THE Actuary

The CAS and SOA move together on principles

by Steve Radcliffe
SOA President-Elect

The Casualty Actuarial Society (CAS) and the Society of Actuaries (SOA) have agreed to form a joint task force to achieve unity on actuarial principles. Allan Kaufman, CAS Vice-president of Research and Development, and I will spearhead this effort beginning this spring. CAS and SOA leadership are to be congratulated on their foresight in making this a priority for our profession.

Individual progress

I congratulate the CAS on the progress it has made in articulating principles. It is interesting to compare the different approaches each group has used to design its principles. By reviewing its actuarial practices, the CAS derived principles by induction. The SOA articulated general or fundamental principles with the hope that principles specific to certain practices could be derived, at least in a general way, from the fundamental principles.

Both groups have made important advancements for our science in the discovery, development, and articulation of principles. Tremendous potential for synergy exists from getting the two groups together. As previously noted, the SOA has concentrated on general or fundamental principles, while the CAS has made large strides in principles that are specific to the practice of casualty actuarial science. Each group can learn much from the other.

Pensions in Canada by 2031

by J. Bruce MacDonald

Retirement income is often compared to a three-legged stool, with the legs being social security, private pensions, and savings. It is interesting, yet disturbing, to see what the situation may be in 40 years.

Social security

Three basic elements make up the Canadian social security system:
- Canada or Quebec Pension Plan (CPP, QPP, or C/QPP)
- Old Age Security Pension (OAS)
- Guaranteed Income Supplement (GIS)

The C/QPP provides a pension of 25% of career average earnings, adjusted for increases in national average earnings. Maximum benefits are payable if the member has worked for 85% of the contributory period from age 18 to retirement. The pension is fully indexed with the cost of living. Retirement is normally at age 65 but can be as early as age 60 subject to a reduction.

In 1993 both members and their employers contribute 2.5% of covered earnings, which are about the average earnings of Canadians. (Those who are self-employed contribute twice these amounts.) The Thirteenth Actuarial

In this issue:

Editorial
Professional responsibilities ●

by Mary Hardiman Adams

Speaking at the Society's annual meeting last October, President Walter Rugland opened by saying, "I take great pride in being an actuary. It is an honorable and respected profession." He continued, ". . . We have the public trust and stand accountable for the quality of our work. And we are a profession because of the way we apply our research in practice, because we practice in a way that the people who use our work can rely on our results, because we attest that we are qualified to do the work we do, and we are able to discipline ourselves." He then added, "Three things make a profession great: men and women with a spirit of adventure, men and women who know their duty, and men and women who strive to meet a standard."

Spirit of adventure is an inborn quality; you have it or you don't. The second and third — knowing duty and striving to meet a standard — are objective. If they are not instinctive, they can be acquired.

Within the profession, four sources of guidance on knowing duty and meeting standards exist internally for the practicing actuary. They are:
• The Code of Professional Conduct (the "Code")
• Standards of practice
• Qualification standards
• The profession's counseling and discipline bodies, which in the United States is the Actuarial Board for Counseling and Discipline (the ABCD), and in Canada, procedures established by the Canadian Institute of Actuaries (CIA).

The Code
The Code of Professional Conduct, as adopted by the Society's Board of Governors on October 23, 1991, is almost the same as the code adopted by each of the other organizations representing actuaries in the United States. The Code is structured to contain Precepts (16 of them) that identify the standards and Annotations that provide additional explanatory, educational, and advisory material on how the Precepts are to be interpreted and applied.

New FSAs are familiar with the Code from completing the Fellowship Admissions Course as the last step in their Fellowship education. I wonder whether actuaries who are not new FSAs appreciate the depth of information in the Code. Do they recognize that they need to abide by the Code? Do they understand what "professional responsibility" means?

Other items in the Code:
• The need to observe qualification standards and follow standards of practice
• In communications, identifying the actuary who can answer questions and relying on other sources
• In interpersonal business relations, such items as conflicts of interest, confidentiality, courtesy/cooperation, differences of opinion, advertising and last, but not least, direction on when one needs to communicate with the appropriate counseling and disciplinary body

We should all be familiar with this material, which is printed beginning on page 117 in the 1993 *Society of Actuaries Yearbook.*

(A note: the Joint Committee on Professional Conduct is alive and well and is hard at work trying to eliminate the word "almost" as used in the first sentence of this section on the Code.)

Practice standards
Under the Society's Code, practice standards in the jurisdiction in which the actuary renders service apply. For practice in the United States, the Standards of Practice promulgated by the Actuarial Standards Board (ASB) apply. For practice in Canada, the Standards of Practice promulgated by the CIA apply.

Standards are issued only after the ASB takes several steps:
• Development by a specialty committee of the ASB
• Approval by the ASB for exposure to the membership
• Exposure with the request for comments and, in some instances,

testimony at hearings
- Revisions by the specialty committee

Finally, approval by the ASB (Note: any of these steps may be repeated several times.)

Do we, as practicing actuaries, respond to exposure drafts? Are we mindful of applicable practice standards? Do we follow them? We must.

Qualification standards

The Society's Code of Professional Conduct says, "An actuary shall perform professional services only when the actuary is qualified to do so and meets applicable qualification standards." It is up to each actuary to observe qualification standards — to know what they are for the field of practice of a particular assignment — and to keep current on any changes in the standards. For practice in the United States, qualification standards are promulgated by the American Academy of Actuaries. For practice in Canada, eligibility standards are set out in the CIA's bylaws.

External to the profession's own qualification standards, pension actuaries are subject to the enrollment procedures of the Joint Board for the Enrollment of Actuaries to perform ERISA-related assignments.

Are we all, as practicing actuaries, mindful of applicable qualification standards? We must be.

Counseling and discipline

The Code provides that an actuary with knowledge of a material violation of the Code shall disclose this to the appropriate counseling and discipline body (except where confidentiality or law would prevent it). The CIA's procedures are followed for practice in Canada. Violations arising from practice in the United States should be reported to the ABCD.

The ABCD has existed since January 1, 1992, and is comprised of actuaries from each of the organizations that has adopted the Code of Professional Conduct. For questions that need specific expertise, the ABCD will request the attention of an ASB or other organization's specialty committee or a committee member.

The ABCD refers to the standards professionalism — the Code of Professional Conduct, the standards of practice, and the qualifications standards — to reach a decision. Its purpose is to give guidance in response to inquiries and complaints about members of the organizations that have adopted the Code of Professional Conduct and to evaluate the merits of any complaints. The ABCD observes essentials of confidentiality and due process.

If the ABCD recommends discipline, it issues a confidential report to the member and the member's actuarial organization(s). Each organization then is responsible for concluding the process.

We have much source material for guidance in our actuarial practice. We have a self-disciplinary process in place. We must remember our resources: the Code, qualification and practice standards, and the counseling and disciplinary bodies. We have many reasons to be proud of our fellow actuaries and their standards.

Tsk, tsk, shame on some U.S. pension actuaries

It has come to our attention that some (per other sources, many) actuaries are reporting the "value of vested benefits" as an amount that turns out to be the value of accrued benefits for vested employees. Our inquiries indicate that these actuaries do not have a problem understanding how the correct computation is to be made. They just do it their way . . . for whatever reason.

This is wrong; it is deceitful; it is unprofessional.

Do not forget, when problems arise, talk it out. In Canada, refer to the CIA. In the United States, consult the ABCD; it is there to help you.

Bulletin board to come this fall

At its January 1993 meeting, the SOA Board of Governors approved establishing a Bulletin Board System (BBS). The "SOA Forum" will be accessible through the CompuServe network. The Computer Science Section has endorsed the BBS and is supporting its development. Startup is targeted for fall 1993.

Members' feedback is important as the SOA explores which services would be of most benefit. Please call or write Jim Weiss at the SOA office with your ideas.

SECTION CORNER

This column reports on activities and newsletters of all special interest Sections on a rotating basis.

Futurism Section

The Futurism Section Council is planning a retreat with an outside facilitator to help it research its role and to help decide on the Section's viability. A point/counterpoint article in the April issue of the Section's newsletter, *Actuarial Futures*, offers two views of whether the Section should exist, with Immediate Past Chair Thomas Mitchell saying, "Yes," and Chairperson Godfrey Perrott arguing against. Ken Polk is the editor.

Other officers of this Section are Bob Ryan, vice-chairperson, and Dennis Barry, secretary/treasurer.

The Section is sponsoring a panel discussion and workshop at the New York annual meeting in October based on the book, *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future.*

International Section

The February issue of *International Section News* focuses on the Far East, with articles from Korea and Thailand, an update on current events in Hong Kong and China, and a description of the actuarial program at Nankai University in China. Other articles cover market developments in Eastern Europe and the former Soviet Union and life industry regulation in Australia.

