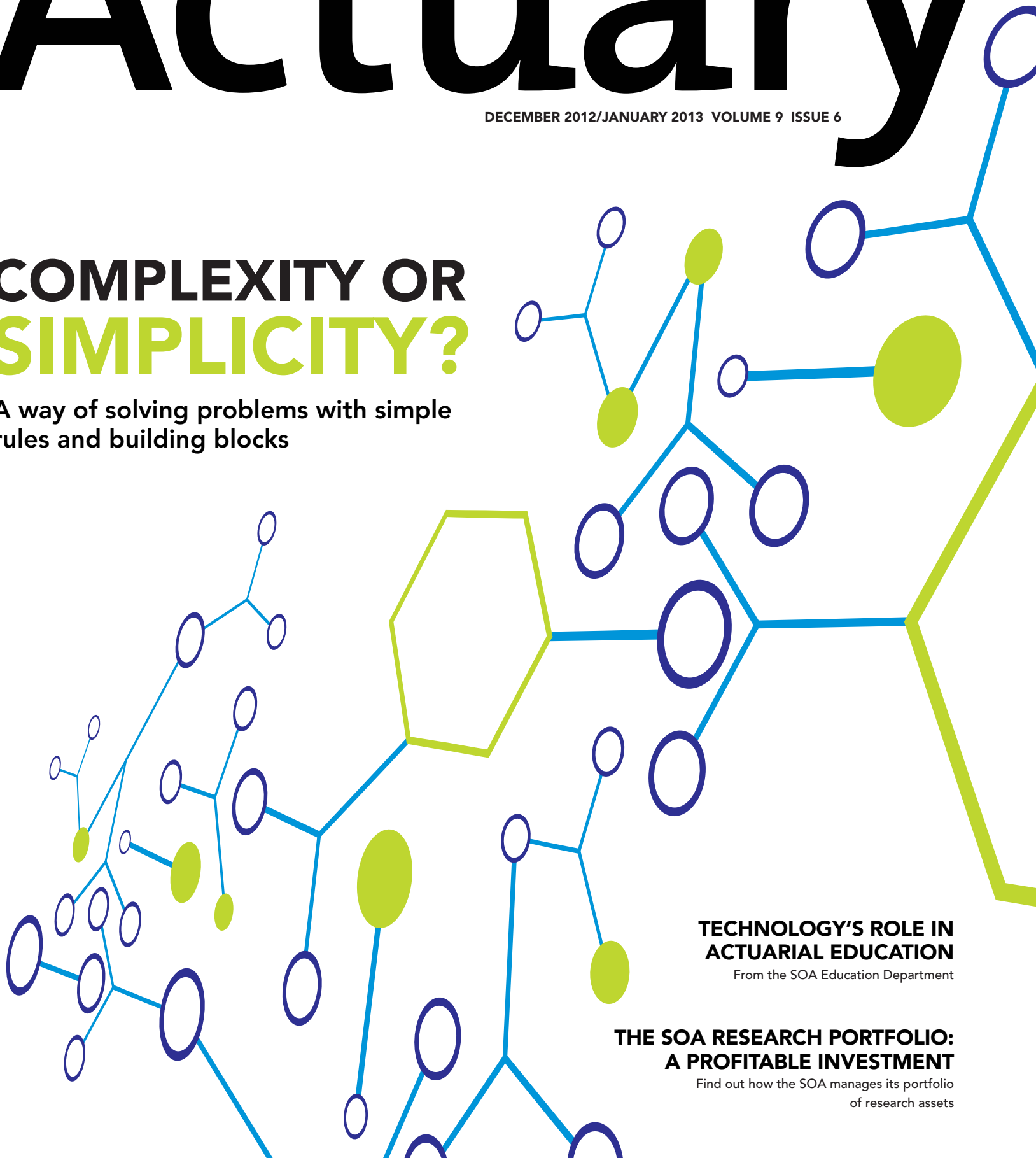
SOCIETY OF ACTUARIES

The Actuary

DECEMBER 2012/JANUARY 2013 VOLUME 9 ISSUE 6

COMPLEXITY OR SIMPLICITY?

A way of solving problems with simple rules and building blocks



TECHNOLOGY'S ROLE IN ACTUARIAL EDUCATION

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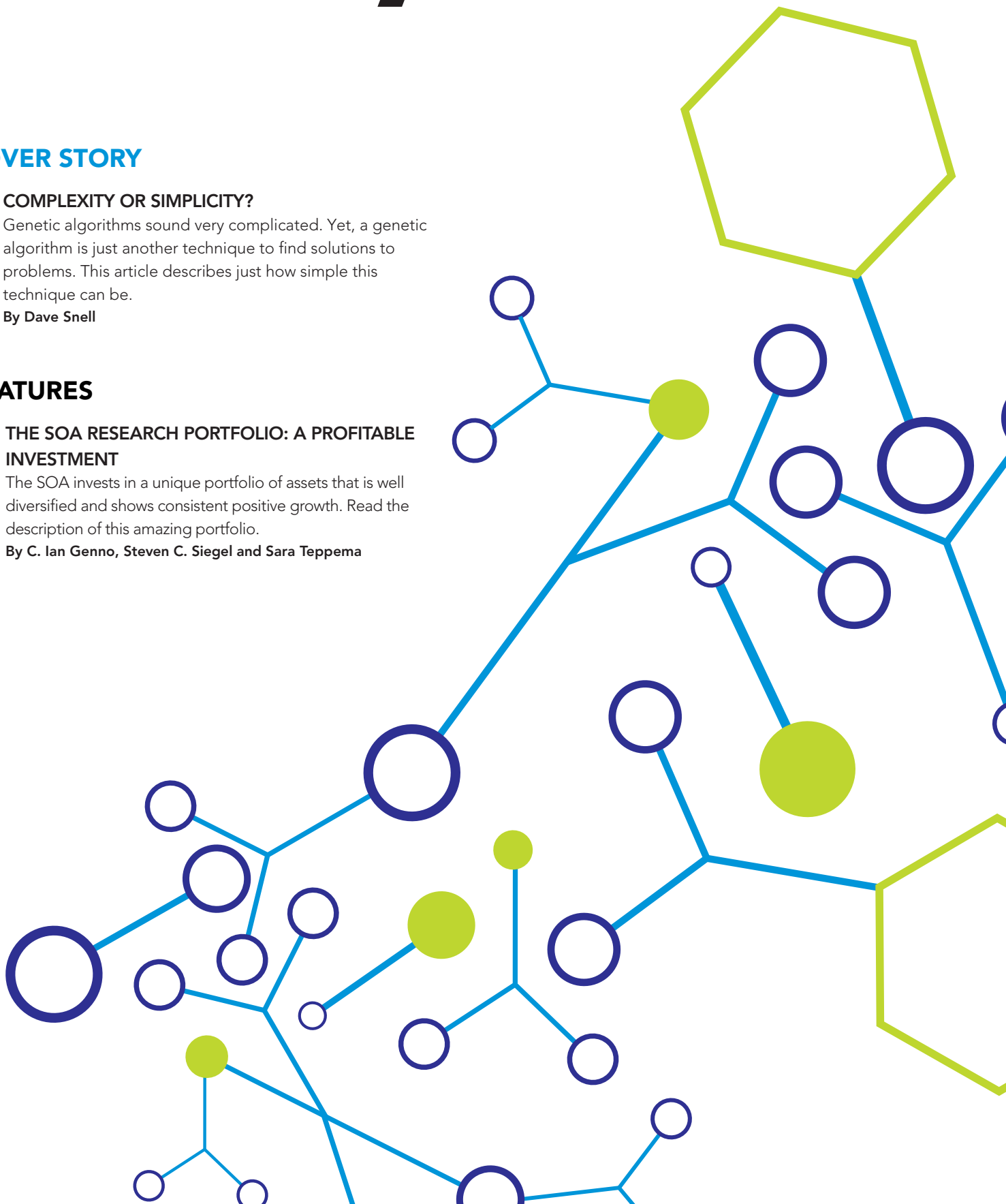

The Actuary
SOCIETY OF ACTUARIES

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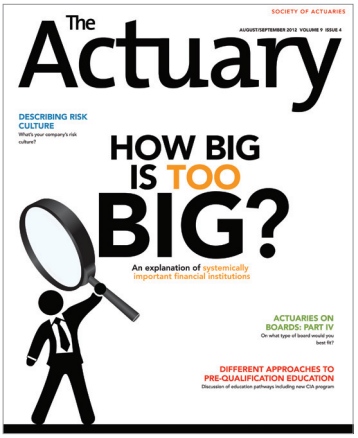
Letter To The Editor

REACTION TO A LETTER FROM THE PAST SOA PRESIDENT



DEAR EDITOR,

I appreciate the emphasis on professionalism by our leadership. I believe actuaries would agree it is ethically obligatory to correct a client's potential favorable misperception. Brad Smith's letter on professionalism in the Aug./Sept. issue may have created an unfavorable perception of himself. He acknowledged gaining "a client who will never engage the services of a competitor" because the client believed he would be in the office at 6 a.m. on a given Saturday morning, despite the fact that he was not routinely (and had never been in the office before) at that hour. I do hope that there is more to the story.

I was also struck by an early anecdote in the letter because it was about me. I was not the "mock interview" student he met with, but I was that kind of C+ college student. Yes, I "did not care," at least about getting A's from my college professors. (I did graduate in four years and I have always valued knowledge.) Why is there an easy actuarial stereotype? I suggest we have a failsafe process for creating near cookie cutter professionals. The examinations—a rigorous testing to ensure actuaries have the aptitude, knowledge and tools to evaluate risk—contribute to that process, but so too does the fact actuaries and firms will first screen hires by eliminating from consideration any applications with a GPA below X. I would have been eliminated, but so would many of the brightest and most creative people on the planet. I suggest this formula is one that is limiting to the critically needed diversity and creativity of our profession. I believe Herschel Day's article, "Notes from the College Classroom," in the Sept./Oct. issue of *Contingencies* highlights the risk of reliance on grades as well as opportunities to better round actuarial students.

Opinions and statements are solely my own. A

Wes Edwards, FSA, MAAA
Louisville, Ky.

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Editorial

A SEAT AT THE TABLE

BY SUSAN SAMES

***THE ACTUARY* RECENTLY** finished a four-part series on actuaries on corporate boards. The series makes the case that actuaries bring valuable skills to boards and provides ideas on how actuaries can better position themselves for such a role. I just finished the first of a three-year term on the SOA's own board of directors and wanted to share what that was like. While the SOA is a nonprofit, many of the governance issues are the same. One of the more significant differences is higher percentage of women on our board.

The "Women's Leadership Breakfast" at the SOA's 2012 Annual Meeting was led by Mary Heath of HeathFlynnHolt, an executive coaching firm specializing in women and leadership. She said that women now hold just under 15 percent of the seats on U.S. corporate boards. Her firm is targeting to double that. They consider 30 percent a tipping point where there are enough women to change the dynamics of the group.

As I talked to women at this session, there was a lot of excitement that our incoming president is a woman and that the board has reached this tipping point with 11 women out of 28 members. There was also a lot of interest in how our board operates, how we conduct discussions, how we make decisions, whether we try to arrive at a consensus or use a simple majority vote. Do we just approve these initiatives? Do our discussions change people's minds?

As with the corporate boards described in the series, our board provides oversight. We deal with strategic, not day-to-day operational, issues, and much of our work is done outside of the meetings. For example, the board just adopted a new strategic plan, which is intended to carry us from 2013 to 2016. While the board had input, we did not develop the plan itself; a task force was authorized by the board. Most initiatives are dealt with in this manner—a smaller group, which often does include board members, studies the issue and reports back to the board with information, analysis and recommendations, which we will discuss and vote on during the meeting.

At 28 members, the SOA has a large board. It can be a logistical challenge to hold a meaningful discussion with that many people. Over time, the board has developed ways to manage its meetings to help ensure that members get the most out of them. The board is not trying to achieve a unanimous vote; that would be impractical. We do try to have enough discussion to get what we term "a sense of the board."

I think it is a hallmark of our board that we have a lot of discussion. We meet in person at least three times a year and hold monthly calls in between. So that we all come suitably prepared, we have a Board Book of material to read in advance. We review a preliminary agenda in advance and have an opportunity to provide comments. We have a timed agenda for the meeting. The basic elements of *Robert's Rules of Order* are used as guidelines for the meetings, so we have formal motions, which are moved and seconded. Every member has an opportunity to ask questions and provide comments on every topic. We all participate. If we have not had enough time to discuss an issue, it may get put on the agenda for the next day or the next meeting. When motions are put to a vote, we have a show of hands with board members voting "in favor," "opposed," or "abstaining." Immediately after the meeting we issue an email to our membership with highlights of the meeting. The formal minutes of the meetings are available once the board has voted to adopt them. Communicating with members is very important to us.

The single most amazing feature of the board meeting itself is how large the room setup needs to be. It is in a large ballroom, which is about the size of two standard breakout rooms. Everyone has a microphone; otherwise we would never be able to hear one another. Seating is designed to facilitate discussion. We each can see every other

member, as well as the presenters and at least one of the two full-sized screens.

Terms start at the end of the annual meeting. New members are informed that they are elected in September and attend their first board meeting (which is held during the two days immediately before the Annual Meeting) as a guest. I did not fully appreciate the literal meaning of "a seat at the table" until I was a guest at last year's meeting and sat at a table along the outside of the room looking in. I found that first meeting very instructive. Not being able to actively participate freed me up to simply listen and observe how the meeting flows, how members conduct themselves, how they interact.

There are many benefits to getting involved. Many former SOA board members look to their service as the highlight of their professional life. I know I will as well. Board service is an excellent way for actuaries to stretch themselves and build relationships with other actuaries. The SOA provides top-notch training to its board members around governance and related topics. Our recent training covered making decisions with limited data and how our mind naturally fills in gaps in ways that may not lead to the best outcome.

What difference has it made to have more women on the board? While it's hard to define the impact without lapsing into stereotypes, it does make a difference. (The only belief more off the mark than thinking gender determines everything, i.e., the old "biology is destiny," is maintaining that gender makes no difference whatsoever.) As I reread the "Actuaries on Boards" series, my attention was caught by the June/July article on personality traits that lend themselves to board membership. Experience and technical skills are necessary, but not sufficient. Softer skills, like reading people, being able to influence others, working well in a group setting and diplomacy, are critical.

