a vision.

### ***The One Who Is to Come . . .***

A quote from Proverbs 29:18 on vision, says: “Where there is no vision, the people perish . . . .” The Vision of the SOA is:

. . . for actuaries to be recognized as the leading professionals in the modeling and management of financial risk and contingent events.

Note that the SOA vision is not expressed in terms of practice areas. An actuary who is grounded in the principles of actuarial science should be able to master the time, nation, and practice-specific materials that comprise the science of compliance.

In focusing on the actuary of the future, we must think of actuaries as the heirs of Morgan, Price, Dodson, Halley, Graunt, and others. These people long predated the qualification requirements of the Institute of Actuaries or the Actuarial Society of America; yet the consulting mathematician, the model builders, and the collectors and interpreters of data are our real spiritual ancestors.

When President McConney answered his rhetorical question, “What are actuaries?” he said:

The actuary in reality is a sound, practical rather than too theoretical mathematician applying simple principles of probabilities to human affairs in the unknown future.<sup>15</sup>

This is not a bad definition for 1949, or even for 1997.

### ***Challenges of a Brave New World***

A glimpse into the future shows that the general public will face increasing financial uncertainty:

- Individuals have declining confidence in benefits promised by state-supported entitlement programs such as U.S. Social Security and Medicare or CPP/QPP in Canada.
- Downsizing, mergers, and acquisitions have shown individuals that they cannot rely on an employer solely for health care, disability coverage, and other benefits.

<sup>15</sup>McConney, E. Op. cit., p. 2.

- Concerns about retirement income have been augmented with concerns about long-term care and quality of life during retirement.
- As individuals assume more responsibility for their savings, they will look for vehicles with both increased yields and an acceptable level of security.
- As risks exceed the capacity of traditional products, alternative risk transfer mechanisms must be developed.

Who better than actuaries can design and manage programs that will provide for financial security in such uncertain times? We should not lose sight of the wonderful quote from Nobel Laureate Dennis Gabor that Ed Lew brought to our attention in his Presidential Address<sup>16</sup>:

The future cannot be predicted but futures can be invented. It was man's ability to invent which has made human society what it is today . . . The first step of the technological or social inventor is to visualize, by act of imagination, a thing or state of things which does not yet exist, and which to him appears in some way desirable. He can then start rationally arguing backwards from the invention, and forward from the means at his disposal, until a way is found from the one to the other.<sup>17</sup>

### *Reinventing the Future*

The SOA is actively inventing the future by working on programs that will have an impact on the actuary of tomorrow:

- The Board Task Force on Education is developing the new syllabus for the year 2000. It concentrates on actuarial principles and meets the vision of actuaries as the leading professionals in the modeling and management of financial risk and contingent events.
- As part of the new syllabus, a professionalism requirement for Associates is planned.
- Efforts are also under way to design a continuing education program to help actuaries maintain their professional skills, including the implementation of a variety of distance learning programs.
- The *North American Actuarial Journal* has premiered as the new scholarly journal for the actuarial profession.
- An SOA seminar entitled "Actuarial and Financial Modeling Towards a New Science" was held at Georgia State University. Key papers were published in *NAAJ*.

<sup>16</sup>Lew, E. A. 1974. "Reordering the Actuarial Priorities," *Transactions of the Society of Actuaries* XXVI:323-33.

<sup>17</sup>Gabor, D. 1964. *Inventing the Future*. London: Pelican Books.



- A second edition of *Actuarial Mathematics*, with an increased emphasis on financial risk, was published this year.
- A new textbook on Financial Economics, made possible by the Actuarial Foundation and Lincoln National Corporation, will be published in 1998 and made available to SOA members.
- The SOA has expanded its Web Site on the Internet at <http://www.soa.org>.
- The SOA is a leading member of the new International Forum of Actuarial Associations, designed to establish professionalism and educational standards for actuaries throughout the world.
- The SOA has renewed its agreement with Nankai University to develop actuarial science in China. We have also established an Asia Committee and will open a regional office in Hong Kong shortly to service the more than 600 SOA members in Asia.

While these are significant activities initiated by the SOA, actuaries all over the world are also contributing to our profession.

### ***The Actuarial Control Cycle***

One example that especially intrigues me comes from the Institute of Actuaries of Australia. It is a concept called “The Actuarial Control Cycle” (see Figure 1).