The International Section sends copies of its newsletter to presidents of the international actuarial organizations maintained on a list in the Society's library. In response, several organizations have sent their newsletters, which are housed in the library and are available to members. Items received include proceedings of an October 1992 international seminar on health assurance in Istanbul, Turkey; the Korea Insurance Development Institute's *Monthly Insurance Statistics, Vol. 1993.2*, and the December 1992 and February 1993 issues of the *Society of Actuaries in Ireland Newsletter.*

The International Section's efforts to build a data base of foreign actuarial meeting information has garnered 16 replies. Anyone traveling abroad can contact Bob Collett at his *Directory* address to see what meetings might be worked into trip schedules.

Issues facing actuaries in retirement systems

by Judy Anderson
SOA Education Actuary

As the Society of Actuaries moves into its first year under the revised committee structure, the Retirement Systems Practice Area is actively initiating new projects while maintaining projects already in progress.
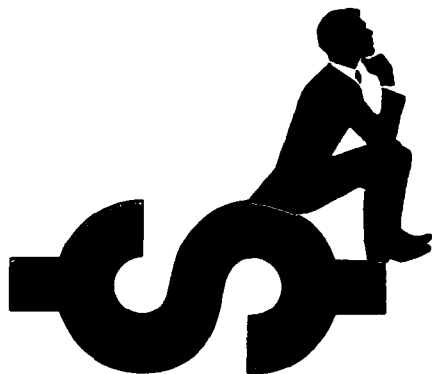
Projects include:

- Group annuity mortality table construction
- FAS 106 research and seminars with the Health Systems Practice Area
- Symposium of papers on appropriate/adequate funding of retirement benefits
- Specialty Guides and references for pension actuaries
- A study on employee turnover and retirement patterns
- Data collection to profile pension practitioners and their meeting and seminar attendance to better meet their needs

The revised SOA structure allows practice areas to enlarge their focus through practice advancement committees. (See "Revised committee structure" on page 5). The Retirement Systems Practice Advancement Committee is considering which issues to address. Following are some significant issues being considered.

Possible decline of the defined benefit plan

The number of defined benefit plan terminations has increased. Some have been replaced by or absorbed into other plans. Frequently, the new coverage is a defined contribution plan. Many reasons have been cited for terminations of defined benefit plans:

- Increasingly complex regulations, as well as more favorable regulations for defined contribution plans.
- Changing employment patterns. Defined benefit plans are designed to reward the employee who spends most of his or her career with a single employer. With employees now more likely to change jobs, employers are ambivalent about long-term relationships. Defined contribution plans are more portable and are more generous when benefits are taken for severance rather than retirement.
- Economic environment. Under the current economic environment, the focus of plan sponsors may have shifted away from benefit adequacy to the cost of the plan. Again, defined contribution plans have more visible termination benefits and portability. In addition, required contributions and the cost reflected on a company's financials are more predictable. Also, employee attention has shifted from long-range planning to job security and more immediate benefits such as health care, family leave, and flex time. This change in focus also may be influencing unions that had been strong supporters of the defined benefit approach.
- Employee preference. Many employees prefer the defined contribution approach with a personal account balance they can watch grow. The defined benefit plan is more difficult to understand.

The terminated defined benefit plans generally have been sponsored by smaller employers. Excise taxes on recaptured plan surplus in the United States and complex rules on surplus distribution in Canada may have inhibited large plan terminations. However, as lower interest rates eat into plan surpluses and tax and expense considerations grow, larger plans also may be affected.

Some believe that as the baby boomers get closer to retirement and focus on their pension benefits, a shift back to defined benefit plans may occur.

Canadian regulators are concerned about the decline of the defined benefit plan. In the United States, increased regulation may reduce the administrative advantages of defined contribution plans.

Although the future of the defined benefit plan is not clear, it is clear we should not plan for a future that looks like the past.

Increased regulatory complexity and compliance

Increased complexity in government regulation has made it harder to stay up-to-date on regulation details. Plan sponsors also may be less willing to use resources to review and amend their plans to comply with laws and regulations that are so complex they could defy compliance.

Increased competition and reduced employment opportunities

Economic conditions have led plan sponsors to cut back on consulting services and have increased pressure on actuaries to cut fees. Many actuarial firms have downsized, and fewer employment opportunities exist in the retirement systems area.

Advances in technology are likely to have an additional adverse impact on actuarial jobs, with computerized pension valuation systems available to non-actuaries.

Plan underfunding and the PBGC

Recently, the Pension Benefit Guaranty Corporation (PBGC) has been in the spotlight, with newspaper stories comparing the PBGC situation with the S&L crisis. Underfunded defined benefit plans sponsored by corporations facing difficult times make the PBGC problem worse.

The PBGC controversy has identified some inconsistencies in U.S. pension funding. For example, U.S. minimum funding standards allow for benefit improvements to be funded over an extended period. A plan that improves benefits for retired participants could easily extend the funding of the improvements beyond the retirees' lifetimes.

Recent drops in interest rates illustrate another anomaly. Plan funding valuations performed on a long-term basis could reasonably use

an interest rate higher than that available in the annuity market and higher than the interest rate used by the BGC to determine the liability for a terminating plan.

Options and alternatives

As the Society's Retirement Systems committees look at the issues, we realize we have more questions than answers. By addressing them now, however, we can shift our focus to the future. The following are some areas that could be addressed:

- What research would help assess the future position of actuaries in retirement systems practice?
- Should actuaries be more active in individual financial planning and work for the benefit recipient?
- Should pension actuaries reposition themselves as "employee benefits actuaries," with a thorough understanding of health and other group benefits? (The SOA is supporting pension and health actuaries practicing in post retirement benefits by offering seminars, research, and basic education.)

- Are some growth areas particularly suited for pension actuaries, such as international benefit consulting, designing executive compensation, evaluating personal injury and divorce cases, and giving expert testimony?
- Does the Society need to provide more continuing education on assets/investments for pension actuaries?
- Should the profession go beyond compliance with pension law and renew its focus on basic actuarial principles?
- What can the Society do to help retirement systems actuaries in practice for themselves or at small firms?

Some of these questions suggest actions the Society of Actuaries could take; some fall under the purview of the Canadian Institute of Actuaries and the American Academy of Actuaries. Some rest in the hands of the individual practitioner. Any comments and suggestions for the SOA Retirement Systems committees are welcome.

Revised committee structure

The Society of Actuaries has revised its structure to be able to respond better to members' needs in their practice areas. The reorganization changes the committee structure from a solely functional one into one that integrates four practice areas with needed functions. The SOA is organized into seven segments: three are operational and four relate to specific practice areas. The three operational areas are:

- Administration
- General Initiatives
- Examination and Basic Education

The four practice areas are:

- Life Insurance
- Retirement Systems
- Health Benefit Systems
- Financial and Investment Management

The General Initiatives area includes Knowledge Extension Research, Research Coordination, Program, Member Communications, External Relations, and similar committees.

Under each practice area, committees will focus on:

- Research — studies and analyses of use to members specializing in that area
- Professional Development — programs that add more practice-specific knowledge and skills past those acquired for designations
- Specialty Guides — up-to-date guides to sources to help stay current in a specialty
- Practice Education — material to educate candidates and members in existing practice fields
- Practice Advancement — providing scope of new professional requirements within existing fields and ways to meet them

This revision permits committees to better focus on their specific charges. The *1993 Society of Actuaries Yearbook* details the revised committee structure beginning on page 30.

Thanks to exam volunteers

by Bernard Bartels
SOA Registrar

Much time, energy, and effort is spent by more than 1,000 SOA members supervising actuarial examinations. The mere marshalling of these forces is no small accomplishment. Those who administer the tests appreciate all the work the volunteers do so this vital link in the development of the next generation of actuaries can be completed. Although space does not allow a list of the names of all those who are involved in this effort, we are grateful to the volunteers who help bring a successful exam administration to fruition.

Efforts continue to keep the complexities of the system within control. Members' suggestions on how to improve exam administration, keep costs under control, accelerate shipping procedures, and recruit supervisory personnel are most welcome. Call or write me at the society office with your comments.

5 schools receive grants

The Society of Actuaries recently awarded $2,500 grants to five colleges and universities in recognition of full-time faculty members attaining Associateship status.

The schools and faculty members are:

- Columbia College, Columbia, Missouri — Dr. Jiann-Shiun Huang, assistant professor
- Université de Montréal, Montreal, Quebec — Martin Bilodeau, Department of Mathematics and Statistics
- Central Missouri State University, Warrensburg, Missouri —Jinhua Tao, Department of Mathematics and Computer Science
- University of Nevada, Reno, Nevada — Manalur S. Sandilya, Managerial Sciences Department
- University of Minnesota, Morris, Minnesota — Jinghua Kuang, assistant professor, Division of Science and Mathematics

The grants will be used to aid students and faculty doing research and attending actuarial research conferences, paying exams fees, producing promotional material for the departments, and purchasing books, journals, and computer hardware and software.

Actuaries in leadership positions

by Angelica Michail

This article is condensed from a report the author completed for the Executive MBA program at Peter Drucker Management Center.

Like many industries, the life insurance industry is caught in a whirlwind of changes. Its financial strength, the very foundation of its business, is in question. Is the industry's leadership up to the challenges and opportunities presented by these problems? Are their organizations effective in dealing with these challenges?