Susan Sames

I hope our example encourages more women to go through the nominations process for the board. Fewer women opted into the process this past election cycle than the year before. Ideally we would have a large, diverse pool of candidates every year.

Of course, gender is not the only characteristic that makes a difference. While I am very pleased to be part of our board and proud that we have reached a significant milestone in terms of the representation of women, we are not yet particularly diverse either as a board or a profession in other significant ways. I hope I have encouraged others to get involved. We have a large board. There are many seats at the table. A

Susan Sames, FSA, MAAA, is a consulting actuary with Towers Watson. She can be contacted at *sue.sames@towerswatson.com.*

EDITORIAL CORRECTION

IN THE OCTOBER/NOVEMBER 2012 issue of *The Actuary,* the article "The Financial Risk of Life and Annuity Unclaimed Property," stated an estimated settlement of $700 million for MetLife.

The state of Florida, along with several other states, reached a $40 million settlement with MetLife. The settlement will be used to pay for the states' investigation. However, consumers' payments are estimated to be significantly higher.

The authors of the article and *The Actuary* regret any confusion caused by the error.

*Sources include: Regulatory Settlement Agreement between MetLife and the Florida Office of Insurance Regulation signed April 19, 2012; MetLife and Florida Office of Insurance Regulation press releases dated April 23, 2012; and articles in The Miami Herald and Tampa Bay Times from the same date.

Letter From The President

TAKING THE ACTUARIAL PROFESSION TO THE NEXT LEVEL

BY TONYA B. MANNING

THE FOLLOWING IS AN EXCERPT OF SOA PRESIDENT TONYA B. MANNING'S ADDRESS TO MEMBERS AT THE 2012 SOA ANNUAL MEETING.

I'd like to begin by asking a pretty easy question: Who here has a smartphone in their pocket? OK, does anyone have the iPhone 5 yet? Really? I am just a bit envious.

The phone is something we take for granted today … until we can't find it or it stops working. But, do you remember the days when each home had only one phone? Ours was avocado green, and was in the kitchen … with a really long cord that I could wrap around the wall into the den so I could talk with "privacy." I'm sure some of our younger members don't remember this!

Here's the progression of the phone:

- First there was the truly old-fashioned style, where you would just pick up and ask Sarah, the operator, to connect you.
- Then, we progressed to direct dialing and rotary … and avocado green.
- Then, touch-tone—with maybe two or three per house.
- And, at last, you could talk on the phone like Max from "Get Smart" with a cell phone, that was so large you had to carry it around in a bag. (Thank goodness for the remake of this movie or I'd lose one-third of you!)
- Now, we have smartphones. An amazing gadget that pretty much contains my life. And, it seems everyone has one (or maybe two—work and personal), not on the wall, but in their pocket or purse.

Think about it, your little phone can do everything the original phone could do (minus maybe Sarah, the operator, but we do have Siri!) And, it can do so much more. These technological advances have taken something that was pretty amazing—the old-fashioned telephone—to a whole new level.

So, you may be wondering, why am I talking so much about a phone, and what does it have to do with the Society of Actuaries? What I have illustrated is how the phone has evolved over time to a whole new level from simply valuable to absolutely essential. And our profession has evolved, too.

Our profession is amazing. It really is. We can take large amounts of data and complex problems, add some calculus, probability, finance, produce pricing and multiyear forecasting, and help companies develop solutions to important business problems.

Not bad—not bad at all!

But we need to continuously move forward and keep evolving to bring our profession to the next amazing level.

At the SOA's October 2012 Board meeting, the Board approved the SOA's updated strategic plan that will be in place for the next four years. This plan maps out the SOA's direction and priorities. We are very excited to embark on this plan, and continuing to take our profession to the next level is a key part of our strategic plan.

In response to our strategy, there are five areas in which the SOA is working to bring our profession to the next level.

They are:

1. Strengthening our Relationship with Candidates,
2. Creating New Opportunities for Actuaries,
3. Professional Development,
4. Research, and
5. Becoming a Global Actuarial Organization.

Tonya B. Manning

STRENGTHENING OUR RELATIONSHIP WITH CANDIDATES

Let me start with the candidate experience. From my perspective as a wide-eyed, 20-something exam taker, I viewed the SOA as an entity that only sold solar-powered calculators and gave exams. (Yes, I still have my calculator!) A lot has changed and improved since then.

In 1990 we established the Fellowship Admissions Course (also referred to as the FAC). This course became the final step to becoming a fellow. At the FAC, candidates learn about ethics and professionalism. They enhance their oral communication skills to help them deal with issues they might face as they progress in their careers. I attended an FAC in McLean, Va. and loved it. I am excited that I will be able to attend the FACs this coming year as president, but I know **my FAC** will always be my favorite.

Now more recently, we added e-Learning modules as part of the education process. E-Learning provides candidates with a more interactive, engaging learning experience; and it's available 24/7 worldwide. And because the platform is so flexible, we can quickly introduce new material to make sure we keep our curriculum current.

So, how do we bring the candidate experience to the next level? We want to strengthen the SOA's relationship with candidates. I know that when I was a candidate, I didn't feel connected to the SOA much at all. (Other than buying a calculator and taking exams.) I didn't have a great understanding of what the SOA did other than offer exams.

But technology has evolved and allows us so much more opportunity to connect with our exam takers. We can use emails, websites, blogs, webcasts, and even social media to reach out and connect. And that is exactly what today's candidates have been telling us they want—connection.

Candidate focus groups and online surveys have helped us get a better understanding of what candidates both want and need. One example is understanding the exam process. It can be really tough for candidates to get their arms around our education process, and, unless they are already employed in an actuarial practice, they sometimes don't have a complete idea of what it's really like to be an actuary. (The good, the bad, and the ugly.)

We want to be a better information resource for them. To do this, we will need to update the SOA's website so that it provides more career-related information. It could include things like targeted marketing to high school and university math teachers to help them become better informed about our profession and to better advise potential or current candidates. The site could also provide information about internships and entry-level jobs.

We want to support candidates while they are working their way through the exam process—to do this, we might provide standardized study materials, performance feedback on the preliminary exams, or additional practice exam resources.

We hear quite often that candidates are also interested in more opportunities to network with practicing actuaries and with each other, and we are looking into ways we can create those opportunities. In this increasingly competitive world, enhancing the SOA's relationship with candidates will not only better support those currently taking our exams, but will allow us to continue to attract the best and brightest candidates and ensure a vibrant future for our profession.

In summer 2012, I had the opportunity to talk to a group of candidates at a student summit. Whenever you get together with a bunch of college students, it's going to be fun. Not only was it fun—it was very informative! Candidates enthusiastically shared their perspectives and insights about where they hope the profession will grow. Overall, I was really inspired by their passion and enthusiasm for our profession.

CREATING NEW OPPORTUNITIES FOR ACTUARIES

We know that people who consider becoming actuaries have many options, but we want being an actuary to be their first choice. We want a strong pride in the profession to extend to our members as well. So, just like university students, today's actuaries have more opportunities available to them than ever before!

For almost 60 years, the SOA had two designations—ASA and FSA. In 2007, we added the CERA credential, bringing the SOA to a new level in establishing actuaries as risk management experts. Now the CERA is a globally recognized credential.

And over the years, we've added tracks as actuaries branch out into new roles. I know some people here remember the days when there were only two tracks. Now we have five. Soon we'll have a sixth track—General Insurance. The first exams will be given in the fall of 2013—not too far away!

So how do we create more opportunities for our members and take them to the next level?

- We want to help more of our members move into areas that are nontraditional for actuaries, like investment & fund management, environmental finance, and business analytics. The SOA is conducting market research to determine pathways for actuaries to move into these new areas.
- We want to support entrepreneurial actuaries who find a need in the marketplace and move to fill it. But, we know there are barriers to entry, so we want to learn how the SOA can help members overcome them. Ideas we have include offering support through further education, helping actuaries network together, and marketing the profession to employers outside of the insurance and employee benefits industries. We realize that moving into new areas like these may not be easy, but for the right person it can be a very rewarding career move.

Actuaries like Mark Hug, the chief marketing officer at Prudential Financial; Laura Bennett, CEO and co-founder of Embrace Pet Insurance; and Carol McCall, the chief strategy officer at GNS Healthcare, a big data analytics company, have taken their training and business acumen to nontraditional areas and roles. While their work is not strictly outside the profession, they have broken down barriers. It's exciting to see our fellow members make moves like these, and I hope many more of us will be able to break ground like this in the years to come!

PROFESSIONAL DEVELOPMENT

Seeing actuaries in areas like these is very different from the past where there was often one central actuarial department within a company. In my area—retirement benefits—actuaries originally focused on liability calculations and regulatory compliance. With a focus just on calculations and compliance, actuaries could get by just speaking "actuarialese" to other actuaries. We know this is no longer the case. So, how do we bring our roles as actuaries to the next level?

Actuaries need to see themselves and be seen as integral business partners. We are, at our core, problem solvers and that is essential. But, communication skills, problem solving, and persuasiveness—they all have to be part of the mix—these are all important tools that every business leader needs. We need to develop and hone these skills to change the misperceptions of actuaries. This takes work.

For example, I began working on my communication skills while in college, where I took a speech communications class my senior year. To say the least, I was a bit nervous. In fact, I remember wearing long skirts on the days I had to make a speech so my classmates couldn't see my knees shaking. Later, when I began working at a consulting firm, I volunteered to make internal presentations—a low risk way to get experience in presenting and improve my skills.

Being an actuary is more than just doing the calculations or the modeling. Actuaries are called upon to recognize bigger-picture issues, and we must use our business and communication skills to address those issues.

Two of our sections, Actuary of the Future and Management & Personal Development, are creating articles and podcasts, and they're sponsoring sessions at meetings like this one that are focused on developing business leaders with a wide range of skills. The SOA also continues to offer professional development options like our Business Savvy Skills Seminar and e-Learning courses that emphasize the skills we need to keep our focus on the big picture.

Take advantage of these and make an investment in your career. I'm still on a mission to improve my business and communication skills, and I strive daily to be informed about not just my area of expertise, but the big picture. I do this in my career and as a volunteer for the SOA.

RESEARCH

Next, let's look at research. Research has always been a key part of the SOA's mission. The research we conduct gives us a great opportunity to have our voices heard on important issues facing society today.

In the early days, our research focused on mortality and morbidity studies. In recent years we've undertaken an effort to improve our experience studies. In the 1990s, our research activity expanded to include studies that support our different practice areas. And, we've had academic research delivered to us through the *North American Actuarial Journal*.

Recently we've branched out even further in our research efforts; first, with the Rapid Research initiative. With our SOA staff actuary, Joe Silvestri, we were able to develop data-driven retirement research in response to real-time questions from policymakers and the industry. Retirement issues are in the news daily, so it's important to be able to develop research on this topic and to respond quickly. We are now exploring ways to apply the rapid research approach to other practice areas.

Another topic that's in the news daily (or maybe even hourly) is health care. In 2011 we launched an initiative to dedicate significant resources to health research. This research is targeted to wide audiences (not just actuaries), such as the public, policymakers and the media.

So how do we take our research to the next level? We now select potential projects based on whether the research will:

- Expand actuarial practice,
- Inform public policy, and
- Serve societal interest.

All of the criteria are focused on **impact.**

We will also continue to seek media attention for our research, since this is the best way to help employers and the general public understand the actuarial perspective on today's important issues.

Funding for seven diverse research ideas has already been approved. These include topics such as complexity science and behavioral finance, regulatory risk for insurers, and a climate change index.

BECOMING A GLOBAL ACTUARIAL ORGANIZATION

While we are expanding boundaries metaphorically through our research, we are also expanding geographically as the SOA evolves into an international actuarial organization.

We know the world is shrinking. Our little phones keep us connected with anyone, anytime, anywhere in the world. Historically, the SOA has been viewed as a U.S. and Canadian organization. However, we've always had members outside of the United States and Canada. Today, SOA members live and work in more than 60 countries across the globe. As Brad Smith indicated in his address at the 2012 Annual Meeting General Session, more people worldwide are electing to join the SOA community, and the SOA has a responsibility to serve them.

So how do we take our growing membership to the next level?

- We want to be the leading global provider of actuarial education. The SOA has invested in an education system that uses computer-based testing and e-Learning modules that members and candidates worldwide can access.
- We are working to strengthen the value of the SOA credentials in today's increasingly global environment. Adding the General Insurance track is a big step toward positioning ourselves as having the premier international actuarial designation.
- Our new strategic plan emphasizes the SOA's growth as a global professional organization.
- We want to build and support strong actuarial communities worldwide, fostering and supporting our members and candidates regardless of where they live and work.
- When faced with a choice, we want employers to hire actuaries with an SOA designation.
- When faced with a choice, we want candidates to choose the SOA because of the breadth of our actuarial education.

LOOKING AHEAD

It's exciting to see the SOA and the profession's growth. The SOA wouldn't be able to grow as it has without the involvement of our 3,300 volunteers. We recognized 10 of those outstanding volunteers during the 2012 Annual Meeting's General Session, but in my mind every volunteer is outstanding.