First, a problem is identified, and the risks and the client’s situation are analyzed. Data are collected and a model is built to develop possible solutions, which are then presented to the client. Once an approach is selected and implemented, the experience is monitored and the model is refined. Then, the cycle starts over to determine whether the problem is fully solved or if further changes are needed. All of this occurs with a proper understanding of the overall environment and is subject to high standards of professionalism.

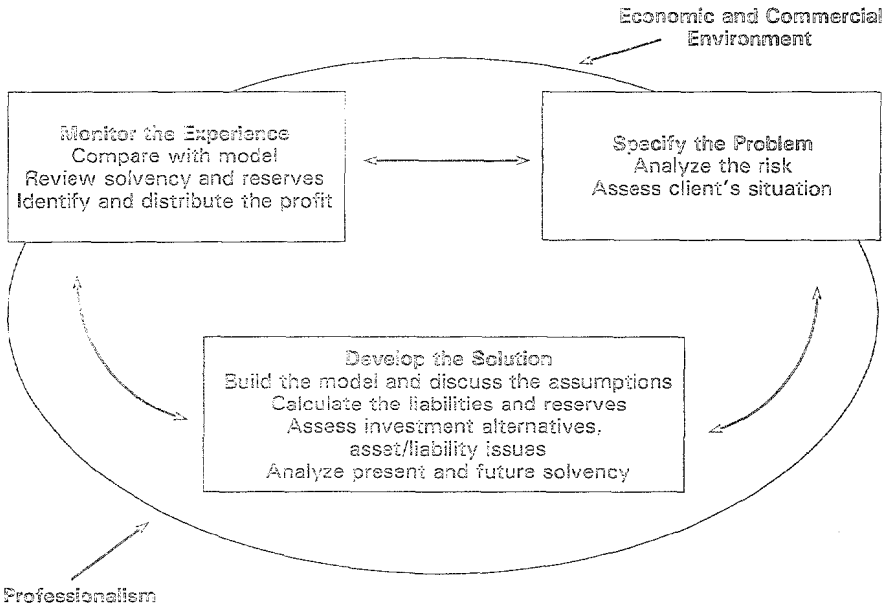
The control cycle can be applied to traditional areas such as health, investments, life, and pensions, but a much wider range of problems may also come under the rubric of this paradigm. In Australia, actuaries are already applying the control cycle to problems involving electric power distribution and mining resource management.

Trevor Matthews, President of the Institute of Actuaries of Australia, has proposed that actuarial science be redefined in terms of the Actuarial Control Cycle.<sup>18</sup> This concept is excellent in its description of the process that actuaries use to solve problems, and it should be included in the SOA educational program.

<sup>18</sup>Trevor Matthews. 1997. “Shaping the Next Century,” Presidential Address to the Institute of Actuaries of Australia.

FIGURE 1

The Actuarial Control Cycle



*Actuaries Make Financial Sense of the Future*

Another example of actuaries contributing to their profession comes from the British Institute of Actuaries. For its 150th anniversary next year, the Institute has chosen as its theme: "Actuaries Make Financial Sense of the Future." This appropriately describes the true talents of actuaries. Duncan Ferguson, President of the Institute of Actuaries, and Paul Grace, President of the Faculty of Actuaries, are to be commended for selecting this theme.

Actuaries are not mere mortals—they are wizards who can make uncertainty certain. Examples abound.

- You can't be certain how long you'll live, but actuaries can design plans to care for your loved ones in the event of untimely death and plans to provide income if you live long beyond your working lifetime.
- You can't be certain whether you will get sick, but actuaries can design plans so that you will have medical care and even income if this happens.

- You can't be certain when or where a tornado, hurricane, or earthquake will strike, but actuaries can design programs to provide financial relief from such events.
- You can't be certain of the default risk on a single loan, but actuaries can transform a portfolio of such loans into a new type of security.

Actuarial science is not smoke and mirrors. It is built on the solid foundations of mathematics, probability, statistics, and finance. And while actuaries cannot predict the future, we can build models to project the future assuming various actions. These mathematical models are just as real as the scale models architects and engineers build.

As actuaries, we must never lose confidence in our ability to make a difference. The Once and Future Actuary is the model builder and manager, the financial architect and engineer, who can lay the foundation for a secure financial future. It is ours to invent.