Actuaries deeply influence the present and future operations of life insurance companies. The companies rely on actuaries to know the business and manage the risks. Actuaries often are positioned at the very core of the life insurance company operations — developing products, pricing risks, evaluating the financial condition — or at the core of related support organizations such as consulting firms. Today, some actuaries even occupy the highest corporate positions of president or CEO, managing and leading their organizations.

To find out more about these actuaries/leaders, I asked eight of them the following questions:

o How did you attain your leadership position?
o When and where did you get your motivation to lead?
o Do you have any advice or recommendations for the Society of Actuaries on how to develop actuaries for leadership positions?
o How do you create and manage change in your organization?
o Are there things you do differently because you are an actuary?
o What is your company's vision?

On becoming a leader

John Gardner in his book, *On Leadership,* answers the question, "Can leadership be taught?", with an "emphatic but qualified yes." He explains that it is "emphatic because most of the ingredients of leadership can be taught" and "qualified because the ingredients that cannot be taught may be quite important." He says that "certain characteristics are genetically

determined, but the hereditary gifts leave the issue of future leadership performance undecided, to be settled by later events and influences."

As I reflected on the responses I got from the presidents/CEOs, I thought of John Gardner's words. Each interviewee has innate mathematical, analytical, and logical abilities. Through random events, conscious career planning, or pursuit of personal interests, each also has had opportunities to develop important nontechnical skills. Each exhibited high self-confidence, a drive to excel, the desire to make a difference, and the willingness to work hard, first by passing exams and then by performing well on the job. They have proved exceptional competence as shown by their achievement of top leadership positions. Most got on-the-job training and attended company and SOA sponsored management training programs. One attended an intensive three-month executive program at Harvard. One had a mentor and sustained his motivation through inspirational messages. Another avidly studied management and historical literature.

Because the SOA plays a critical role in the professional development of future life insurance actuaries, I asked those I interviewed for recommendations of what the SOA can do to help realize the leadership potential of actuaries.

Their responses were:

o Provide opportunities to gain broad perspective.
o Promote a sense that the individual

can make a difference.
o Encourage networking among actuaries who are leaders.
o Encourage participants to share ideas in the various workshops and round table discussions at conferences.
o Provide development in both hard (technical) and soft (leadership/management/communication) sciences.
o Provide exposure to other disciplines, not just actuarial/insurance related topics.
o Include more "thinking" problems and less memorization of information in the exams.

On being a change agent

An actuary knows from the start that his or her career is designed to move through different stages. Thus, the actuary is trained for and expects change.

Responses on how they create and manage change were:

o Maintain focus; keep an eye on the objectives.
o Continually rethink and rejustify work processes.
o Be adaptable and flexible to change; be ready to change to keep the company aligned with the environment.
o Be aware that change may require a modification in the company's culture and paradigms.
o Make the change process participative. When employees are directly involved in bringing about change, the outcome is more acceptable and effective.
o Allow employees to decide when and how to change. Employees will change to satisfy their own requirements.
o Build consensus and support.

Company vision

The question, "What is your company's vision?", was not an easy one to answer and explore. No one objected to the question, but some perceived it as ambiguous. Even when someone described a vision, it was not specific enough to give a clear picture of what the company wants to become. I believe most actuaries are used to solving tangible and specific problems in the present. Though in general actuaries are trained to consider different futures in the scenario testing, they usually reserve their analyses and recommendations

for negative contingencies, not positive ones.

Visions, missions, goals, and objectives are often "buzzwords" that are once-a-year topics at conferences and company gatherings. For many actuaries, a positive vision for the future, I believe, is not always easy to conceptualize, verbalize, or visualize.

The visions described were:
- Continue to create value — real and perceived — for the client, company, and society.
- Be the leading insurance company in the brokerage market.
- Be around 100 more years, providing service to insurance companies so they can achieve their goals and objectives.
- Survive and grow in size and profitability.
- Create and support business simulation models that enable financial institutions to look at business holistically.

- Be the premier actuarial organization in the world.
- Be the provider of choice for the parent company's affinity market, i.e., customers of parent company's products.

Conclusion

These actuarial leaders expressed diverse leadership ideas and practices; many are similar to what was found in other industries. In a way, it reinforces the phenomenon that what is happening to the insurance industry is not unique to that industry. It is symptomatic of what is happening in the environment.

Similarly, their responses and behaviors related to change are broad-based. They are not limited to responses that are products of their actuarial training and experience but are combinations of their technical and nontechnical training, experiences, and thoughts.

One strength the actuary can bring to the leadership position is the ability to evaluate the financial impact of change. If that is kept in balance by a consideration of the sociological impact, then it enhances and does not impede his or her effectiveness.

Are actuarial leaders able to manage business organizations well into the '90s and beyond? My small sample shows that these leaders are open to new ideas, optimistic for their organizations, sensitive to people issues, and strive to be in touch with their customers. If these results are indicative of what the leaders in the insurance industry are thinking and doing, then I believe the insurance industry can weather the storm of problems brought by change. It can eventually make change its ally in fulfilling its reason for existence — to provide financial security.

Angelica Michail is president of Michail Associates, Rowland Heights, California.

Early-release copies of *TSA* papers

The following papers have been accepted for publication in Volume 45 of the *Transactions*. Members who would like an early-release copy before it is published in a preprint should send $5 for each paper to the SOA Books and Publications Department.

"Loading Gross Premiums for Risk without Using Utility Theory" by Colin M. Ramsay

In pricing insurance products, it is difficult to explicitly include a product's inherent level of riskiness. A way around this is to use von Neumann's and Morgenstern's expected utility theory to develop a price that includes the level of risk the insurer faces. However, this theory has many difficulties associated with it. In the real world, the evidence is overwhelming that neither individuals nor corporations behave in the manner described by this theory's axioms.

Instead, risk measure functions are used in this paper to load gross premiums. A function R is called a risk measure function if it measures the level of "riskiness," r, inherent in an insurance risk X where $r = R[X]$. For an insurance risk X and a given risk measure function $R[X]$, it is suggested that the gross premium be calculated as a function of the mean ($E[X]$) and the level of risk r.

The variance is the most commonly used risk measure function, i.e., $R[X] = Var[X]$. However, it does not adequately measure risk if the distribution of X is positively skewed. For positively skewed distributions, risk measure functions depending on the third and/or fourth cumulants are provided. In particular, the normal power approximation is used to derive one such risk measure. Risk measure functions based on the normal power approximation may be useful in pricing financial risks in portfolio analysis.

"Percentile Pension Cost Methods: A New Approach to Pension Valuations" by Colin M. Ramsay

Traditional pension cost methods (such as the projected unit credit, entry age normal, and aggregate) are based on the actuarial present value of future benefits. Since the actuarial present value is based solely on expected values, these traditional cost methods have two serious deficiencies:

1) They tend to underestimate plan liabilities. It will be shown that, for example, at age 65, about a 45% chance exists that an amount equal to the (traditional) accrued liability will be sufficient to pay a lifetime benefit. This calls into question the notion that a fair value of a retiree's future benefits is the accrued liability, and that a fully funded plan is one with no "unfunded liabilities."

2) They cannot provide plan sponsors with certain valuable pieces of information. For example, traditional cost methods cannot be used to determine the probability that the accumulation of a particular sequence of contributions will ultimately provide enough funds to pay benefits. They also cannot be used to determine the size of fund needed to ensure that retirees' lifetime benefits are paid with a specified probability.

Issues affecting the security of pension benefits are important to the Pension Benefit Guaranty Corporation (PBGC). Because of its role as an "insurer" of vested pension benefits, the PBGC is exposed to certain risks when a plan terminates. Traditional pension theory does not provide an adequate mechanism for determining the actual termination liability or for determining risk premiums for this type of termination insurance.

In response to these deficiencies, a new family of cost methods, called α-percentile cost methods, is developed in this paper. These cost methods are based on the probability of adequately covering all participants' benefits. Expressions for the normal cost, the accrued liability, and the gain are provided.

Pensions in Canada cont'd

Report on the Canada Pension Plan indicates these rates will increase to 6.42% by 2031, primarily for demographic reasons, as the CPP is funded on a pay-as-you-go basis. QPP figures are a bit different.

Pessimists say Canadians will not stand for these increases, and the C/QPP will no longer exist. I do not think this will happen. Increases will be gradual, and a tipping point will never be reached. Complaints could cause cutbacks to occur, such as an increase in the retirement age, less generous early retirement provisions, less than full indexing, and a requirement to work for more than 85% of the contributory period to receive a full pension.

The only requirement for OAS benefit eligibility is a specified period of residence in Canada, with 40 years required for the maximum benefit. In 1993, it is about 13.6% of the average wage. It is financed out of general revenues, with no identifiable tax. OAS entry-level pensions are indexed with prices, not wages, and the pension itself is indexed with prices. Using the same actuarial assumptions as for the CPP, OAS will be only 8.3% of average wages by 2031.

The First Actuarial Report on OAS indicated a cost of 3.67% of total earnings in 1993, increasing to 4.75% by 2031. These percentages apply to total earnings, a larger amount than contributory earnings under C/QPP.