I hope you are all as proud to be an actuary as I am and are excited about the future of our profession. As individuals and in the collective, I hope you will pursue the following:

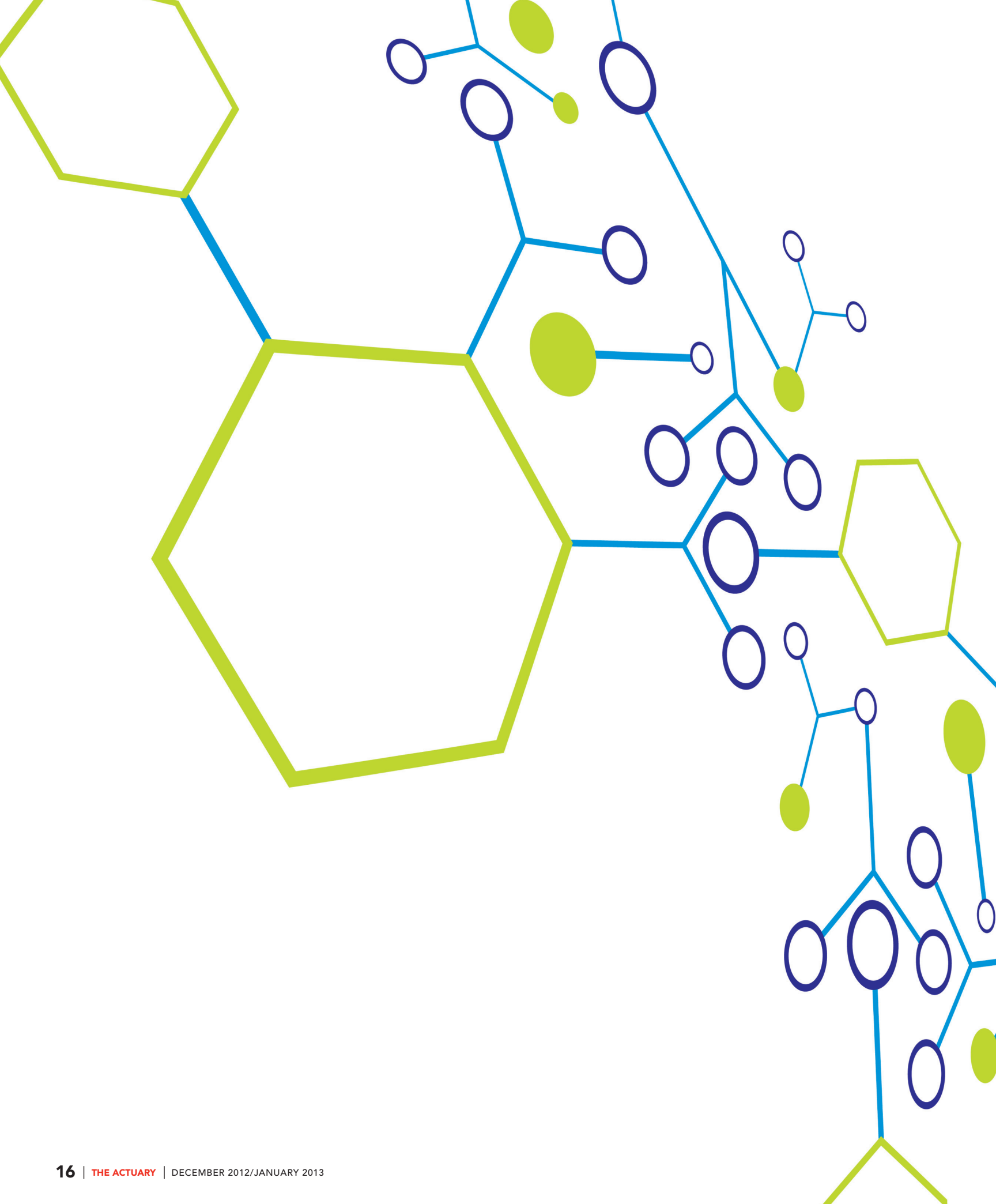
- Continue to push yourself.
- Look for new ways to use your actuarial knowledge.
- Improve your skills.
- Ask yourself how you can take your career to the next level.

It can be as simple as going to a professional development session that is outside of your area of expertise. For example, although my specialty is retirement benefits, I recently attended an educational session on predictive modeling.

As I begin my term as president, I look forward to creating a dialogue with you, my fellow members, as we work together to bring the Society of Actuaries and our profession to the next level.

Thank you! A

Tonya B. Manning, FSA, MAAA, EA, FCA, is president of the Society of Actuaries. She can be contacted at *tmanning@soa.org.*



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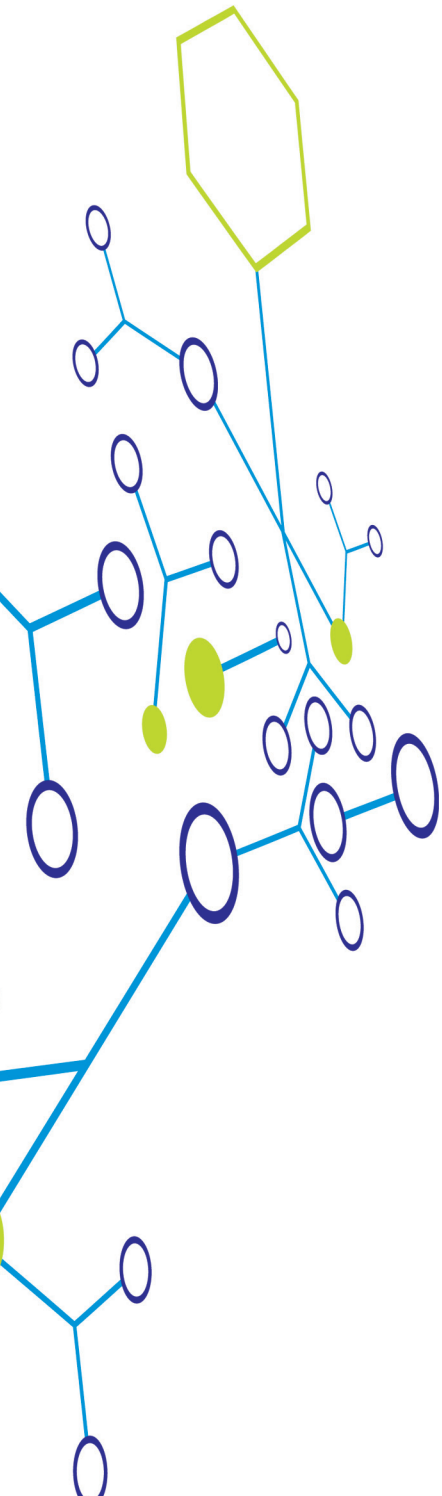


GENETIC ALGORITHMS SOUND VERY COMPLICATED. YET, A GENETIC ALGORITHM IS JUST ANOTHER TECHNIQUE TO FIND SOLUTIONS TO PROBLEMS. THIS ARTICLE DESCRIBES JUST HOW SIMPLE THIS TECHNIQUE CAN BE. BY DAVE SNELL

The opportunity to share my enthusiasm for complexity sciences at SOA annual meetings, health meetings, the Life & Annuity Symposium and lots of regional meetings has been a lot of fun. But then, after a keynote presentation I gave at the Actuarial Research Conference, an attendee came up to me and said that she had a suggestion for a major improvement. She said that instead of "Complexity," I should rename the title "Simplicity." She shared that she is an expert in her field of actuarial focus; and although she enjoyed my presentation, she almost skipped it because she did not want to have to listen to yet another complex actuarial topic outside her immediate area of expertise.

I thought a lot about what she said. She was correct. I was wrong. This is not more difficult than classical, deterministic, actuarial techniques. It is simpler. It is a way of solving problems with simple rules and building blocks. When you stop and seriously think about it, the complexity science techniques are actually more intuitive than some of our classical deterministic actuarial techniques. Complexity science seems to be an umbrella term for many topics; but in this article I shall try to explain just two of them, deterministic chaos and genetic algorithms, with fairly simple examples.

Deterministic chaos is a topic that sounds daunting but really is more simple than complex. My favorite example of this is the logistic equation for population growth that Pierre François Verhulst proposed in 1838. The famous actuary Benjamin Gompertz proposed a similar model for human mortality in 1825. Darwin noted a similar growth pattern in action on isolated islands he visited on the famous sea voyage in the 1830s that led to his theory of evolution. Assume you have a population of some animal on an island with no natural predators and a surplus of food. An actuary would be able to project that the population would, initially, increase rapidly—in fact, it would likely increase exponentially. As we all know though, exponential growth is seldom sustainable. Eventually, the food supply starts to become scarce and population growth is limited accordingly. Verhulst determined that the population growth rate at time 't+1' is going to be some constant, R (related to the Malthusian parameter of maximum growth rate), times the rate at time 't' times the quantity '[1 - the rate at time t]'. More concisely,

$$P(t+1)=R * P(t) * [1 - P(t)] \text{ where } -1 <= P(t) <= 1$$

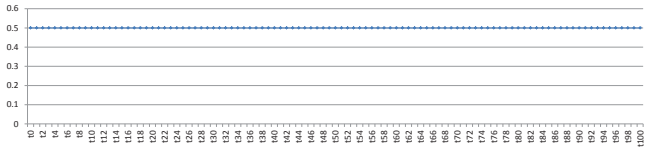
[Pierre François Verhulst's Logistic Equation—originally proposed in 1838]

The Logistic Map: X(t=1)=R * X (t)* [1 – X(t)]

Note: 0≤X(t) ≤ 1

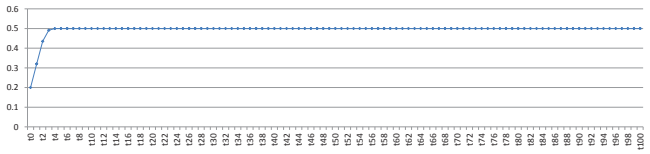
x(t+1)=Rx(t)[1-x(t)] with R=2 and x(0)=0.5

X(91) ... X(100): .5, .5, .5, .5, .5, .5, .5, .5, .5, .5



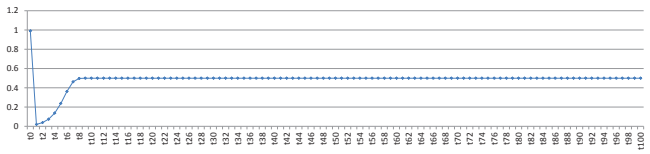
x(t+1)=Rx(t)[1-x(t)] with R=2 and x(0)=0.2

X(91) ... X(100): .5, .5, .5, .5, .5, .5, .5, .5, .5, .5



x(t+1)=Rx(t)[1-x(t)] with R=2 and x(0)=0.99

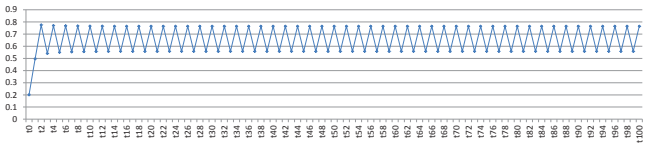
X(91) ... X(100): .5, .5, .5, .5, .5, .5, .5, .5, .5, .5



For R=2, the starting point is unimportant and there is a single attractor of .5

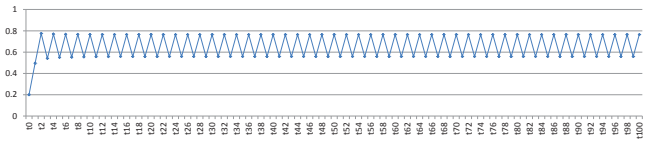
x(t+1)=Rx(t)[1-x(t)] with R=3.1 and x(0)=0.5

X(91) ... X(100): .765, .558, .765, .558, .765, .558, .765, .558, .765, .558



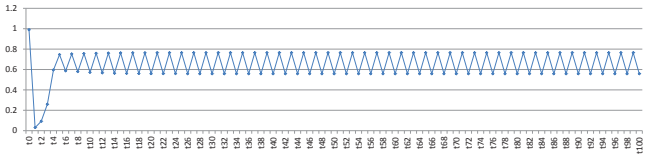
x(t+1)=Rx(t)[1-x(t)] with R=3.1 and x(0)=0.2

X(91) ... X(100): .558, .765, .558, .765, .558, .765, .558, .765, .558, .765



x(t+1)=Rx(t)[1-x(t)] with R=3.1 and x(0)=0.99

x(91) ... X(100): .765, .558, .765, .558, .765, .558, .765, .558, .765, .558



For R=3.1, the starting point is unimportant and there are two attractors of .558 and .765

Figure 1. Logistic Map with R=2 and R=3.1

When R is small, say R=2, it does not matter what starting value you choose for x(0). The resulting iterations will always converge to a single attractor of 0.5. As R increases, the number of attractors doubles (according to Feigenbaum's constant: 4.6692016), as shown in Figure 1, and the later iterations oscillate between them.

This seems orderly. Some grand mathematical process is controlling the affair; and we might expect the trend to continue. We would be wrong.

Looking at Figure 2, we see that once you reach R=4, just a tiny change in one of your assumptions may cause an undetermined effect on the validity of your model. The two graphs are somewhat similar; but there are definite differences in some areas. Everyone has heard of the butterfly effect. Here is the butterfly effect in action in very basic algebra. Keep in mind the only thing that caused the two graphs to differ so noticeably at the later durations is a starting assumption difference beyond the trillion decimal place. That's 0.2 versus 0.2000 blah, blah, blah, 001.

The implication for actuarial models, which may be far more complicated than the logistic equation, is that very small variations in starting values may have huge unforeseen consequences. Try stopping one of your projection models after 10 years and input the numbers you have at that point into the same model. Do you get the same results at the ending year? What if you reentered your output each year as the next year's starting values? The results 50 years from now may be significantly different from your expectations.