OAS is subject to a "claw-back" tax. In the 1992 taxation year, this tax was 15% of net income in excess of $51,765 to a maximum of OAS benefits received. The threshold is indexed with the increase in the consumer price index, minus 3%. With Canada's inflation rate well under 3%, this threshold will not increase in the next few years. The costs in the preceding paragraph do not take this tax into account.

GIS is an income tested demogrant. The maximum paid to a married couple in 1993 is about 21.1% of the average wage. Because it is indexed with prices, not wages, this figure will decline to 12.8% by 2031. The only cost estimates for GIS were made by the SOA Committee on Social Insurance and indicate the cost will remain constant at about 1.3% of income.

Obviously, OAS and GIS will be a less significant part of the retirement

income of Canadians by 2031. It now is possible for someone whose only source of income is C/QPP and OAS to qualify for a partial GIS payment, even if C/QPP is at its maximum level. This situation will gradually change.

By 2031, a Canadian whose only source of income is C/QPP and OAS may be subject to the claw-back. A reasonable scenario can be developed showing that the claw-back can even apply to a GIS recipient. These anomalies may be corrected, but still it would be unwise to rely on OAS to continue except for those with the smallest incomes.

The status quo could be maintained by indexing entry level OAS and GIS with wages rather than prices, but this would require large cost increases.

Private savings

This article will deal only with tax-assisted savings for retirement. In the 1950s, Registered Retirement Savings Plans (RRSP) were introduced to allow Canadians to save for their retirement. Under Canadian tax laws, the self-employed and members of partnerships could not establish pension plans for themselves, although they could for their employees. At various times, regulations have severely limited what pensions significant shareholders, who also were employees of a company, could provide for themselves.

While much money has been contributed to RRSP, detailed statistics, which are based on income tax records, have not been analyzed in a useful way. The impression is that those classes previously mentioned, which include most doctors, dentists, accountants, and lawyers, have been the principal contributors, and that other Canadians who do not belong to private pension plans have not contributed very much. The same is probably true for those in private pension plans who wish to supplement their pensions, although contributions by such individuals are limited by the tax laws.

Group RRSP are a recent phenomenon. While RRSP are individual contracts with the taxpayer with no provision for an employer contribution as such, employers have established them. Frequently, employers give employees raises to enable contributions, using the convenience of payroll deductions. RRSP are simple to

administrate, because they are not subject to pension benefits legislation and the tax requirements are much less complicated.

RRSP have certain disadvantages. Money in them need not be used to provide life pensions. Lump sum withdrawals can be made. Even when periodic payments are made, the funds may be exhausted while the owner is still living. There is no requirement that a spousal pension must be taken. Perhaps more importantly, many RRSP, unlike pensions, are subject to the claims of the owner's creditors. This can be a serious problem for professionals in partnerships where liability frequently is unlimited.

In any event, the increase in contributions to C/QPP will inhibit RRSP contributions.

Private pension plans

In this category are plans operated by governments for their employees, as well as those of private companies. Here there is good news and bad news.

The good news is that most of these plans provide adequate benefits, and that most, except for some operated by governments, are sound funded. A recent survey by the Financial Executives Institute showed that only 10% of plans in the survey (which did not include governmental plans) had solvency deficiencies, while only 39% had unfunded liabilities on a going-concern basis. Individuals in these plans should have adequate pensions. Pension benefits legislation, which requires that there be liberal vesting and that benefits be taken only as a pension, has ensured that employees who terminate will receive a pension.

The bad news is that in 1990 only 44.8% of employed workers were in private pension plans. The number has declined from 47.0% in 1984. Conventional wisdom is that the cause is the administrative burden imposed by new pension and tax legislation, resulting in plans being terminated or replaced with Group RRSP. While there is some truth in this, the fact is membership had been constant at around 47% for many years before 1984. Many new plans being established are probably Group RRSP, rather than conventional pension plans. Pension supervisory authorities have told me that many terminated pension plans were small plans that covered only one or two employees.

These numbers exclude cases where the retirement vehicle was exclusively a profit-sharing plan or a Group RRSP, but no evidence exists that a significant number of workers are covered in this way.

Some way must be found to encourage establishing new private plans. The increase in contributions to C/QPP will inhibit this. While it is doubtful that an increase in CPP benefits is in the cards because of the cost, mandatory private plans cannot be ruled out.

Conclusion

All this leads to these conclusions:

• There will be a cutback in certain features of C/QPP but not in the level of benefits paid at normal retirement.
• OAS and GIS will become less important parts of the Canadian social security system.
• Group RRSP, if not individual ones, will become subject to pension benefits legislation.
• Coverage under private plans must be expanded if mandatory plans are to be avoided.
• This is possibly the best of all possible times to have retired, but it may not be wise to live too long.

J. Bruce MacDonald, retired, does some consulting work for the Senior Citizens Secretariat of Nova Scotia.

Transactions authors profiled

Fourteen papers have been accepted for publication in Volume 44 in the *Transactions*. The following biographical sketches describe 4 of the 18 authors. The 14 other authors have been profiled in previous *Actuary* issues.

"Internal Rate of Return as an Evaluator of Tax Planning Strategies" by Kenneth A. LaSorella and Edward L. Robbins


KENNETH A. LASORELLA, FSA 1981, MAAA, is senior manager of financial

services consulting—actuarial life/health at KPMG Peat Marwick. Previously, he was with Sun Life of Canada and with Teledyne, Inc. He has extensive experience in financial actuarial modeling for the purpose of asset liability matching, pricing, purchase GAAP, and quantification of the AIDS risk. He serves on the Society's HIV Research Committee. LaSorella is a Fellow of the Life Office Management Institute.

EDWARD L. ROBBINS, FSA 1971, MAAA, is principal, financial services consulting—actuarial life/health at KPMG Peat Marwick. His areas of expertise are life insurance actuarial studies, company taxation, and financial reporting. Before joining KPMG Peat Marwick in Chicago in 1984, he spent more than 10 years with Pan-American Life Insurance Company as the chief actuary for Latin American operations. He received a bachelor of science degree from Cornell University. He is a past member of the Society's Education and Examination, Program, and Continuing Education committees, and a past president of the Chicago Actuarial Association. He currently serves on the Committee on Papers. He has published papers in *Best's Review* and *Contingencies*.

"A Practical Algorithm for Approximating the Probability of Ruin" by Colin M. Ramsay
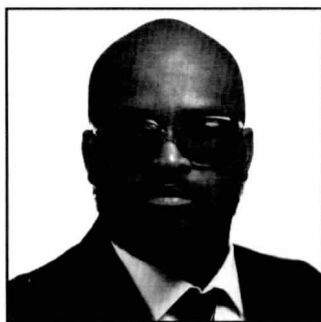

COLIN M. RAMSAY, ASA 1984, MAAA, is an associate professor of

actuarial science at the University of Nebraska—Lincoln. He received his bachelor of science degree in actuarial science from the City University, London, England, in 1979 and his master's (1980) and Ph.D. (1984) degrees in statistics from the University of Waterloo, Ontario. His research interests include ruin theory, the impact of AIDS on insurance, and the adequacy of pension funding levels. Ramsay's papers have appeared in the *Journal of Risk and Insurance*, *Journal of the Institute of Actuaries*, *ASTIN Bulletin*, *Insurance: Mathematics and Economics*, and *Scandinavian Actuarial Journal*. His papers in the *Transactions* appear in Vol. 41 (1989), Vol. 42 (1990), and Vol. 43 (1991).

"Non-parallel Yield Curve Shifts and Convexity" by Robert R. Reitano
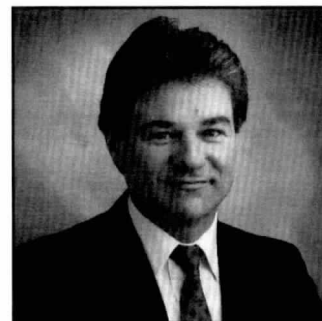
ROBERT R. REITANO, FSA 1980, MAAA, received a bachelor's and a master's degree in mathematics from the University of Massachusetts and a Ph.D. in mathematics from the Massachusetts Institute of Technology. He is senior investment policy officer and director of research at John Hancock Mutual Life Insurance Company. He has been an assistant professor at the University of Massachusetts, an instructor for the Actuaries Club of Boston, and a visiting scholar at M.I.T. He is serving on the Finance Track Education Objectives Committee, Investment Section Council, and the Committee on Papers. He has published papers in *ARCH*, *The Journal of Portfolio Management*, and the *Transactions*, Vol. 34 (1982), Vol. 42 (1990), and Vol. 43 (1991). His paper, "Multivariate Duration Analysis," was awarded the SOA Annual Prize in 1992.

On the Lighter Side
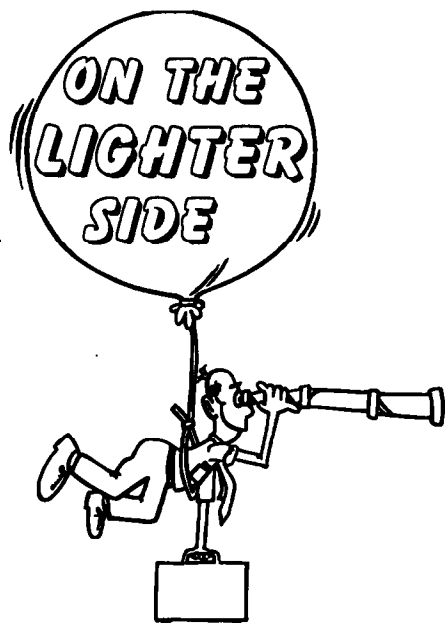
Ping pong balls revisited

by Julian Ochrymowych
Puzzle Editor

In the October 1992 issue, an *Actuary* reader sought comments on the relative probabilities for success in the National Basketball Association (NBA) lottery. The 11 teams who don't make the playoffs are thrown into a lottery to determine the order in which they will draft college players. The team with the worst record gets 11 ping pong balls; the next worst, 10 balls; and so on, down to one ball. The balls are identified by team and thrown into a hopper. One is randomly drawn, and that team gets first pick among available players. The probability for any team is simple: divide the number of balls it is allotted by 66 (total).

But what is the probability of Team A getting the second pick? This question was subdivided: (1) given that no balls have been drawn yet or (2) given that A is not the first team.

The reader commented that it's important to know that any remaining balls of the first team chosen are not removed from the hopper. If one of these balls is chosen, it is discarded and the selection continues. Mark D. Evans, John Rutter, Steve Powell, Kevin Larsen, Richard Q. Wendt, Marc I. Whinston, Joe Nunes, and David Horrocks (son of SOA member Geoffrey Horrocks) all disagreed with the importance of such knowledge. As Evans wrote, "Actually, whether the balls are discarded immediately or as encountered is irrelevant. Removal of a redundant ball does not alter the relative probabilities of drawing the remaining eligible balls."

Question (2) was answered in two ways. The simpler way was to assume that the team receiving the first pick was known. Then the probability is $A/(66-N)$, where A is the number of balls that Team A started with, and N is the number of balls that the team drawn first started with. For example, assume that A starts with 10 balls and the team with 5 balls is drawn first. The probability of A being second is 10/61. The second way, used by Rutter and Larsen, only assumes that A is not the first team. Then, the required probability can be expressed, as suggested by Rutter, as:

$$\sum_{\substack{N=1 \\ N \neq A}}^{11} \left(\frac{A}{66-A}\right)\left(\frac{N}{66-N}\right).$$

the chances of each other team being chosen first from a universe excluding A, then multiplied by the probability of A being chosen second.

Of the seven who responded to Question (1), all agreed it is the sum of the conditional probabilities that each team other than A is drawn first, times the probability given in Question (2):

Σ P(T is chosen first) • P(A is picked second | T is chosen first)
which is:

$$\sum_{\substack{N=1 \\ N \neq A}}^{11} \left(\frac{N}{66}\right)\left(\frac{A}{66-N}\right) = \left(\frac{N}{66}\right)\sum_{\substack{N=1 \\ N \neq A}}^{11} \left(\frac{A}{66-N}\right).$$

Powell notes that for cases where A = 1 through 7, the probability of being second is greater than the probability of being first, and vice versa for A = 8 through 11.

Wendt related how "the local sports talk radio station was talking about the draft lottery probabilities one night and [he] was able to get on air with an 'expert' actuarial analysis. ...The host did not find this to be the most stimulating conversation of the evening."

Evans took his solution one step further, enclosing a formula for the probabilities that team T gets the nth pick, given that picks 1 through $n-1$ are known.

Larsen provided a summary of probabilities for all draft picks that incorporates the fact that only the first three result from a drawing. The remaining eight picks are given to the remaining eight teams ranked from worst to best record. (See Larsen's table on this page.)

Anyone who would like copies of calculations by those mentioned in this article should contact *The Actuary* staff editors at the Society of Actuaries office, 708-706-3500.

NBA LOTTERY DRAFTING PROBABILITIES

Draft Pick	Rank from worst to 11th worst										
	Worst	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th
	# Balls										
	11	10	9	8	7	6	5	4	3	2	1
1	0.1667	0.1515	0.1364	0.1212	0.1061	0.0909	0.0758	0.0606	0.0455	0.0303	0.0152
2	0.1556	0.1447	0.1331	0.1207	0.1077	0.0940	0.0797	0.0648	0.0494	0.0334	0.0169
3	0.1435	0.1368	0.1289	0.1197	0.1092	0.0973	0.0842	0.0698	0.0542	0.0373	0.0192
4	0.5342	0.2992	0.1316	0.0350	---	---	---	---	---	---	---
5	---	0.2677	0.3463	0.2697	0.1163	---	---	---	---	---	---
6	---	---	0.1238	0.2821	0.3541	0.2399	---	---	---	---	---
7	---	---	---	0.0516	0.1881	0.3675	0.3929	---	---	---	---
8	---	---	---	---	0.0187	0.1049	0.3188	0.5577	---	---	---
9	---	---	---	---	---	0.0055	0.0475	0.2310	0.7159	---	---
10	---	---	---	---	---	---	0.0012	0.0159	0.1320	0.8508	---
11	---	---	---	---	---	---	---	0.0001	0.0030	0.0482	0.9487

Source: Kevin Larsen

Principles cont'd

Task force guidelines and objective
We agreed to the following guidelines for the joint task force:

- Unity on fundamental principles between the CAS and the SOA is good for the profession as a whole.
- Principles help define the actuary's work as an applied science.
- Clarity from principles is useful.

The task force's objective will be to lay a foundation to coordinate the articulation of principles in the CAS and the SOA.

First assignment

The task force's first assignment is to review the current draft of the "Principles of Actuarial Science" produced by the SOA and to suggest revisions so it will be acceptable to both groups. This document will be published as an SOA *Transactions* paper. All CAS members are invited to write discussions.

The statement of principles has undergone intense discussion among life actuaries. More than 150 comments were received and incorporated into the current document. However, the lack of input on subjects known best by casualty actuaries has been a short-coming.

For the task force's purposes, this paper should be treated as a draft of the current state of principles in the SOA. The SOA's Board of Governors has accepted it but not officially adopted it.

Description of paper

This paper by the SOA Committee on Actuarial Principles tried to accomplish three main goals:

- To write clear, noncircular definitions of such concepts as actuarial risk and financial security systems. The actuary's work is mainly defined by working with these concepts.
- To define actuarial paradigms that are used to describe, measure, and analyze these systems.
- To write rules that could be used to decide whether actuarial models within the paradigms were valid.

The SOA believed this work was necessary to have precise definitions and assumptions before we could move on to write principles that were more specific to our practice.

Possible changes

Some changes that may be appropriate for the principles document involve renaming the categories of principles to make them more suitable for CAS members and more understandable to SOA members.

The paper currently classifies principles as fundamental principles, methodologies, and standards. The term "methodologies" is a problem for some who have reviewed the document. A better terminology might be "general principles, specific principles, and standards."

Specific principles could be further divided into two groups: practice specific and function specific. Some differences in specific principles that apply to life and casualty actuaries may exist, but there should not be differences in the general or fundamental principles.

Contributions to improve document
The CAS already has articulated some specific principles on reserving, rate-making, and valuation. The CAS can especially contribute in the sections on credibility theory and definitions of statistical regularity. The CAS has more refined principles in these two areas and will improve the SOA document on principles. The SOA also plans to use the format of the CAS principles when it writes the specific principles for the SOA.

The SOA has found principles to be helpful in many ways:

- They codify a precise and common language for actuaries to use.
- They provide an inventory of tools available to the actuary for solving problems.
- They provide a strong foundation for standards.
- They can drive the education effort and define the material that an actuary needs to know.
- They can guide the research effort to priority areas.
- They will define precisely the identity of the actuary.
- They can create an intellectual common ground for all actuaries that will make the profession stronger.

This task force will address the last point in a search for that common ground.

On behalf of the SOA, I am looking forward to this joint effort with great anticipation and hope.

Steve Radcliffe is President-Elect of the Society of Actuaries and senior vice president and chief actuary of American United Life Insurance Company, Indianapolis, Indiana.

History, culture surround last spring meeting

Historic and culture-filled Quebec will be the site for the Society of Actuaries last spring meeting, June 14-15, where participants can choose from more than 55 sessions focusing on financial reporting and product development.

One of the meeting's highlights will be a presentation at the June 14 general session on professionalism by Major-General Lewis W. MacKenzie (retired), former commander of the United Nations peacekeeping forces in Sarajevo. General MacKenzie has served in nine peacekeeping tours in six mission areas: the Gaza Strip, Cyprus, Vietnam, Cairo, Central America, and Sarajevo.

Among the session topics are the impact of low interest rates, U.S. and Canadian actuarial standards of practice, important working relationships for valuation actuaries, cash flow testing as a management tool, and solvency issues of life insurance companies worldwide. Those interested can get updates on "fair value" financial reporting and reinsurance regulatory, tax, and product developments. Secrets on better business writing skills and tips from graders on how to write a better Fellowship exam will be shared.