Deterministic Chaos

The Logistic Map: X(t+1)=R * X (t)* [1 – X(t)]

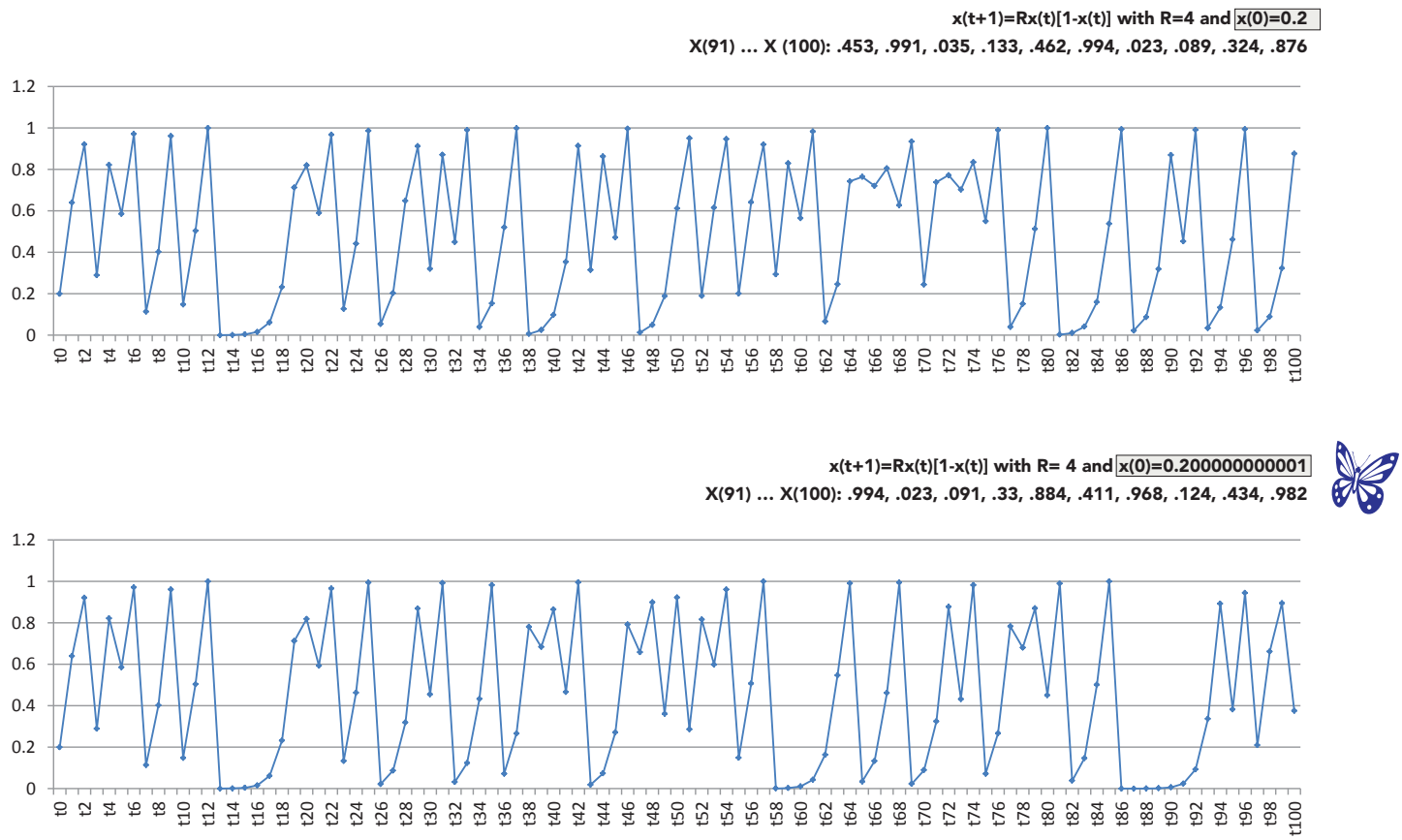


Figure 2. Logistic Map with R=4 — Deterministic Chaos Emerges

Deterministic chaos merely means that a simple non-periodic system may be completely determinable over the short term but it becomes unpredictable past its horizon of predictability, and according to James Gleick, a pioneer in chaos theory, "any physical system that behaves non-periodically is unpredictable." Common examples include weather predictions (highly accurate over a few days, seldom accurate past a couple of weeks) and financial markets—perhaps even actuarial financial models!

Read more about the science of chaos theory in *Chaos: Making a New Science*, by James Gleick.[1]

Genetic algorithms sound very complicated. Yet, a genetic algorithm is just another technique to find solutions to problems. It uses simple rules, comparative scoring, and selective modifications for the subsequent iterations. Even bacteria effectively employ them (to evolve stronger bacteria that are resistant to antibiotics). Is a fifth grader bacterium smarter than an actuary? In my workshops (with Brian Grossmiller, a kindred spirit in complexity sciences) on genetic algorithms, I often start with basic genetics: genes, alleles, mitosis and meiosis; but that is probably too complicated.[2]

A genetic algorithm can be ideal for a situation where:

1. You have no direct algorithm for an exact solution (or an exact solution would be too complicated or too time-consuming);

2. The number of potential solutions is too large to try them all; and
3. Solutions can be scored such that you can compare the value of solution X versus solution Y and easily see which is better.

In a genetic algorithm, we usually assign a set of actions or conditions and then we evolve better and better sets in a process that mimics the evolutionary process. The genetics terms and metaphors are historical. John Holland introduced them back in 1975 when he first described genetic algorithms in his book, *Adaptation in Natural and Artificial Systems*.[3] He was impressed by the speed at which species had evolved, as evidenced by the fossil record, and he developed ways for us to emulate evolution as a technique for solving problems too time-consuming by other means.

Let's take a simple example that Brian and I used in our workshop. Say you want to manage a health care provider system to reduce costs and still provide adequate coverage for the plan participants. In our example, Brian had empirical cost data from more than 3,000 provider groups. Each provider group offered one or more specialty services. These might range from acupuncture to urology. Each specialty has a relative cost (e.g., the average charge from an ophthalmologist might be higher than that from a pediatrician) and each provider group also has a relative cost (provider group 5 may be in a fancy location and charge, on the whole, much more than provider group 253).

We want to lower costs while maintaining some desired level of access to at least some minimum number of choices for each of the various specialties. If we only wanted to minimize cost, this would be easy. We could just include the lowest cost provider groups and exclude the higher priced ones. Unfortunately, some of those needed specialties are not available from the lowest cost provider groups. We might also want to include relative quality of services measures, based on patient feedback or a number of other comparative criteria.

A provider group will either be in our network or not. These are the only allowable choices so we can represent our set as a long string (analogous to the long DNA strands we have in each of our human cells) of zeros and ones representing whether a provider group is in (one) or out (zero) of our network.[4]

If we randomly generated 100 solution sets they might be as shown in Figure 3 below.

Here, we see that solution set 1 includes provider groups 2, 3 and 5 while solution set 100 includes provider groups 3, 5 and 6. I also added the relative scores for these sets (the score takes into account cost and coverage and potentially lots of other criteria) in the last column. Details of the scoring algorithm are unimportant here (but you can see them in the referenced Excel workbook). The point is that via the score we have an easy way to see if one set is better than another one.[5]

Given a situation like this, an actuary might try to figure out an exact solution; but the number of simultaneous equations (not necessarily linear) is immense (3,000+) and the result might take a very long time and effort. Alternatively, the option of trying out each potential set is unthinkable. There are 2^{3000} possible solution sets; and if you are suspecting that is a big number, you are correct—big time! The number $2^{3000} > 10^{903}$, but the number of atoms in the known universe is around 10^{82} and the number of seconds since the beginning of time (the Big Bang) is around 10^{17}; even multiplying these numbers together we are not even close to the number of possible solution sets.[6] Clearly, we do not have time to try comparing all the solutions. Yet, we can easily and quickly check to see if one potential solution set is better (i.e., gets a lower score) than another one.

This is a perfect place to try a genetic algorithm approach.

PROVIDER GROUP	1	2	3	4	5	6		3000	SCORE (lower is better)
SET 1	0	1	1	0	1	0		0	0.9873
SET 2	1	1	0	0	0	1		1	0.8206
SET 100	0	0	1	0	1	1		0	1.1393

Figure 3. Sample Sets of Provider Groups for a Health Care Network

For More Info

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The following is a description of one of the sessions available for purchase: "This session will contain discussions on potential risks that may be emerging, and how to identify these risks and understand them. The discussion will include how to triage the identified emerging risks based on what would have a material impact on an organization. This session will leverage the emerging risk survey published earlier in the year by the Joint Risk Management Section.

At the conclusion of the session, attendees will be able to identify emerging risks to their organization, evaluate the impact on their organization and, ultimately, explain the resultant impact to their stakeholders."

We will start out with 100 potential provider sets.[7] Each of them will have a gene string of 3,000 genes, and each gene can be only a zero or a one (each gene represents the inclusion or exclusion of a specific provider group). Our first step will be to randomly assign zeros and ones to all of the genes in every set. For example, let's say we randomly generated the sets shown in Figure 3.

Then, we rank those sets according to their scores. The winners (lowest scoring sets) in this generation will not be terribly impressive. After all, they were randomly generated sets—no brainpower needed here.

Next, we'll decide upon some way to determine mating rights so that we can use these sets to spawn a new, hopefully smarter, next generation. Oh, that word "hopefully" is bothersome, isn't it? We don't want to risk our next generation being dumber; but if all we do is combine randomly created sets together—even the brighter ones—we could get bad combinations and our "species" might devolve instead of evolve. How does nature handle this?

In nature, the various members of a generation do not all live the same length of time. In essence, some die young and never get to have children; some have children and then die (perhaps even in childbirth); and some live on to coexist with the new kids on the block. In genetic algorithms, we call these latter ones "elites." In order to guarantee that our generations do not get dumber instead of smarter, we will specify that a certain number of the sets in generation 1 (the favored ones) will self-replicate into generation 2.

For now, let's set the percentage of elites to 10 percent. That means when we get around to building generation 2 from generation 1, the top 10 sets (of our 100 sets) of generation 1 will copy over exactly. Our next task then is to figure out how to generate the remaining 90 sets of the new generation 2.

Again, let's look at what happens in genetics. In most species of mammals, the biggest, or prettiest, or smartest, or strongest member or members of the group are deemed the most attractive mates for reproduction. For example, the norm in a kangaroo mob is that only the dominant male of the entire mob gets to mate with the various females. Among humans, we are not quite that strict (although in history, emperors and kings had many, many mates) and most folks have a chance at finding a mate; but still the smartest, richest, strongest or prettiest seem to have more choices.[8]

We will arbitrarily say that the top 20 percent of the sets will be the parents of the next generation. This will, of course, include our elites (our top 10 percent). I have to emphasize that these percentages are not scientifically determined and this is not the usual method I would employ; but it works fine for this example, and it shows that there is still a lot of "art" in the making of genetic algorithms.[9]

Now that we have established our pool of potentially preferred parents we can address the actual reproduction process. In nature, a child gets a DNA string that is composed of pieces from two parents. Let's say that we choose sets 2 and 5 as the parents. Then, on a gene-by-gene basis, each gene of the child will have either a copy of the corresponding gene from set 2 or the corresponding gene from set 5. The child will end up as some combination of sets 2 and 5. (See Figure 4 on page 22.)

OK, that works. However, we are limiting our possibilities here because of our experience. When Ben Wadsley, another genetic

	GENE 1	GENE 2	GENE 3		GENE 2,500	GENE 2,501	
SET 2	1	1	0		0	1	
SET 5	0	1	1		1	0	
CHILD	1	1	1		0	1	
SOURCE	SET 2	SET 5	SET 5		SET 2	SET 2	

Figure 4. Heredity in Action—Two Parents (Set 2 and Set 5)

algorithm cohort of mine, wrote an asset-liability management genetic algorithm he got faster results by drawing from five parents rather than two. As I thought more about this, I remembered that when we lived in Northern California, my older daughter once brought home her date, and he was surprised to discover that she had only two parents … and they were still married … and to each other! Clearly, I was naïve in assuming that we had to limit our genetic algorithms in this manner. In this example, we'll draw from our top 20 percent and let any one of the 20 of them be the dominant parent (gene contributor) for any gene in the child's gene string. This will provide a far better level of diversity, and our generations will continue to improve for a far longer time. Once I switched from two potential parents per child to 20 or more, I got a lot more diversity much sooner. Perhaps it does take a village.

Remember, inbreeding is bad among humans; and it is also bad in genetic algorithms. We want to keep the gene pool as diverse as we reasonably can in order to avoid marrying siblings or first cousins. Once again, I go back to genetics and see that a built-in mechanism exists to adapt to changing circumstances and add diversity. It's called mutation. Sometimes (perhaps most of the time) mutations result in a weaker cell; but sometimes it is an improvement. Some bacteria have developed the ability to mutate rapidly and thereby build immunity to antibiotics. We will generate our children as usual, and then randomly mutate some genes in the string. Assume we set our mutation rate to alter 30 genes of the 3,000. Again, play around with these parameters. You can learn (as do your genetic algorithms) through experimentation.

Figure 5 below is a revised picture of how the genes might be populated from five parents.

After we build all the sets for generation 2 (total = elites + children: 100 = 10 + 90), we repeat our test runs with this new generation and sort the scores again. Then, we repeat the process for many generations and watch as our "best set" results get better (lower) numbers. In the sample Excel workbook, all of the scores are normalized such that a solution set containing every provider group would have a score of 1.000. Initially, some solution sets will have scores larger than 1.000 since a random selection will likely include some sets drawn from the more expensive providers. Within just a few generations, though,

	GENE 1	GENE 2	GENE 3		GENE 2,500	GENE 2,501	
SET 1	0	1	0		1	0	
SET 2	1	1	0		0	1	
SET 3	1	0	0		1	1	
SET 4	1	0	0		0	1	
SET 5	0	1	1		1	0	
CHILD	0	0	0		1	1	
SOURCE	SET 1	SET 3	SET 4		SET 1	SET 2	

Figure 5. Five Parents (Our runs actually used more parents.)

we are seeing what looks like intelligence emerging. By generation 10, the score was below 0.85.[10] A few actuaries familiar with the problem were able to use their standard minimization techniques to beat that with scores around 0.78 and they projected that an optimal solution would score around 0.75. However, the genetic algorithm easily beat that within an hour and went on to reach results as low as 0.70. For a different set of adequacy conditions, the actuaries still thought the likely best case configuration was around 0.75, but the genetic algorithm got down to 0.55. Considering the amount of claim payments involved in a large health care network, this could result in a significant savings.

We instructed the program to repeat this process until we stopped getting any improvements (e.g., when the best score stayed the same for 25 generations) and that happened in a couple of days on a relatively inexpensive PC that did not have to be paid overtime for working through the night. The result was a dramatic improvement over the best analytical solutions we were able to achieve by classical actuarial means. The simple emulation of basic evolution got better results without any knowledge of multiple decrement contingencies, or advanced statistics, or differential equations … and yes, I think a student could be taught to do this without any knowledge of algebra!

Let's summarize what we did:

1. We chose a solution set (aka gene string) length of 3,000 where each respective provider group (aka gene) had to be 0 (not included) or 1 (included in our health care network).
2. We formed generation 1 by randomly assigning zeros and ones throughout each set; and we decided to have 100 sets per generation.
3. We tested each set of the generation and saved its score (penalizing, but not eliminating, any set that did not meet our coverage adequacy requirement).
4. We ranked the scores in order from best to worst.
5. We chose the top 10 sets and designated them as elites. Elites get to advance to the next generation intact.
6. We chose to have 20 parents per child, and we built the 90 children needed (to fill out the next generation) drawing from portions of the top-scoring 20 sets.
7. Each gene was chosen from some corresponding gene of one of the 20 parents (randomly choosing the dominant parent for that gene).
8. We went back through the children and randomly mutated 30 of the 3,000 genes (but we did not mutate genes of the elites).

9. We repeated steps 3 through 8 until the scores stopped improving.
10. We went out and partied while the genetic algorithm did all the grunt work for us; meanwhile the theoretical purist actuaries worked through the night trying to come up with a deterministic solution at our top competitor; and thousands of chimps at typewriters tried to pound out the exhaustive best solutions at our not-quite-top competitor.

Lessons learned: Building a genetic algorithm solution is pretty easy; but it is not a cookbook recipe process. The speed and the final solutions are influenced heavily by the starting assumptions. My first algorithms were plagued by inbreeding. Initially, I was so focused on early improvements that I placed too much weight on the scores when I assigned mating rights to the winners of a generation. I was assigning higher parenting probabilities in a direct proportion to better scores. Gradually, I backed off from that approach and found that by increasing the number of potential parents, and decreasing the relative probability of parent A contributing a gene rather than parent B contributing that gene, I avoided inbreeding for a longer time and ended up with better results. I recommend to the reader that you experiment with larger generations (i.e., much more than 100 sets per generation—I normally use at least 1,000), but still keep the number small enough to fit all of a generation into available program memory. I also found it useful to increase the mutation rate as the incremental improvement between generations starts to decrease. Another lesson I learned quickly was that it was important to be able to start from a previous generation of solution sets. That way I could experiment with my assumption parameters (parents,

elites, mutations, etc.) and avoid having to wait for hours to see the impact of those changes. There are many other tips I learned (and many more I am still learning) through these exercises. Whenever I hit a wall though, it was very handy to question my own initial assumptions; and to read more about genetics and then get another inspiration from how evolution accomplishes continual improvements.

Deterministic chaos and genetic algorithms sound like really complex topics. I believe they are not as complex to understand as many of the tools you are currently using. Let's think of them as potential topics in the simplicity sciences and embrace some of these handy tools. A

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ENDNOTES

1 *Chaos: Making a New Science*, by James Gleick, 1987, Viking Penguin Inc., New York, New York. Gleick describes the history of Chaos Theory; and how Feigenbaum's constant (4.6692016) became so pervasive throughout seemingly independent science applications. My quote about chaos in non-periodic systems is from p. 18 of this book. You can also read more about this example, and some related ones, in the January, 2012 issue of the *Forecasting & Futurism* newsletter in my article "When Algebra Gets Chaotic."

2 If you would like a more detailed, step-by-step description of how to design a genetic algorithm, see my article "Genetic Algorithms—Useful, Fun and Easy!" In the December 2012 issue of the *Forecasting & Futurism* newsletter. It also gives you a reference to a free workbook for the health provider network problem I discuss briefly in this article. Another good actuarial application of genetic algorithms, for asset and liability management, is in Ben Wadsley's article "Are Genetic Algorithms Even Applicable to Actuaries?" in the July 2011 issue of the *Forecasting & Futurism* newsletter.

3 *Adaptation in Natural and Artificial Systems: An Introductory Analysis with Applications to Biology, Control, and Artificial Intelligence (Complex Adaptive Systems)*, by John Holland, 1992, The MIT Press, Cambridge, Mass. This is the seminal work that started the genetic algorithm movement.

4 In human genetics, a DNA strand has a limited number of choices at each position (A-T, T-A, C-G or G-C); but the 3.2 billion positions result in a lot of potential variety.

5 See note 2 for a reference to the details for this example.

6 Current thought is that the Big Bang occurred around 14 billion years ago, which is a little over 10^{17} seconds. An interesting thread can be found at *http://answers.yahoo.com/question/index?qid=20080525070816AAaZAOU*. Likewise, the number of atoms in the observable universe is obviously not known precisely; but it is generally thought to be in the range of 10^{78} to 10^{82} (*http://www.universetoday.com/36302/atoms-in-the-universe/*). If we say $2^{3000}=10x$ then $x=3000*\log(2)/\log(10)=903.09$. Taking the outside estimate, 10^{82} times ^{1017} = 10^{99} which is a tiny fraction of 10^{903}.

7 In a typical genetic algorithm application, you may decide to have thousands of sets per generation. I am choosing just 100 here to keep the example simple. The advantage of more sets per generation is a greater diversity and higher probability the smarter sets will be a lot smarter. The disadvantage is that your algorithm will run slower as you have to test every set in the generation before you see your comparative results. It also may be more difficult to hold this information in memory, which can result in a lot of slower disk drive interaction.

8 An excellent book about this concept is *The Red Queen: Sex and the Evolution of Human Nature*, by Matt Ridley (April 29, 2003), Penguin Books, Ltd.

9 My earliest algorithms for mating rights would base the probability of being chosen as a parent on the absolute score the robot (or set) obtained. Thus, a robot getting a score twice as good as the next robot would have twice the chance of mating. This approach works well in early generations; but gradually leads to inbreeding. A better approach was to base mating probabilities on the relative score. In this case, the top scoring robot of 100 would have 100/99 times the probability of mating versus the second place robot, and 100/90 times the probability of the 10th place robot. Try different reproduction schemes to see what fits your particular applications.

10 These numbers are illustrative but your results will vary from them based upon the randomization of initial sets, the PC computing power and other factors. The trend though will be rapid improvement in the first several generations and decreasing improvements as the score becomes closer to an optimal mix of provider groups.

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THE SOA RES
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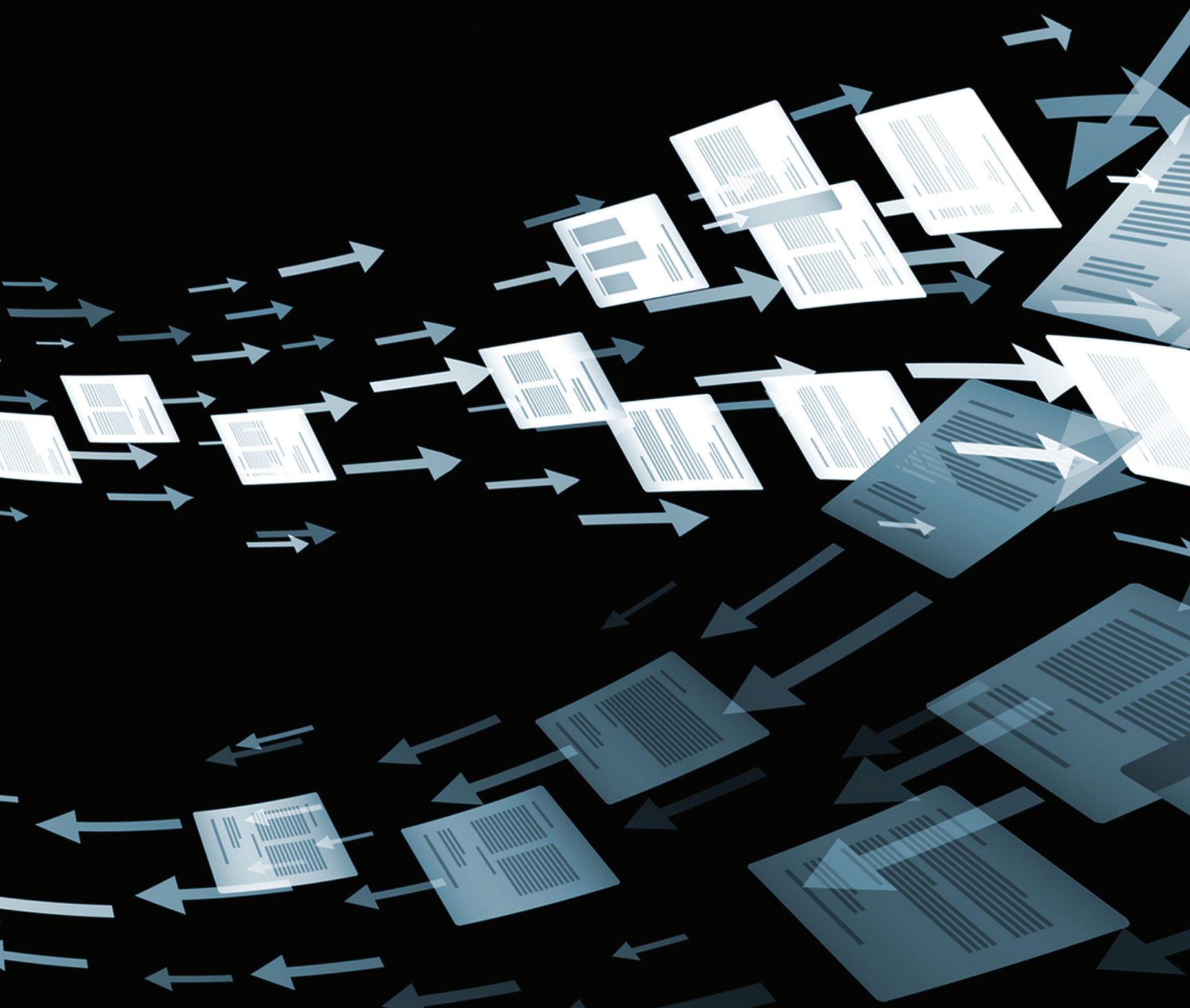
EARCH PORTFOLIO:
BLE INVESTMENT



THE SOA INVESTS IN A UNIQUE PORTFOLIO OF ASSETS THAT IS WELL DIVERSIFIED AND SHOWS CONSISTENT POSITIVE GROWTH. HERE'S A DESCRIPTION OF THIS AMAZING PORTFOLIO. BY C. IAN GENNO, STEVEN C. SIEGEL AND SARA TEPPEMA.

Did you know that the Society of Actuaries invests in a unique portfolio of assets? This portfolio is well diversified and shows consistent positive growth. Best of all, you receive dividends from it year after year. What's this highly profitable, "no strings attached" investment? It's none other than our wide-ranging and leading-edge actuarial research.

The SOA recently reviewed its research strategy, and how it manages its portfolio of research assets. In this article, we describe the key conclusions of this review and how we're currently implementing a new research strategy. With this new strategy, we forecast continued strong profits and bullish performance for our research portfolio.

The SOA supports research that advances actuarial knowledge, expands boundaries of actuarial science, and develops intellectual capital for use by existing and future generations of actuaries.

A NEW STRATEGY

In October 2011, the SOA board discussed and approved a new strategy for all of our research and intellectual capital, following a comprehensive review by a team of SOA volunteers and staff. A key element of our new research strategy is to achieve an appropriate balance between:

- Research that develops intellectual capital for immediate use by practitioners in our traditional areas of practice;
- Research that fosters further new thinking and developments in actuarial science (typically led by academics and others working in the pure science and its applications); and
- Research that expands the boundaries of our profession, rethinking the roles that actuarial science and actuaries can play, thereby creating new opportunities for actuaries.

The first step to implement this new strategy, with work ongoing throughout 2012, was to focus on the concept of expanding boundaries for the profession, to broaden our practice research portfolio. The next step involved a comprehensive review of the success of, and learning from, the SOA's data-driven staff research function, which had been tested as a pilot within the U.S. retirement practice in 2011 and 2012; the SOA board decided in October 2012 to make this in-house research function permanent, and to explore how to expand this to include Canada as well as other areas of practice. And for 2013, the board is reviewing how experience studies are conducted, and is formulating a new strategy for this important component of research.

THE PRACTICE RESEARCH PORTFOLIO: EXPANDING BOUNDARIES FOR THE PROFESSION

For many actuaries, experience studies are the best known of the SOA's varied research efforts. For others, the benefits of practical research projects may be more applicable to their daily responsibilities. Simply put, practice research has historically focused mainly on research efforts that help actuaries do their jobs better.

Looking forward, the SOA will continue this focus—but also aspire to use practice research to expand the boundaries of our profession, and invest in research projects that are broader and deeper (and likely larger in scope) than those of the past. To support this initiative, the board has identified three specific types of research that expand boundaries and reach different audiences:

- Expansion of practice: research that expands actuarial practice into new or nontraditional areas, or research that stays within traditional practice areas but extends that practice in new ways;
- Public policy: research that informs the development of government policy at the state, provincial or national level; and
- Societal interest: research that informs the public and has the potential to raise the visibility of the actuarial profession in the media.

In recent years, the SOA practice research function has operated primarily through practice area research committees. Six research committees—focusing on Finance,

Health, Life Insurance (combining the efforts of several life insurance-related section councils), Retirement, Risk Management, and Postretirement Needs and Risks—receive direct funding from the SOA, in addition to funds designated for research by various section councils. Other non-practice-specific sections, such as Forecasting and Futurism and Entrepreneurial Actuaries, also sponsor smaller research projects with their own funds.

THE RESEARCH EXECUTIVE COMMITTEE

In 2012, the SOA formed the Research Executive Committee (REC), a group of volunteers with significant and diverse SOA research experience that will manage our new research strategy. The REC's responsibilities include:

- Setting an overall research agenda for the SOA and recommending research budgets, based on input from the research committees, section councils, other groups working on research, SOA members and other interested stakeholders;
- Recommending funding of research proposals that seek to expand boundaries for the profession, via a new Research Expanding Boundaries Funding Pool (REX Pool);
- Collaborating with the research committees, section councils and other groups to identify and develop new research projects to address unmet needs;
- Setting quality standards for published research;
- Developing an overall strategy for more effective distribution and communication of research results to target audiences and stakeholders; and

- Monitoring the success of research projects, and finding ways to leverage success.

The REC acts primarily as an executive oversight group (similar to the role of the Education Executive Committee, within the SOA's Education area), to provide overall leadership across all areas of SOA research. The various practice-specific research committees will continue in their key role of initiating and managing research projects. In situations where the REC identifies new research ideas to address unmet needs, or interested parties bring research ideas directly to the REC, the REC will assess these ideas and engage the appropriate research committee for development. To the extent that a research idea does not clearly fall within the scope of a particular research committee—such as in the case of a multidisciplinary research topic—the REC can create a temporary work group to explore the topic and potentially facilitate a research project.

The REC's mission is focused specifically on practice research (rather than experience studies, which are separately managed within the SOA). The REC also wants to support the independence of section councils and other groups that have independent funding, which will continue to have autonomy in deciding how to allocate their own resources in support of specific research pursuits.