During meeting breaks, attendees can take a five-minute walk from the meeting hotel, the Quebec Hilton, to the walled old city and the Citadelle. Shopping and entertainment are just minutes away at Place Quebec, a complex with 75 stores and boutiques. Don't miss the Monday night reception at Le Chateau Frontenac, an 18th-century style French castle.

The complete actuary

The Life Styles Inventory

by Alan Finkelstein

I f you were asked to describe your personality, specific strengths and weaknesses, how you think and behave, and how you feel about yourself and others, where would you begin? Which phrase is most representative of your personality?

- **Constructive** — Self-enhancing thinking and behavior that contribute towards healthy relationships, working effectively with people, and skill at accomplishing tasks
- **Passive/Defensive** — Self-protecting thinking and behavior that promote the fulfillment of security needs through interaction with people
- **Aggressive/Defensive** — Self-promoting thinking and behavior used to maintain status or position and fulfill security needs through task-related activities

Which of the following seemingly contradictory patterns of thought and behavior are a more accurate description of who you are?

- **Humanistic/Encouraging** — Interested in other people, tend to care about others, and able to encourage them to improve **or**
  Oppositional — Disagree with others, seek attention by being critical and cynical, and respond to others with skepticism and sarcasm
- **Affiliative** — Committed to forming and sustaining satisfying relationships, strengthening interpersonal skills, and motivating others through genuine praise and friendliness **or**
  Power — Use force, intimidation, and coercion to get results and gain prestige, status, and influence (in other words, a lack of confidence in others' abilities)
- **Approval** — Need to be accepted by others to increase or sustain feelings of self-worth and preoccupied with the opinions of others **or**
  Competitive — Need to compete with and compare oneself with others to increase or sustain feelings of self-worth; a "win-lose" orientation that distorts perspectives and goals
- **Conventional** — Tend to act in a conforming way rather than

Life Styles Inventory™ 1
Circumplex

human synergistics®
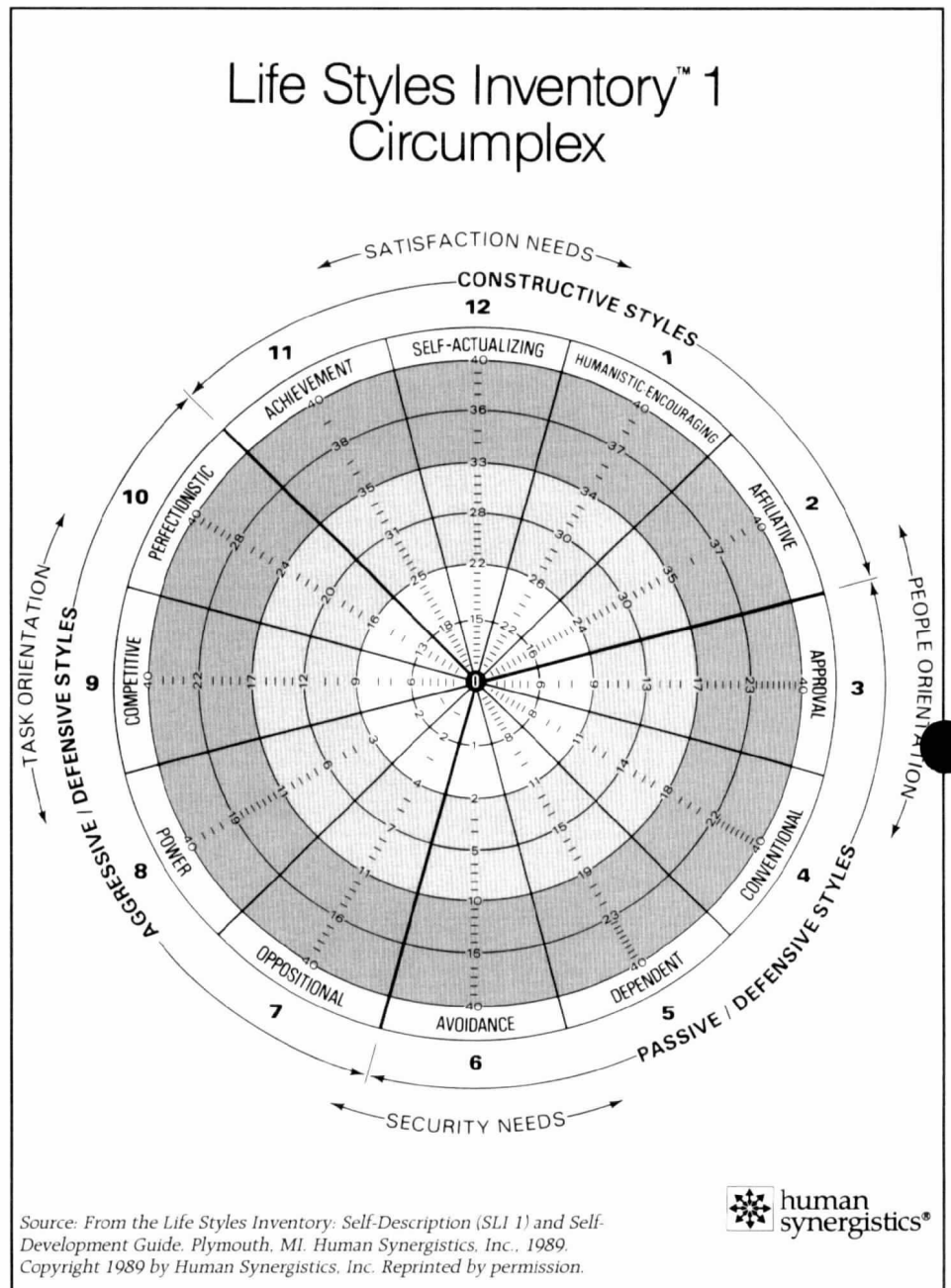
displaying originality; mistakes are covered up because a low profile is maintained **or**
Perfectionist — Preoccupied with flawless results in every detail and tend to place excessive demands on self and others

- **Achievement** — Able to attain high-quality results on challenging projects by possessing the skills necessary for effective planning and problem solving **or**
  Dependent — Lack of self-respect

that results in feeling unable to accomplish things and relying on others to determine one's behavior

- **Self-Actualizing** — Concerned with self development, creativity, responsibility, and acceptance of self, others, and situations as they are **or**
  Avoidance — Tend to withdraw from situations perceived as threatening and feel guilty about real or imagined mistakes

To help you better understand yourself, Human Synergistic of
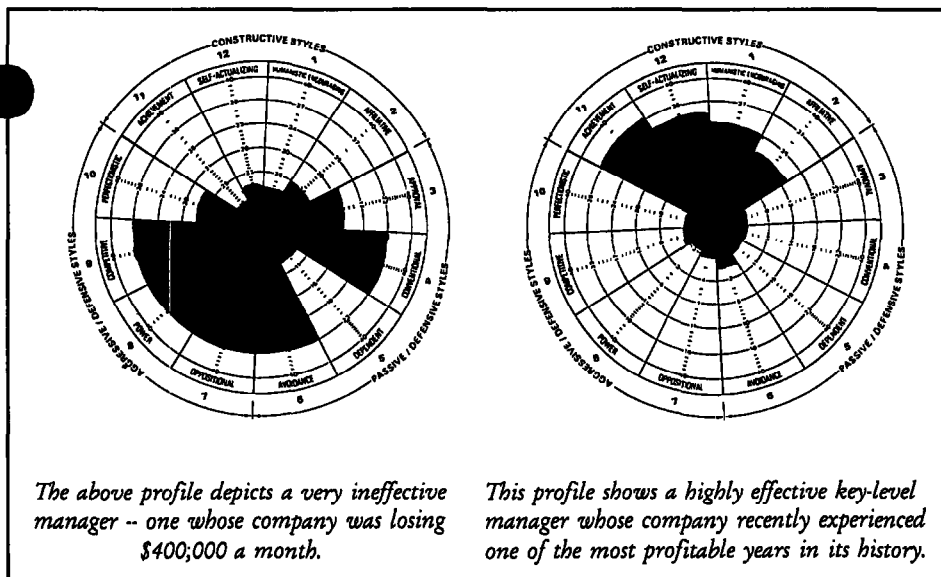
The above profile depicts a very ineffective manager -- one whose company was losing $400;000 a month.

This profile shows a highly effective key-level manager whose company recently experienced one of the most profitable years in its history.

Plymouth. Michigan, has developed a tool known as the Life Styles Inventory (LSI). The leader's guide states, "The LSI provides you with a valuable opportunity to look at your thinking and behavior — to recognize your specific strengths, as well as any 'stumbling blocks' that may be standing in your way. You can use what you learn to initiate positive changes in how you think and act and increase your personal and professional effectiveness."

The self-development guide uses the following steps:

The Life Styles Inventory
You are asked for candid responses to 240 phrases: "0" indicates the phrase is unlike you: "1" indicates the phrase is like you quite often: and "2" indicates the phrase is like you most of the time. Your scores are then tabu-lated on a scoring sheet.