SOURCE OF FUNDS: THE REX POOL AND RESEARCH COMMITTEE FUNDING

As outlined above, the REC is charged with recommending funding to support research initiatives that seek to expand boundaries for the actuarial profession, from a specific pool of funding called the REX Pool. The REC also provides funding to support existing research committees.

The REX Pool is available to eligible entities such as established SOA research committees, SOA section councils, committees or task forces of the SOA board, and special ad hoc committees formed by the REC.

Eligible entities are encouraged to submit funding applications to the REC. Applications simply need to describe a well-thought-out idea with a supporting rationale and an approximate estimate for funding. To simplify the process for those seeking REX Pool funding, and facilitate generating as many good research funding ideas as possible for consideration, applications do not need to be in the form of a full traditional research proposal.

The REC has established criteria for the kinds of research ideas it wants to fund. These may include, but are not limited to, the following:

- Does the proposed research expand boundaries for the profession? Through expanded practice? Through public policy? Through societal interest?
- Does the proposed research further an SOA strategic goal?
- Will the proposed research lead to new, unique and relevant insights?
- Will the proposed research address a critical gap in current research?
- Does the proposed research meet a time-sensitive need?
- Could the proposed research garner significant media attention?
- Will the research be of specific interest to certain audiences?
- Is the proposed research multidisciplinary?
- Does the proposed research represent a new partnership opportunity for the SOA, e.g., with non-actuarial partners and/or co-funders?
- Would the proposed research enhance the stature of the profession (or damage it, if passed up)?

INITIAL REX POOL DECISIONS

The first round of REX Pool funding for research proposals that expand boundaries for the profession was completed in September 2012. The REC allocated its total REX Pool budget of $400,000 (allocated by the SOA board for 2012) to seven diverse ideas that will become new SOA-sponsored (or co-sponsored) research projects:

Creating an in-house research capability enables the SOA to deliver new and different types of research products in key practice areas, to complement its existing research initiatives.

1. ***Complexity science and behavioral finance:*** A study of models of health care behavior and decision making, from a complexity science and behavioral finance perspective.

2. ***Regulatory risk for insurers:*** In partnership with the North American Actuarial Council's Collaborative Research Group (NAAC CRG), a study of regulatory risk faced by insurance companies in Canada, the United States and Mexico, and strategies to deal with regulatory risk.

3. ***Risk adjustment bias in health insurance exchanges:*** A study of potential bias in risk adjustment methodologies under the U.S. Affordable Care Act's risk adjustment system within health insurance exchanges.

4. ***2014 "Living to 100" Symposium:*** This triennial international symposium brings together researchers and dozens of original research papers with a focus on longevity.

5. ***Climate change index:*** This will be phase 2 of a joint project between the SOA, Canadian Institute of Actuaries (CIA), Casualty Actuarial Society (CAS) and American Academy of Actuaries (AAA) to develop an index that can be used as a resource for actuaries and others working in the life, casualty and ERM fields, to develop predictive models and other risk management strategies related to climate change.

6. ***Sustainability of natural resources:*** An existing SOA working group on natural resource sustainability will bring together actuaries and other experts, to define the issues from an actuarial perspective, develop recommended next steps for the actuarial profession, and provide a report to the SOA membership.

7. ***Conference on the future of aging and retirement:*** In partnership with Boston University, the SOA will participate in an international conference on the topic of aging and retirement, with funding going primarily toward a report for SOA members on the discussions and outcomes of this conference.

The REX Pool

FOR MORE INFORMATION on the REX Pool, we encourage you to visit the SOA research website: ***http://www.soa.org/Research/Research-Opps/Expanding-Boundaries-REX/default.aspx***

These research ideas have price tags ranging from $10,000 to $100,000, and were judged by the REC to create the potential to expand the boundaries of actuarial science. The ideas are at various stages of development; over the next few months, they will follow the normal SOA research process, from Request for Proposal to completed project. Several of these projects have already begun this process.

The REC will review the next round of REX Pool applications in March 2013. For the coming year, the SOA board has budgeted REX Pool funding to increase to $800,000 for new project investments.

INSOURCING VS. OUTSOURCING: NEW DATA-DRIVEN, IN-HOUSE RESEARCH CAPABILITIES

Throughout 2011 and 2012, the SOA has been conducting a pilot experiment to assess the feasibility of delivering relevant, timely research insights in the retirement area, using an in-house staff researcher, database and modeling tool. (This contrasts with the traditional SOA research approach of relying solely on volunteers and external hired researchers, and analytical tools and data that are developed specifically for each research project.) Joe Silvestri, a seasoned pension actuary, joined the SOA in early 2011 and has been working with a database and modeling tool provided to the SOA by the U.S. government's Pension Benefit Guaranty Corporation (PBGC).[1] Over the course of this pilot period, the SOA has published retirement research reports based on this database and modeling tool that have garnered considerable attention from U.S. policymakers and the media.

Beginning in 2013, this two-year pilot program will become a permanent staff function within the SOA. As next steps, the SOA will explore engaging a contracted actuary to develop a complementary database and modeling tool to support Canadian retirement research similar to the research with U.S. data. The SOA will also explore what resources are needed to add a similar in-house staff research capability in the health practice area.

Based on lessons learned from the pilot, an ongoing "product line" is being considered, which will include status reports and periodic updates on research issues that the SOA has published papers on; reports on current hot topics, focusing on issues that are of high importance at a given time such as proposed legislation; and fact sheets that would provide brief, data-driven reports for interested stakeholders to develop their own analysis or assessment of implications.

THE FUTURE HORIZON FOR RESEARCH INVESTMENTS

Viewing the SOA's research initiatives as assets for the actuarial profession, it makes sense to periodically review our return on this investment and take steps to optimize its value to SOA members, other interested stakeholders and the broader public. With this responsibility in mind, the REC will be working on an ongoing basis to enhance the value of SOA practice research and refine its strategy. In addition to the first round of REX Pool funding decisions, the REC has already implemented an enhanced communication plan to ensure SOA research effectively reaches traditional and nontraditional audiences. And it is working toward better defining and measuring the impact of SOA-sponsored research through the development and assessment of key metrics. With these initiatives in place, no doubt we're in for a long-term, bull market on SOA research! A

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ENDNOTES

[1] For more information, please see *www.pbgc.gov*.

Education

TECHNOLOGY'S ROLE IN ACTUARIAL EDUCATION

BY JOHN I. MANGE AND SHERRI BLYTH

THE CHANGING USES of technology are readily apparent in everyday life. GPS helps us navigate in real time while driving. We connect to friends and colleagues new and old through social media such as Facebook and LinkedIn. We even ask our phones for restaurant or movie recommendations or schedule (yet more) meetings!

How we learn is also affected by technology. We download mobile apps (e.g., flashcards) to our smartphones and study for exams as we ride the train to work. We also download mobile apps for easy access to program materials at our annual or spring meetings or symposia. We access SOA pre-qualification and professional development online courses using tablets or computers. The SOA's candidates take required associateship and fellowship courses online anywhere an Internet connection is available, submitting their responses electronically.

HOW DOES THE SOA USE TECHNOLOGY IN E-LEARNING?

In 2011, the SOA introduced podcasts as a way for section members to share knowledge in their areas of expertise. Using video to demonstrate competencies such as communication and relationship management was introduced in "Straight Talk: Effectively Communicating with a Non-Technical Audience," a professional development e-Course launched in 2012. Embedded audio files coach candidates in the Fundamentals of Actuarial Practice (FAP) course, the FSA modules and the Decision Making and Communication (DMAC) e-Learning module.

The SOA provides synchronous (real-time) learning to members through webcasts and virtual sessions.

The SOA provides synchronous (real-time) learning to members through webcasts and virtual sessions. In webcasts, speakers with expertise share their knowledge with other members through a live audio feed. Attendees can submit questions through the webcast software and receive immediate answers. Members unable to attend our annual or spring meetings or symposia in person have the option to register and attend up to four sessions virtually. For example, 58 members signed up to attend the "Trend—Future Drivers and Bending the Costs" virtual session at the 2012 Annual Meeting. Members can attend both types of webcasts and virtual sessions via tablets or personal computers. Even if a session you are interested in is not available virtually, recordings of all sessions are available for purchase online.

ADAPTING TECHNOLOGY TO LEARNING STYLES

Individuals have preferred learning styles—visual, audio and kinesthetic are common examples. Visual learners need to see what they are learning; auditory learners need to hear what they are learning; and kinesthetic learners need to move around while learning. The SOA accommodates visual learners by using graphics and video in our courses. We provide podcasts and audiocasts to accommodate learners with visual and auditory preferences for learning. Tablets are one way to reach kinesthetic learners.

John I. Mange

Sherri Blyth

You may have heard or read about how technology extends the reach of social learning from one physical location to geographically diverse locations. As a student you participated in social learning when you learned from both your peers and a teacher in the classroom. In higher learning you may have worked on group projects. Social learning makes use of collaboration. The SOA's e-Learning discussion forums make collaborating between peers from different locations easier than ever before. As online learning becomes more prevalent among universities and professional organizations, the learner inevitably becomes more isolated. By facilitating a connection among learners through the use of these social interaction tools, exploratory learning occurs. A sense of community begins to evolve. Learners are able to more easily express themselves. Peer review introduces new concepts and new ideas. Resources are shared. The value and power of social learning should not be underestimated.

BACK TO BASICS

As technology continues to evolve, learning and development practitioners must take care to ensure that the theories underpinning how people learn are not ignored. (To learn more about learning theory go to *http://www.learning-theories.com*.)

In addition to learning theory, there are taxonomies for educational objectives that are considered when courses and exam questions are developed. The SOA uses a taxonomy developed by Robert Marzano when creating learning objectives and exam questions in the SOA's examination system. The taxonomy consists of three systems and the knowledge domain. These are critical for thinking and learning. Below is a graphic of Marzano's taxonomy.

The SOA prequalification and professional development courses and online courses illustrate how the SOA uses these taxonomies when designing and developing courses and online modules for members and

The Three Systems and Knowledge[1]

SELF-SYSTEM		
Beliefs About the Importance of Knowledge	Beliefs about Efficacy	Emotions Associated with Knowledge

METACOGNITIVE SYSTEM			
Specifying Learning Goals	Monitoring the Execution of Knowledge	Monitoring Clarity	Monitoring Accuracy

COGNITIVE SYSTEM			
KNOWLEDGE RETRIEVAL	**COMPREHENSION**	**ANALYSIS**	**KNOWLEDGE UTILIZATION**
Recall Execution	Synthesis Representation	Matching Classifying Error Analysis Generalizing Specifying	Decision Making Problem Solving Experimental Inquiry Investigation

KNOWLEDGE DOMAIN		
Information	Mental Procedures	Physical Procedures

candidates. For example, online courses use quiz questions to meet the "retrieval" level of Marzano's taxonomy. The use of thought questions encourages learners to understand and apply the concepts being taught. Case studies and end-of-module exercises and assessments submitted for formal grading use the analysis and knowledge utilization levels of Marzano's taxonomy.

TECHNOLOGY AND LEARNING

As we move forward, the SOA will continue monitoring emerging technologies to determine if they will enhance the educational experience of our members and candidates. It is critical that technology enhance the learning experience rather than become the learning experience. The SOA is exploring how to help candidates learn complex concepts and models by using technology that enables experts to illustrate concepts on a whiteboard and explain what they are illustrating. For example, the SOA is looking at ways to simulate building modeling spreadsheets while an expert explains what is being done with the new FSA Quantitative Financial Investments (QFI) course currently under development. This could be something similar to what is being done at Khan Academy. (To learn more about the Khan Academy visit *www.khanacademy.org*.)

With the technologies described above, the SOA will continue creating learning experiences that incorporate learning theory, learning styles and Marzano's taxonomy. In the near future, we expect to launch a tool that candidates may elect to use to help them find one another and collaborate, where appropriate. Candidates will be able to reach out to members to ask questions. In early 2013, members will have new opportunities to participate in learning communities and create their own learning plans. Watch for more news about how you can take advantage of these exciting developments. As you can see, technology is truly enhancing how the SOA provides learning opportunities for candidates and members. A

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ENDNOTES

1 *ftp://download.intel.com/education/Common/in/Resources/DEP/skills/Marzano.pdf.*

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ACTUARIES ON THEIR OWN TIME

For a little more than a decade, **CAROLE VINCENT** has been practicing yoga. What started out of curiosity grew to becoming a yoga instructor. "I am a certified teacher of Yin yoga and Kundalini yoga. I practice both obviously, but I also do yoga Nidra (a yogic sleep) on a daily basis. I also occasionally go to a Hatha, or restorative, yoga class. I've tried many kinds and I encourage my students to try at least a few types because they achieve different things physically and mentally. The one that speaks the most to me is Kundalini yoga because it combines postures, breathing exercises and meditation in one class, sometimes even in one exercise. When stress becomes the obvious challenge, I do more yoga Nidra. Yoga is a very good stress management tool," Vincent says.

Vincent describes the personal benefits of yoga by saying, "it brought in a new me. ..."

When asked for how many years she's been practicing yoga, Vincent says, "I do not recall exactly (the actuary in me would like to be precise). I attended my first class in 2001, I think. I tried it out of curiosity. A teacher was coming to our office on a weekly basis to offer classes after work. I felt so relaxed after the first class, I instantly was addicted. I practiced as often as possible until 2005. I stopped writing actuarial exams then because I kept failing the same exam and got discouraged, I guess. I found myself with a lot of free time and started to attend more yoga classes, and therefore practicing with different teachers. Because I struggled with knee problems all my life and am limited in some postures, I always had to tell the teacher about the condition and soon realized I was repeating my life story too often. My tendency to do things efficiently surfaced and I thought that I could take the teacher training class and use the knowledge for my own good as I would at least be able to adjust the postures on my own without telling my life story to the teacher. My intention was not to teach, but simply to not have to tell my story each time."

Vincent describes the personal benefits of yoga by saying, "it brought in a new me. It benefits me on many levels. When I started, I was doing Hatha yoga which is solely about postures. I therefore felt a lot of physical benefits; I had more strength, I became a lot more flexible and strangely felt taller. When I started to practice daily, I was doing Kundalini yoga which has a lot of mediation and breathing exercises. They contribute to increase focus and I felt a lot calmer and sharper. I learned a lot about my own limits and how to respect them. This is as good as seeing a psychologist and a lot cheaper. I became more aware of my own behavior, and after that, more aware of the behavior of my family, friends and co-workers. It has an effect on the brain somehow—I am convinced of this because I changed habits gradually and without effort. I was eating better and even completely stopped coffee and alcohol for about six months. I felt more creative too. I think the main benefit though was during a time where I suffered from depression and I think it proved to be a very good stress management tool."

What is Vincent's favorite aspect of the practice of yoga? "When you say 'aspect' I think of the eight aspects of yoga (i.e., postures, breathing, meditation, etc.), but I think you probably mean how it affects one's life. I guess my answer will be somewhat in the middle. What I love about yoga is the challenge it presents. For one thing, the challenge changes constantly. For example, when I started practicing, the challenge was about balance, strength, flexibility, etc. These days, the challenge is to quiet my mind. Then there are many aspects of yoga that are related to one's view on things like 'do no harm.' The challenge is to know to what extent this should be applied. For example, is killing a bug that got into your ear and is causing infection going against this yoga principle of doing no harm?"

When asked if yoga creates a body, mind, and spirit connection, Vincent states, "the practice of yoga is a discipline dedicated to creating union between the body, mind and spirit. It would be odd to have a yoga instructor that does not see that.

Carole Vincent—practicing yoga.

"You do not need to believe in this, it happens automatically. Though, I feel the need to be an actuary here and define 'spirit.' I define spirit as a mood (not a soul or a supernatural being).

"'A healthy mind in a healthy body' is another way to see it. If you are healthy (mind and body), your spirit or state of mind or mood will be in good shape. I think it is not just yoga that can bring this state, but it does contribute because yoga works the body and mind simultaneously. An example would be to hold a posture for five minutes. During that time, you work physically but you will likely work your mind even harder to stay in the pose. It works both aspects simultaneously. Then when you are done, you are automatically happy you did it, or at least tried, and your mood (spirit) is improved. All my students smile after doing something like that."

What does Vincent like about teaching yoga and meditation? "I currently teach only a few private classes. It is not quite the same as teaching a group. What I like about teaching Kundalini yoga to a group is that there are always a few new students. The classes are always about the same thing, i.e., postures, relaxation and then meditation. Meditation is usually short and I love teaching this. While I am enthusiastic about that part, I can see that most first-time students are not happy. I am not sure why, but their body language is clearly saying 'why is it difficult for me to just lie here in corpse pose for five minutes?' Most of them struggle their way through it, and all of them are amazed in the end. I guess people are scared to sit still for five minutes and 'do nothing.' Eventually they realize they are actually doing something and that it is difficult and rewarding, and it's a better transition back to real life than just coming out of relaxation. I like to see them come to their own conclusions."

Vincent sees an actuarial tie-in to practicing yoga in that she "sees a similarity for students because both require discipline. Studying for actuarial exams is somewhat of a lifestyle too. When I decided to go back and finish my exams, I was able to better focus, organize my work/studying schedule and calm myself down while reading the question during exams. Yoga helped me understand how my mind works in stressful situations and gave me tools I could use to manage it.

"I see benefits for those stressed by their job or anxious about specific issues at work or their personal lives. There is a fair amount of research done on that topic and it is an efficient stress management tool.

"The most obvious point to me, however, is the multiple aspects. The actuarial field has many aspects, like yoga. For example, actuaries have to consider all kinds of assumptions, whatever actuarial track you are working in. It has a structure, things you need to consider, ranging from ethics to basic math logic. Yoga practitioners also consider many aspects. Most people think postures, which I compare to the basic math logic, but there are many other aspects like compassion for all living things ('doing no harm') which I compare to the ethics of the profession in a way.

"The 'control of the senses' could be compared to the ability of an actuary to disconnect from his work. For example, if you build a model, you cannot feel attached to it because you will never improve it and it will never get to be a sharp tool. Any actuary, whatever they do, has to be able to draw back or retreat from his work to assess it. If you disconnect from your senses, you get the same thing. If you are not attached to the sensorial distractions you are experiencing, you feel some kind of peace of mind. A simple exercise is to go to a bakery when you are hungry or coffee shop when crave a coffee and then go on a day when you are not. You will experience something different. You will not feel the pressure to buy or taste something on those days because your senses will no longer depend on the stimulant. You will feel calmer and a peace of mind on the day where you are not hungry or do not need that coffee.

"The different aspects of yoga form the framework for a yoga practice as do the different competencies or skills of an actuary." A

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FOR MORE OUT OF THE OFFICE,
TURN TO PAGE 38

FRANK WALKER has been involved in water activities since he was child. His interest in canoeing became a love for kayaking by chance. "I had rented canoes over the years and had thought some about buying one. One day while biking, I happened to pass by a city park lake where they were having a kayak demo event. This was my first time to be in a kayak. I tried a sit-on top, and I was hooked. I've since advanced from a nine-foot sit-on top to an 18-foot sit-in kayak," Walker says.

When asked if he has taken any classes or training, Walker states, "I haven't taken any classes or training. I have been involved in water activities since I was a kid so paddling wasn't foreign to me. One can pick up helpful tips from other kayakers or any number of videos on the Internet. I mostly do flatwater kayaking, as opposed to whitewater, so I have decided it's not worth learning how to roll a kayak. If I chose to learn how to roll one, a class would be a good idea."

What does Walker like best about kayaking? "What I liked first was the sense of freedom and power; I was impressed with how easy it was to make the kayak move at a respectable speed. Since then I've realized a myriad benefits that have me going about an average of 2.5 times per week, year 'round. The benefits include: it's a great way to exercise as it provides cardiovascular health and upper body muscle strength (which prior to kayaking, I had none); I weigh at my desired level (One can burn up to 400 calories per hour depending on how fast one paddles. I usually paddle pretty hard.); it's a great way to clear your head of stress; I've seen beautiful nature scenes, from incredible sunsets on the water to a wide variety of wildlife, many of which I've taken pictures of. Besides all that, it's fun."

When asked if he makes special trips for photographs, Walker says, "Many of the photographs I take are just ones of scenes I happen along while kayaking. I don't usually take special trips solely to take pictures, but I do enjoy and select scenic places to kayak. Being able to take pictures of what I see is just icing on the cake."

Frank Walker—on one of his kayaking trips.

What is his most memorable trip? "There have been numerous memorable trips, either due to the beautiful scenery or wildlife or the particular adventures of the trip, but probably the most memorable was competing in (and completing!) a 42.5 mile race down the Mississippi River. In my race category, defined only by length of kayak, I finished third out of 19. That was quite a confidence booster. I thought that was pretty good for me, being 53 years old at that time. Interestingly, my family wasn't there at the finish line. I didn't want them to worry about me so I told them I thought it would take me about six hours to finish. It only took me 5.5 hours (which was certainly long enough), and they were still up in the motel room watching TV."

When asked if he's ever had any mishaps while kayaking, Walker says, "On flatwater kayaking, which is mostly what I do, the most common mishap is that I underestimate the distance I'm kayaking and therefore underestimate my arrival time (sometimes significantly), which causes family members to worry. "On whitewater kayaking or canoeing, wiping out or getting tumped is not an uncommon event, to which I can attest. One may not get tumped, but one should certainly be prepared for the contingency of such an event. It usually makes the trip memorable."

Walker sees an actuarial tie-in to kayaking. "It's more so for whitewater kayaking, but even for flatwater kayaking, there are certainly aspects of risk analysis and risk management. One has to know his capabilities in handling wind, waves, rapids, river obstacles such as trees, boulders, or small waterfalls. For kayak races, whether they be six or 22 or 42 miles long, one needs to set an appropriate pace so that he's got something 'reserved' for the end of the race, which I haven't mastered yet. Like actuaries, serious kayakers are disciplined and always seeking to improve their skills and make use of the best tools available." A

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THOMAS HULL spends a lot of his free time exploring Alps. Having been born in Colorado and currently living in Zurich, that type of activity seems like a natural fit.

"Living in Zurich, I am already in—or at least on the edge of—the Alps, the mountain range that gave rise to the term 'alpine' for high mountain environments," Hull says. "The Alps were formed by the collision of the African and Eurasian tectonic plates. This has given the Alps an immensely complex geology, and as the son and grandson of geologists, I find this quite interesting. Added to that, the Alps are shaped primarily by glaciers, giving rise to numerous narrow steep-walled u-shaped valleys, spectacular waterfalls, and sharp peaks and ridges. The Alps stretch from Slovenia and Austria in the east over Italy, Liechtenstein, Switzerland, Germany, and France to Monaco. My exploration of the Alps involves mostly hiking and skiing, but also visiting the many different towns and villages. Because of the difficulty of getting from one valley to the next throughout history, there are often surprising differences in language, architecture and culture in locations that are quite close together—as the crow flies.

Part of Hull's outdoor activities involve volunteering to maintain natural habitats. Here is what Hull says about it. "In the United States I have done some trail building and revegetation in mountain and urban environments. In Switzerland I have so far participated mostly in maintenance of historic landscapes.

"In the Canton of Zurich there is a landscape that is actually not 'original,' but one that was created in years before industrialization and then the modern service economy. This landscape involved creating channels for groundwater in boggy areas to allow farming. Over a couple of centuries, a habitat grew up that supported migrating birds, amphibians, certain plants, etc. With new farming techniques and more urbanization, these habitats aren't maintained as much, and there are groups that are involved in maintaining them. As an American from a country where people have lived in great numbers only in the last couple of hundred years, it seems very strange to 'restore' something to other than what might have existed before significant human habitation. Upon reflection, though, I realized two things. First, humans have lived here for thousands of years, with Neolithic finds confirming the great length of habitation. Second, Native Americans also had an impact on their environment, so it is hard to define what is meant by an 'original' state. So ultimately, providing migrating birds, amphibians, and certain plants a habitat seems worthwhile!"

Thomas Hull—enjoying the great outdoors.

When asked if he sees an actuarial tie-in to his pastime, Hull states, "This is an interesting question, because I view my pastime as a way to get away from the corporate world and recharge my batteries. But as an actuary I am trained in certain ways of thinking and evaluating the world. My answer risks being perceived as a political statement, but it comes from my training as a scientist who works with data and attempts to draw conclusions about possible futures. Over a lifetime spent in the wilderness, I have witnessed firsthand the impact of a changing climate in receding glaciers particularly. Most other changes are harder to see firsthand, because they involve changes in trends with significant noise along the way. The environment is a complex system with many variables affecting changes—indeed, the earth's climate has varied greatly over the millennia. But looking at the timing of change and the correlation to human activity, I don't think a data scientist can honestly deny we are having an impact. The piece that most interests me is that with such a complex system we don't really know what the outcomes will be, and I'd like to see more of the debate focused on risk assessment—mitigation and management. We can't roll back all of the change at any cost, so what do we do? Reinsurers in particular focus a great deal of energy on this, but it has enormous social implications beyond our industry of course." A

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Section Highlights

HEALTH SECTION

BY KRISTI BOHN

With help from the SOA staff, the Health Section Council analyzed demographic characteristics of its members in conjunction with our member retention and recruitment experience. Using the standard section membership reports along with de-identified SOA membership data made available to us, we found that, while the Health Section has had the highest membership retention rate, 36 percent of SOA members who specify health as their primary area of practice are not members of the Health Section.

A more detailed review of the health practitioners who are not Health Section members revealed these 1,500+ actuaries tended to:

- Be younger than age 35 or older than age 64,
- Work outside the United States,
- Be ASAs, as opposed to FSAs,
- Have less actuarial experience (< five years)
- Be employed in the categories of: banking/investments, other government, unaffiliated or are retired.

These attributes did not surprise us, and several of them are correlated to one other. Drilling down further into the sub-category of those working outside the United States, we found that a large percentage (76 percent) of Canadian health actuaries may not perceive significant value in the Health Section, as their rate of non-participation is more than twice the average.

Fortuitously, Joe De Dominicis recently joined the SOA as staff fellow—Canadian Membership. Joe partnered with the Health Section to create the role of "Canadian Membership Liaison" to the Health Section Council and recruited Maureen Premdas to fill this position. Maureen is working with the council to incorporate the Canadian perspective into the section's activities and identify gaps in Canadian content that could be addressed by the Health Section. Positive results of this collaboration have already been realized, as a series of webcasts have begun that are designed specifically to be of interest to both U.S. and Canadian health actuaries. We are looking for Canadian actuaries to assist with these efforts, so please let Maureen know if you would like to participate. A

Kristi Bohn, FSA, EA, MAAA, is a consulting actuary and chairperson of the Health Section. She can be contacted at *kbohn@soa.org.*

MANAGEMENT AND PERSONAL DEVELOPMENT SECTION

BY JENNIFER FLECK

Actuaries often are labeled as people with strong technical skills, but weak in leadership ability. Have you ever known an actuary who was promoted to management because he or she was very successful as an individual contributor, but then failed at being a successful manager? We don't want you to be that actuary. The Management and Personal Development (MPD) Section is to here to join you on your path to becoming a leader.

One way that we do this is through sessions at SOA meetings. The MPD Section participated in the annual meeting this past October in a number of fun and informative ways. We started with some fun. A number of us went on a "haunted scavenger hunt" of Washington, D.C. It was a beautiful night to see some historic sites and make connections with other like-minded actuaries.

Next we had a session on Critical Influencing Skills for Advancing Professionals. This was a lively discussion about how to influence those around you and why this is important. All leadership is, really, is influencing. Watch *The Stepping Stone*, our section newsletter, for a summary of this session.

Mary Davis Holt, one of the authors of *Break Your Own Rules*, joined us for our annual women's leadership breakfast. We learned about the five self-imposed rules women have that prevent us from getting to the top, and five new rules to replace them. The workplace is about 50 percent women now, but still only 4 percent of Fortune 500 companies are run by women, and only 17 percent are in the executive ranks. This isn't about man-bashing, but about making sure women are not sabotaging themselves.

We ended the meeting with our annual leadership book review breakfast. *Start With Why* and *The Charisma Myth* were both discussed. These both seem like great books to add to your leadership reading list. If you enjoy reading leadership books, be sure to follow our book reviews in *The Stepping Stone* newsletter. Many of our members write reviews for us. It's always nice to have an actuary's perspective before deciding on a book.