The Life Styles Circumplex
Your scores in the first step are transferred to a circular diagram resembling a clock. (Shown on the previous page.) The 12 positions on the circumplex correspond to the life styles previously mentioned. Note the scales are not uniform. For example, a score of 24 falls within the 25th percentile for ".Affiliative" (2 o'clock), but the same score falls within the 91st-99th percentile for "Power" (8 o'clock). The six concentric rings radiating from the center of the circumplex correspond to the following percentiles:

    (a) Low - 10th
    (b) Low - 25th
    (c) Medium - 50th
    (d) Medium - 75th
    (e) High - 90th
    (f) High - 99th

The two profiles on this page are shaded to show how scores radiate from the center.

Interpreting the scores
The self-development guide explains in detail the characteristics of each life style, with variations depending on whether your score fell into the low, medium, or high range. In addition, the guide shows how one life style relates to other styles.

For example, a low score on the "Perfectionistic" style (10 o'clock) indi-cates you are relatively free from perfectionistic drives and are probably realistic about what you can accomplish. However, a very low score indicates you are working below your potential and may have difficulty setting and maintaining appropriate performance standards.

The self-development guide cites many examples where the life styles either complement or contradict one another. The guide also includes a chart titled, "The LSI Thinking Styles and Effective Management," a self-improvement plan, and a bibliography of suggested reading.

The guide also suggests that you retake the Life Styles Inventory in three to six months to identify specific changes in your thinking and behavior and to determine your progress.

Those interested can contact Human Synergistics at 38819 Plymouth Road, Plymouth, MI 48170-4290, telephone: 313/459-1030.

Alan Finkelstein is assistant actuary at Provident Mutual Life Insurance Company, Philadelphia, and a member of the Committee on Management and Personal Development.

A heuristic approach to solving probability problems

by Jonathan Balsam

Actuaries are, first and foremost, problem solvers. The Society of Actuaries recently gave this opinion official sanction by formalizing a course requirement in problem solving (part the two-and-a-half-day Fellowship Admissions Course).

Like problem solvers in any field, we face the danger that, burdened with scores of well-studied solution techniques, we may lose sight of a problem's structure and simplicity.

Risk and probability are areas especially fraught with this danger. To see a problem's simplicity, we often must step back and try to see the forest despite its proliferation of distracting trees.

Fortunately, we are not alone. A formal science beginning in the early part of this century attempts to characterize and analyze problem solv-ing techniques. This science is called heuristics. Its name stems from the Greek word for "find," familiar to us in

the present perfect tense as "eureka," which we associate with the blinding inspiration felt by a naked Archimedes dashing through the streets of ancient Syracuse in triumph. Heuristics codifies the thought processes latent in a flash of inspira-tion, providing those of us who lack Archimedes' gifts with problem-solving techniques that are more likely to be effective than giving up and taking a hot bath.

Heuristics cont'd

Heuristic techniques (heuristics, for short) are many and varied. The interested reader should consult George Polya's two-volume masterwork, *Mathematics and Plausible Reasoning* (Princeton University Press).

By using examples, this article will discuss a heuristic I have found useful in solving probability problems. Many actuaries may already, consciously or unconsciously, use this heuristic, but crystallizing it and spelling it out may prove helpful.

The heuristic comprises two contrasting rules: the first involves symmetry; the second, new information.

Symmetry

Let us use a subjective definition of probability: the probability of an event is a measure of the degree of certainty an observer has that the event will occur. The probability is numerically equal to the maximum amount that a risk-neutral person would pay to play a game with a payoff of a dollar if the event occurs, and no payoff if it does not. (This definition is in contrast to the oft-cited relative-frequency definition of probability, which leaves us without a definition of the probability of an unrepeatable event, say a rainstorm or an earthquake. Actuaries must, therefore, subscribe at least in part to the subjective definition.)

In the early stages of analyzing a problem, its symmetry often leaves us little or no information to distinguish between the possible outcomes. Without such information, we have no impetus to assign different (subjective) probabilities to the outcomes. This leads to the Symmetry Rule: Events in a state of symmetry must have equal probability.

The power of this rule is illustrated in this example:

A bookstore has in stock 10 signed copies of the Bowers, Gerber, Hickman, Jones, and Nesbitt text. Unknown to management, one of the texts has forged signatures and will therefore have no collectible value. An eager actuarial student buys a copy. A week later, a second student buys a copy, and a week after that, a third student buys one. No copies are sold in between. What is the probability that the third student received an authentic copy?

(The reader may want to work out a solution before reading on.)

Solution: Let A_i be the event that student i gets an authentic copy. A standard approach uses conditional probabilities. Thus

$$Pr(A_3)= Pr(A_1 A_2 A_3 \cup \bar{A}_1 A_2 A_3 \cup A_1 \bar{A}_2 A_3 \cup \bar{A}_1 \bar{A}_2 A_3)$$

$$= Pr(A_1 A_2 A_3) + Pr(\bar{A}_1 A_2 A_3) + Pr(A_1 \bar{A}_2 A_3) + Pr(\bar{A}_1 \bar{A}_2 A_3)$$

$$= \tfrac{9}{10} \cdot \tfrac{8}{9} \cdot \tfrac{7}{8} + \tfrac{1}{10} \cdot 1 \cdot 1 + \tfrac{9}{10} \cdot \tfrac{1}{9} + 0 = \tfrac{9}{10}$$

Use of the Symmetry Rule obviates all this algebra. We simply note that the problem as stated does not distinguish among the three students. The fact that they make their purchases in succession rather than all at once does not matter, since each purchase is random. So A_2 and A_3 must equal A_1, easily seen to have a value of 9/10.

Note also that use of the Symmetry Rule invokes the same solution process for any number of students, while the work using conditional probabilities increases exponentially with the student count.

New information

As actuaries, we seldom are satisfied with probabilities as originally determined. Rather, we continually revise them in the face of new information. Some subtlety is required to decide how relevant the new information is to the existing model. This is the subject of the New Information Rule: When new information arises, consider whether it relates to the probability model previously developed. If it does, revision may be necessary. If it does not, then the previously assessed probabilities must still hold.

Again, this is best illustrated by example. The "Let's Make a Deal" problem, originally printed in Marilyn vos Savant's *Parade* magazine column, aroused much controversy in *The Actuary* and elsewhere. (See March, April, June, November 1991 *Actuary* "Lighter Side" columns.)

For those readers who missed it in *Parade*, the problems was:

On a game show, you are offered your choice of one of three boxes. One of the boxes contains a car, while the other two contain goats. The host of the show knows the contents of the boxes, but you (of course) do not. You choose Box 1. Before you open it, the host opens Box 3, shows you that it contains a goat, and invites you to switch your selection to Box 2. Should you switch?

Solution: vos Savant correctly noted in her column that you should switch. (This raises your probability of winning from 1/3 to 1/2.) A firestorm of controversy arose. Respondents, including mathematicians with Ph.D.s, castigated vos Savant for mathematical illiteracy.

What provoked such strong resistance to accepting the correct answer to a question every college math student has the tools to solve? Their resistance, it seems, derived from application of the Symmetry Rule without countervailing application of the New Information Rule. Readers correctly noted that before the host opened Box 3, the Symmetry Rule dictated the equivalence of all the boxes. Therefore, switching carried no benefit. By showing you the contents of Box 3, has the host provided any new information about the relative merits of boxes 1 and 2? On the surface, he has not, so switching seems useless.

Looking beneath the surface, though, he has provided new information. To see this, first consider the slightly different scenario in which Box 3 is opened by mechanical error and reveals a goat. Such an error could not convey useful information, since a random event affecting Box 3 can tell us nothing that distinguishes the other two boxes. But in our scenario, the host chose to open Box 3, knowing it contained the goat. It is possible he chose 3 over 2 precisely because 2 contained the car. In that possibility lies the new information content of the host's action, which makes switching to Box 2 a prudent choice.

Conclusion

The two portions of this heuristic, the Symmetry Rule and the New Information Rule, mirror processes we follow naturally in solving probability problems. Their explicit use has proven helpful in organizing one's thoughts when approaching the problems. As an additional benefit, the heuristic provides a common vocabulary, a means to avoid the miscommunications and misunderstandings so common in probabilistic discourse.

Jonathan Balsam is actuarial assistant at TIAA-CREF, New York.

Dear Editor:

Rules should be followed

Having been a member of the exam setting committees for many years, I read Professor Batten's letter and Neville Henderson's reply in the October 1992 issue with interest. Batten complains that the Society of Actuaries is retreating to medieval methods in not releasing actual exams to students. Henderson responded that the issue was being reviewed and suggested some valid reasons for withholding the exams.

The purpose of this letter is not to take sides with either position but to point a finger at those who abuse the system for their own gain. The Society of Actuaries is not in the education game to make money or enhance its reputation. Our purpose is to enable future actuaries to serve society better.

I believe that we should, as members of a unifying organization, stick together. If the Society decides not to release exams, then all of us should conform to that rule until it is changed. Circumventing the letter and spirit of the rule, for example by having exam candidates memorize questions for subsequent publication and dissemination should, in my opinion, be sufficient cause for disciplinary action. The disciplinary action should be extended to the participating candidates and any Society members involved.