So, if you are a leader, or want to be one someday, check out all the great events and publications that the MPD Section sponsors throughout the year. Or better yet, volunteer to help create these resources. It's a safe place to practice those leadership and interpersonal skills as you learn. A

Jennifer Fleck, FSA, MAAA, is AVP, large case actuary with Unum and is vice chair of the Management and Personal Development Section. She can be contacted at *jfleck@unum.com.*

REINSURANCE SECTION

BY P. SCOTT MEISE

The Reinsurance Section's primary goals for the year ahead are to (1) increase our membership, and (2) increase our perceived value to our members. We know that our members have interests that cut across and are shared with numerous other sections, and thus we often share research projects and funding. Some of the areas where the Reinsurance Section offers unique value are networking, focused research, and contributing back to the reinsurance industry (although if you feel there are things in those areas where we could be doing something else, please get in touch!). When I joined the section two years ago, one of the things I found was that there was already an experienced group in place carrying on some good functions: research, continuing education, webcasts, the newsletter, membership focus, and LEARN (a Reinsurance Section group that gives presentations to state insurance departments to help foster a greater understanding of reinsurance and its value). However, we always need new volunteers to keep the good work going.

So, some of the things we're going to focus on over the next year are:

- **More:** Continue to do the things above that we feel have been going well for some time and expand on them where we can. One research project in progress is an in-depth look at treaty terms in the industry from both the ceding and reinsurance companies' perspectives.
- **Spreading the Message:** We believe that reinsurance is integral to the insurance industry, and that the knowledge and awareness of it is important. In addition to spreading the message through LEARN, industry meetings, webcasts, and the like, we will be bringing back the Intro to Reinsurance Bootcamp on May 8, 2013—the day after the Life & Annuity Symposium in Toronto.
- **Customer Focus:** We want to hear from you! Whether you're a part of the section and would like to get involved or see us pursue something we aren't currently pursuing, or if you're thinking about joining but want to make sure you're getting value, get in contact with us!

My hope is that those in the Reinsurance Section feel that our work adds to the reinsurance industry and insurance as a whole, and the section provides them opportunities they otherwise wouldn't have. A

P. Scott Meise, FSA, MAAA, is vice president and actuary with RGA Reinsurance Co., and 2012 chairperson of the Reinsurance Section. He can be contacted at *smeise@rgare.com.*

A Look Into ERM

WHAT SHOULD YOU DO AT A YELLOW LIGHT?

BY DAVID INGRAM

AN AUDI ADVERTISEMENT STATES:

> "The yellow light was invented in 1920. Almost 100 years later, 85% of drivers have no idea what to do when they see one."

The level of risk in the real world is changing all of the time. Everyone anywhere near a hurricane zone knows the annual season for those storms. They make sure that they are prepared during that season and don't worry so much in the off season. Most risks do not have clear regular seasons, like hurricanes. (And, in fact, hurricanes are not really completely bound by those rules either.)

A good risk management program needs to have a system that looks for the conditions that mean that it is hurricane season for each of the major risks. And it needs to have plans for what needs to be done in each part of the firm when they "proceed with caution." The managers of each of the affected areas need to know those plans and their own roles. There needs to be a big yellow light that flashes somewhere. And then the managers need to act; they need to execute the plans to proceed with caution. Too many companies try to create a risk mitigation program that will work in all seasons. It is thought to be a sign of good discipline to practice full mitigation all of the time. That makes as much sense as walking down the street everyday with your umbrella open over your head. If you really understand your risks, then you can develop a good system for turning on the yellow light when things are trending riskier and thereby triggering enhanced risk mitigation actions.

The same thinking applies when a yellow light is triggered by company actions. Most firms have risk limits. Some of those risk limits are soft limits. That means that the limit itself is a yellow light. Hitting the limit in these firms means that you must proceed with caution.

More commonly, the limits are hard—either red lights, cement barriers or brick walls. A red light risk limit means that when you get to the limit, you must stop and wait for someone to tell you that you can proceed. A cement barrier risk limit means that you are prohibited from proceeding when you hit that limit. A brick wall risk limit means that if you hit the limit, you are likely to be fired.

In most cases, companies do not use these terms, nor do they necessarily understand that they have choices other than the one that they have made. But, if you talk to enough insurers, you will hear of examples of each. The companies that have red lights will often hold a meeting to discuss what to do about the breach that has already happened. They will choose whether to insist upon actions that negate the breach immediately or over time. They are very serious about the limits, but realistic that business involves many decisions and that operating at maximum efficiency means operating close to the limits, making breaches a regrettable possibility.

The firms with the cement barrier risk limits do not want to talk about breaches. They want to set up systems to prevent the breaches without intervention. The limits will be programmed into their systems and written into their agreements with their

intermediaries. Usually the firms with cement barrier limits are not seeking to maximize the utilization of their resources, they expect to operate a comfortable distance from the limits. They are protecting against an occasional mistake or rogue operator.

The brick wall firms, on the other hand, are aggressive and have a very performance-oriented culture. But, they are also very serious about avoiding excess losses and expect their limit systems to be their main protection against that eventuality. In these performance cultures, rewards for success are high. Subtle signals are commonly ignored. Credibility for the limits and for risk management in general demands an occasional sacrificial ram.

In these three sorts of control systems, there are often informal yellow lights and occasionally formal caution signals. All firms that use hard limits should create a formal yellow light system with a process that identifies an official caution point along with suggestions or rules or plans of how to proceed when the yellow light goes on.

On the roads, yellow lights cause problems because there are really three different understandings. One group believes that it means, "Speed up to avoid the red light," while another group thinks it means, "Stop now and avoid having to make an emergency stop when the red light comes on."

David Ingram

The third group knows that what the yellow light really means is "**watch out for the other two groups.**" A

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2012 ANNUAL MEETING RECAP

THE SOA'S 2012 ANNUAL MEETING was well received and attended once again this year. Highlights of the meeting include: the induction of the 64th president of the Society of Actuaries; announcement of the Distinguished Volunteer Service Award recipients; a keynote speech on the power of introverts from Susan Cain, a *New York Times* bestselling author; a speech from writer, author and past Olympian Matthew Syed on the science of success; and outgoing and incoming presidential speeches from Bradley M. Smith and Tonya B. Manning.

There were more than 1,800 attendees at the meeting who had the opportunity to attend more than 100 seminars and educational sessions and earn up to 18.30 professional development credits. Also, the networking opportunities at this year's annual meeting were second to none.

In his outgoing presidential address, Smith focused on the importance of effective communication and societal problems with actuarial implications. He then turned his attention to consolidation, the election process and other experiences he had during the last year. An in-depth discussion on the general insurance track followed. Smith concluded his remarks by extending a sincere thank you to the people who made things happen for our organization. To read the whole speech, visit *http://www.soa.org/About/History/about-2012-smith-gen-speech.aspx*.

In her incoming presidential address, Manning discussed the five areas in which the SOA is working to bring the actuarial profession to the next level. Those areas are: 1) strengthening relationships with candidates; 2) creating new opportunities for actuaries; 3) professional development; 4) research; and 5) becoming a global actuarial organization. A condensed version of Manning's speech can be found on page 12 of this issue. To read the whole speech, visit *http://www.soa.org/About/History/about-2012-manning-presidential-address.aspx*.

Cain, this year's keynote speaker, centered her speech on her *New York Times* bestselling book *QUIET: The Power of Introverts in A World That Can't Stop Talking*. Cain, a self-described introvert, shared her story of success as an introvert and introduced attendees to other successful introverts—such as Albert Einstein and Warren Buffett. After presenting attendees with six true/false questions to determine if they are introverts, Cain offered invaluable advice on everything from how to better negotiate differences in introvert-extrovert relationships to when it makes sense to be a "pretend extrovert" to how introverts perform better in quieter, less stimulating environments. Cain went on to explain how everyone needs to cultivate solitude, even extroverts, because from solitude comes creativity.

The attendees of this year's annual meeting were treated to a plethora of invaluable information. If you were unable to attend this year's annual meeting, make sure you get your plans in place now for next year's annual meeting, which will be held Oct. 20–23, 2013 in San Diego, so you don't miss another wonderful opportunity to grow professionally. A

— SOA Executive Director Greg Heidrich

THE ACTUARIAL PROFESSION IN THE NEWS

The SOA is focused on raising awareness of actuaries in the media. Recent efforts have been successful. Here are just a few examples:

Tame The Threat Of Inflation In Retirement

SOA survey data is referenced in CNN's *Money* magazine. To read the article, visit *http://money.cnn.com*, search term Society of Actuaries, or use the QR code.

Risk Ratings Help Set Life Insurance Rates

Member Al Klein discusses life insurance rating with Bankrate.com. For more information, visit *www.bankrate.com*, search term Al Klein, or use the QR code.

SOA Study: Most Retirees More Concerned Than Five Years Ago About Retirement Finances

LifeHealthPro reports key research findings from "Impact of the Economy on Individual Retirement Risks." For the whole story, visit *www.lifehealthpro.com*, search term, SOA study, or use the QR code.

Stop Selling Wrong Retirement Products

MarketWatch quotes Anna Rappaport and Joe Tomlinson discussing retirement products. To read more, visit *www.marketwatch.com*, search term Anna Rappaport, or use the QR code.

Keeping Healthy At The Office

Member Jennifer Gillespie is quoted about workforce health. To read the article, visit *www.minnesotabusiness.com*, search term Jennifer Gillespie, or use the QR code.

Saving Money With Smart Open Enrollment Changes

Associated Press quotes actuary Ian Duncan discussing open enrollment-related issues. For the whole article, visit *www.boston.com*, search term Ian Duncan, or use the QR code.

View all of these articles by going to *www.soa.org/newsroom* and clicking on the Profession In The News link. A

ATTENTION READERS!

If you have an idea for an article you think should appear in *The Actuary,* or a response to something you have read in these pages, tell us about it by sending an email to *theactuary@soa.org*.

PROFESSIONAL DEVELOPMENT OPPORTUNITIES

REFOCUS 2013: SEE THE FUTURE FIRST
March 3 – 6
Las Vegas, Nev.

THE LIFE INSURANCE CONFERENCE
April 15 – 17
New Orleans, La.

THE RETIREMENT INDUSTRY CONFERENCE
April 17 – 19
New Orleans, La.

ENTERPRISE RISK MANAGEMENT SYMPOSIUM
April 22 – 24
Chicago, Ill.

LIFE & ANNUITY SYMPOSIUM
May 6 – 7
Toronto

HEALTH MEETING
June 10 – 12
Baltimore, Md.

48TH ACTUARIAL RESEARCH CONFERENCE (ARC)
Aug. 1 – 3
Philadelphia, Pa.

CRITICAL ILLNESS INSURANCE FORUM
Sept. 16 – 18
Ft. Lauderdale, Fla.

DI & LTC INSURERS' FORUM
Sept. 18 – 20
Ft. Lauderdale, Fla.

View all professional development opportunities by visiting *www.soa.org* and clicking on Event Calendar.

Recommended Readings

Even if you missed the 2012 Annual Meeting, you can still learn from the speakers Matthew Syed and Susan Cain.

From Sue Sames

Matthew Syed, an unassuming award-winning journalist and former U.K. Olympian, wrote *Bounce: Mozart, Federer, Picasso, Beckham, and the Science of Success* to debunk the "Talent Myth," the idea that success depends on having been born with talent. Syed's analysis shows that success is a matter of hard work and thousands of hours of disciplined practice, rather than lucky genes. He has many examples from sports, art and music. For more information on Syed's book, visit ***http://bit.ly/UyABx5*** or use the QR code.

From Sue Sames

Susan Cain, the author of *QUIET: The Power of Introverts in a World that Can't Stop Talking*, maintains that we all miss out when introverts are undervalued. Although introverts are approximately one-third of the general population, Cain's informal show-of-hands audience poll showed that actuaries are overwhelmingly introverted. Taking temperament (introversion/extroversion) into account can ease communication. There's even a chapter titled, "Beyond Temperament: The Role of Free Will (and the Secret of Public Speaking for Introverts)." The author, a self-described introvert, worked extensively for more than a year to become a public speaker, proving out Syed's thesis, namely that hard work is what makes a difference. For more information on Cain's book, visit ***www.thepowerofintroverts.com*** or use the QR code.

If you are looking for ways to find quiet in a noisy digital world, you can find good ideas in *Hamlet's BlackBerry: Building a Good Life in the Digital Age,* by William Powers. For more information on Powers' book, visit www.williampowers.com or use the QR code.

E-COURSES

Enterprise Risk Management

This e-course is designed to provide information to actuaries who do not yet regularly practice in enterprise risk management (ERM), but want to know more about it to help expand existing skills or meet professional development requirements.

Financial Reporting

The e-course is designed to introduce you to the basic concepts and terminology necessary to understand financial statements and regulatory capital requirements. While applications and examples are taken from the insurance industry, much of the content is not industry-specific. In addition, while the focus is on Canada and the United States, an important part of the environment in these jurisdictions is the effort to align with international standards.

Investment Strategy

The e-course is designed to provide you with an understanding of the investment theories used to implement the investment process. Throughout this e-course, you will be exposed to case studies from real experiences that illustrate the range of considerations in managing investment portfolios supporting particular liabilities and goals. After completing this module, you should be able to define, design, monitor and modify an overall investment strategy given a client's objectives and constraints. You should also be able to communicate results to the client.

Operational Risk

This e-course is intended to help you learn how to identify, measure and manage operational risk.

For more information on these and more e-courses, visit www.soa.org *and click on e-courses under the Professional Development tab.*

Enterprise Risk Management

ERM

Symposium

Where Cutting Edge Theory Meets State of the Art Practice

More than 400 executives, directors, and risk management experts gathered at the 2012 Enterprise Risk Management (ERM) Symposium in Washington, DC, to present the latest on ERM thinking and practices. Make sure you don't miss the next opportunity—our 2013 ERM Symposium—to learn from industry leaders about this emerging discipline and expand your ERM skills.

Highlights include:

- Top risk management experts offering their perspective on key risk issues
- Pre-Symposium seminars on ERM topics
- Networking opportunities to renew and expand your list of ERM contacts
- Exhibitors demonstrating their ERM services and knowledge
- Call for papers program showcasing new research

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Presented by the Casualty Actuarial Society, Canadian Institute of Actuaries, Professional Risk Managers' International Association and Society of Actuaries

Asociación Mexicana de Actuarios, A.C.

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ERM-II

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