I hope that, during this period when the Society is choosing not to release actual exams, all involved in the educational process will work diligently to guide exam candidates in their charges toward competent and ethical professional behavior. Competence can be taught. Ethics can only be demonstrated.

Leslie John Lohmann

Cash flow testing will increase insolvencies

The March issue contains an article on cash flow testing. The article presented some "significant findings" that several actuaries have learned from cash flow testing. Each of them obvious to anyone with a rudimentary knowledge of compound interest. Any time spent performing cash flow testing to arrive at the conclusions in the article was time wasted.

The question was posed, "Will asset adequacy testing prevent all company insolvencies?" I submit that the current emphasis on cash flow testing probably will result in a slight increase in insolvencies. Cash flow testing, in addition to being expensive, also leads companies into having a false sense of security with respect to products that are intrinsically inappropriate for insurance companies. Instead of cash flow testing, we, as a profession, should design products with sane commission schedules, high surrender charges, and market value adjustments.

Al Burns

Actuaries should address inequities

The February issue had an article on "Setting of goals." I thought the article was good, except for one example. It stated, "It has been said that if all the wealth in the world were distributed equally among all living persons, in five to ten years this wealth would go back to those who have it now. . . . Those who are not trained to handle money will mismanage it again."

This statement really bothered me. It implies that poor people are poor because they are less talented than the rich. One might make this claim if true equality of opportunity existed, but it doesn't. We have grave injustices in our world. Many people do not have enough to eat. Many do not have access to land, clean water, schooling, basic health care, or freedom. Many people in the third world are being crushed by the debt crisis. To imply that poor people would squander any wealth or resources given them is blasphemous.

As actuaries, we often strive for equity among participating and non-participating policyholders, between smokers and non-smokers, and within other classes of insureds. What would happen if actuaries also would strive to address the vast inequities in our world? Although striving for equity in a global sense probably is not in our job description, we should consider joining others in applying our talents to such an important and urgent matter the next time we are setting our goals.

Cathy Lindman

In memoriam

Jack D. Milne FSA 1942

Charles A. Ormsby FSA 1949,
MAAA 1965

Former SSA chief actuary comments

On the whole, I agree with the interesting and thoughtful remarks attributed Eric Klieber in "Social Security discussion continues" in the February issue. However, I must strongly disagree with his proposal that actuarial estimates should extend into the future for only 25 years, instead of 75 years. This would show very little of one cost element that we can be very certain about —namely, the aging of the population as the baby boomers begin to reach retirement age in about 2010.

Robert J. Meyers

Actuarial Research Conference

The 28th Annual Actuarial Research Conference will be August 19-21, 1993, at the Wisconsin Center at the University of Wisconsin in Madison. This year's conference will honor Professor James C. Hickman and his contributions to the actuarial profession.

The SOA's Education and Research Section is hosting the conference. Sponsors include the six organizations representing actuaries in North America, the Actuarial Education and Research Fund, and several local insurance organizations.

Advance conference and hotel registration forms are available from Judy Yore, 708/706-3573, at the Society of Actuaries office. Conference registration should be mailed to the Wisconsin Center, University of Wisconsin, 702 Langdon Street, Madison, WI 53706, by July 19. On-site registration will be taken at the Wisconsin Center during the morning of August 19. The conference will begin at 1 p.m., Thursday, August 19, and end by 4:30 p.m., Saturday, August 21. The registration fee is $80, which includes continental breakfasts, coffee breaks, Thursday mixer, lunches, and Friday banquet.

Participants are invited to present papers on any topic relevant to actuarial science. Final deadline to be included in the program is July 19. Send the paper title, abstract, authors, and presenter information to E.W. (Jed) Frees at his *Directory* address or by electronic mail to jfrees@bus.wisc.edu.

Exhibit space is available to vendors of software or textbooks. Contact Frees to reserve space.

ACTUCROSTIC
by Pete Hepokoski

A. Mississippi civil rights leader murdered 6/12/63 (full name)
57 107 23 245 139 179 73 221 8
206 44

B. Drama without intermission (2 wds., hyph.)
231 89 22 124 196 210 111 39 70 141

C. Descartes or Coty
182 130 16 100

D. Ontario city also called "Lakehead" (2 wds.)
235 83 204 51 159 186 122 14 145 250

E. Brave New World author (full name)
34 125 198 138 236 187 167 68 110
217 178 214

F. European nation admitted to the UN in 1990
96 65 208 126 10 230 155 75 180
102 50 193 244

G. Fabricate
132 232 52 32 195 94

H. Number for Willie Horton or vanadium (hyph.)
203 163 17 93 116 40 137 219 6
106 188

I. Wood for an archer's bow
81 118 215

J. Bacheller's ____ Holden: A Tale of the North Country
191 105 222 59

K. Medical occupation (2 wds., hyph.)
119 46 1 200 85 147 72 171 158
225 234 95 11 136

L. Milton or Odets work (2 wds.)
190 87 143 5 212 239 48 114 242
26 162 35

M. Type of model that may project GNP
13 202 112 140 243 226 58 152 174
134 99

N. A membrane of the eye
161 109 249 19 224 63

O. Repetitious
216 21 183 54 237 91 74 37 121

P. And so forth (2 wds.)
240 45 229 98 146 165 69 84

Q. Goethe play about the French Revolution (2 wds., with The)
71 176 149 77 192 233 33 115 201
4 142 29 166 246 25

R. Chuck who played baseball and acted
2 55 151 123 211 31 113

S. Far-reaching
175 189 20 172 108 184 7 247 47

T. What not to do to a welcome
153 12 150 238 67 131 223 104

U. Part of a chaise longue
18 90 157 181 97 168 241 82

V. Modern restaurant genre (2 wds.)
24 205 49 120 62 135 117 76

W. Proficient
144 148 227 160 80 133

X. Suntan follower
218 42 28 53 127 101

Y. The ___ That Could (2 wds.)
103 207 3 79 41 15 30 66 173
36 56 197

Z. Nonsense! (2 wds.)
61 164 129 209 86 220 156

AA. Syphilis detector (2 wds.)
43 228 9 78 38 169 128 213 64
154 60 194 185 177

BB. Put forward
88 92 199 27 248 170

1 K	2 R	3 Y	4 Q	5 L	6 H	7 S	8 A	9 AA		10 F	11 K	12 T	13 M		14 D	15 Y	16 C	17 H	18 U	19 N	20 S	21 O	22 B	23 A
	24 V	25 Q	26 L	27 BB		28 X	29 Q	30 Y		31 R	32 G	33 Q	34 E	35 L	36 Y	37 O	38 AA	39 B	40 H		41 Y	42 X	43 AA
44 A	45 P	46 K	47 S	48 L	49 V		50 F	51 D	52 G	53 X	54 O	55 R	56 Y	57 A	58 M	59 J	60 AA		61 Z	62 V		63 N	64 AA
65 F	66 Y	67 T	68 E	69 P	70 B	71 Q	72 K	73 A		74 O	75 F	76 V	77 Q	78 AA	79 Y	80 W	81 I		82 U	83 D	84 P	85 K		86 Z
87 L	88 BB		89 B	90 U	91 O		92 BB	93 H	94 G	95 K	96 F		97 U	98 P	99 M	100 C	101 X	102 F	103 Y	104 T		105 J	106 H	107 A
108 S		109 N	110 E	111 B	112 M	113 R	114 L	115 Q		116 H	117 V		118 I	119 K	120 V	121 O	122 D	123 R	124 B	125 E		126 F	127 X	128 AA
129 Z	130 C	131 T	132 G	133 W	134 M	135 V	136 K		137 H	138 E		139 A	140 M	141 B		142 Q	143 L	144 W	145 D	146 P		147 K	148 W	149 Q
150 T	151 R	152 M		153 T	154 AA	155 F		156 Z	157 U	158 K	159 D	160 W	161 N	162 L		163 H	164 Z	165 P	166 Q	167 E	168 U	169 AA		170 BB
171 K	172 S		173 Y	174 M	175 S	176 Q	177 AA	178 E	179 A		180 F	181 U	182 C	183 O	184 S	185 AA	186 D	187 E		188 H	189 S	190 L	191 J	192 Q
193 F	194 AA	195 G	196 B	197 Y	198 E		199 BB	200 K		201 Q	202 M	203 H	204 D	205 V	206 A	207 Y	208 F	209 Z		210 B	211 R	212 L	213 AA	214 E
	215 I	216 O	217 E	218 X		219 H	220 Z	221 A	222 J		223 T	224 N		225 K	226 M	227 W	228 AA	229 P	230 F		231 B	232 G		233 Q
234 K	235 D	236 E	237 O	238 T	239 L	240 P	241 U		242 L	243 M	244 F	245 A	246 Q	247 S	248 BB	249 N	250 D						

Solution for March Actucrostic: We think the World Series claims the undivided attention of the United States, but there is a saying here that an army from Mars could invade France, the government could fall, and even the recipe for sauce Bearnaise be lost, but if it happened during the Tour de France nobody would notice.—Red Smith, "Bicycles in the Alps"