



SOCIETY OF  
ACTUARIES

ACTUARY OF THE  
FUTURE SECTION

# Actuary of the Future

ISSUE 42 • MAY 2018

## The Dawn of the Machine- to-Machine Age and Its Implications for Insurance

By Syed Danish Ali

Page 16



- 3 Chairperson's Corner**  
*By Emily Hsu*
- 4 Letter From the Editor**  
*By Xiaochuan (Mark) Li*
- 6 Self-Studying for Actuarial Exams**  
*By Mitchell Tamashunas*
- 8 Graduating as an ASA**  
*By John Miller*
- 10 The Young ASA: Why Being Overqualified is Subjective**  
*By Tim van Laarhoven*
- 12 A Different Pathway to Become an Actuary: Interview With Jacob Pratt**  
*By Minyu Cao*
- 14 What Does Data Science Mean for the Future of Actuarial Science?**  
*By Dustin Verzal*
- 16 The Dawn of the Machine-to-Machine Age and Its Implications for Insurance**  
*By Syed Danish Ali*
- 21 A Change Will Do You Good**  
*By Mitchell Stephenson*
- 24 The 52nd Actuarial Research Conference (ARC) and an Invitation to ARC 2018**  
*By Daniel Bauer, David Buechner and Bruce Jones*

# Actuary of the Future

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# Chairperson's Corner

By Emily Hsu

**T**he Olympic Winter Games in Pyeongchang made history in many ways—geopolitics, technology, weather, diversity and the many records set by veterans, rising stars and newcomers alike. Nations around the world set aside their differences to cheer for the athletes and witness their journeys to the games.

Days before the 2018 Olympics were set to begin, the Actuary of the Future (AOF) Section Council braved one of Chicago's winter storms and held a daylong meeting at the Society of Actuaries (SOA) main office. The purpose of the meeting was to answer two questions: (1) who are our members and target audience? and (2) how can we be of value to them? Many ideas were discussed, and the council is committed to bringing these ideas to life in the coming months.

Many parallels can be drawn between the Olympics and the actuarial world. Uncertainties abound due to ever-evolving regional and universal legislation. FinTech and InsurTech disrupt the workings of the financial field and beyond. Unpredictable changes in climate, diseases and medical advances continue to occur. Professionals in similar/newer fields with specialized skills in data analytics and forecasting are challenging and expanding the traditional role of actuaries in the marketplace. Global mobility promotes more frequent exchanges of knowledge and expertise. All these are factors that currently (and will continue to) affect actuaries regardless of where they are in their careers.

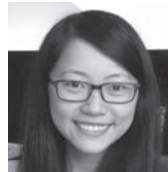
Knowing that risk is opportunity, AOF wants to help actuaries remain relevant and viable throughout their careers. From guiding students and career changers through exams and the job search process, to providing working actuaries with the soft skills and industry know-how to advance their careers, to giving senior managers opportunities to connect with and pass on their experiences to the younger generation, the council has a lot planned. I am excited to be the chairperson of this action-packed year. Luckily, we are not alone on this mission. The AOF will leverage many existing relationships and build new ones with like-minded groups to bring you content that is aligned



with our goal. Keep an eye out for updates on our webpage, look for AOF sessions at various SOA meetings and make sure you have signed up for our emails!

What would you like to see from the AOF? How does our goal resonate with you? If you have any feedback or ideas, or if you would like to volunteer in any capacity, we want to hear from you!

Becoming and being an actuary is not a one-time accomplishment; it is part of a career-long journey with many big moments. Let AOF be your coach on that journey and keep you in medal contention for those big moments. ■



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# Letter From the Editor

By Xiaochuan (Mark) Li

*“To improve is to change; to be perfect is to change often.”*

—Winston Churchill

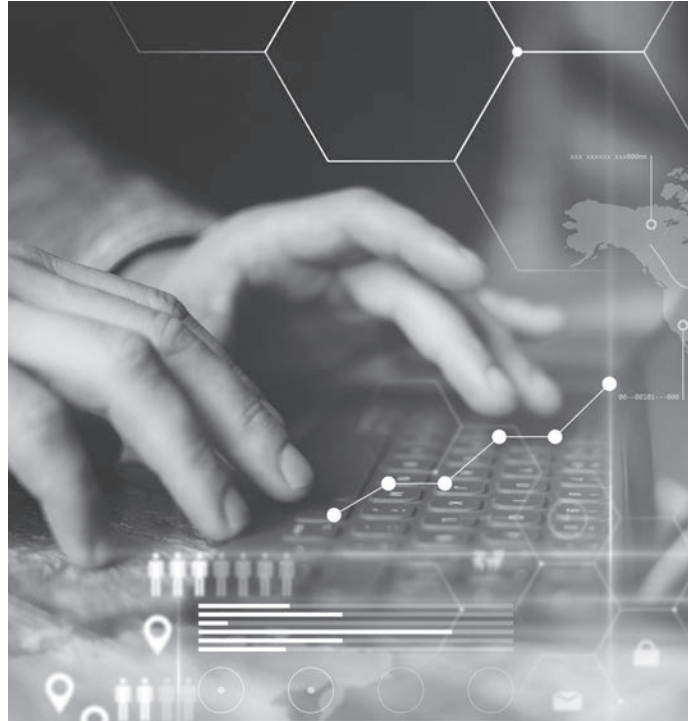
**T**he Actuary of the Future (AOF) Section expects a great many changes this year. Emily Hsu, the section’s chairperson for 2018, convened a face-to-face council meeting earlier this year to discuss the section’s position and future direction. The goal is to bring more value to our members. Various initiatives have been planned for the year, so please stay tuned.

This spring issue of the newsletter contains articles tailored to both new actuaries (effective studying techniques for exams and job search lessons from actuaries with different backgrounds) and more experienced actuaries (new technologies and their disruptive impact on traditional insurance).

Mitchell Tamashunas has contributed an article about his experience in preparing for exams, “Self-Studying for Actuarial Exams.” Although a student at a Center of Actuarial Excellence (CAE), he challenged himself by not taking any specific courses in helping students pass exams to save time for courses in more theoretical subjects that fit his interests. Effectively using the resources available—manuals, textbooks and videos—is the key to his success in passing four curriculum exams during his second year in college.

John Miller is a senior who will graduate with three majors and an Associate of the Society of Actuaries (ASA) designation. How does he account for such great achievements? He describes how being aware of his weaknesses and taking efforts to overcome them, practicing good time management and being receptive to criticism have contributed to his success.

Actuarial students always ask how many exams they have to pass before they can pursue a job. In his article, “The Young ASA: Why Being Overqualified is Subjective,” Tim van Laarhoven explains why people should not worry about this too much; instead, the key is to balance exams, work and knowledge. He gives suggestions on how to land an actuarial job in the very competitive market, including taking more exams, gaining



experience in related fields, improving technical skills, taking advantage of Society of Actuaries (SOA) and college resources, and learning from internship opportunities.

Minyu Cao has interviewed career changer Jacob Pratt, who shares his journey from high school math teacher to actuary. In addition to taking exams, he encourages actuaries to reach out proactively to people and companies in the industry that may provide opportunities. It takes time and determination, but success can only happen after hard work.

Dustin Verzal writes about what data science means for the future of actuarial science. While explaining how actuarial science and data science have evolved over time, he shows how the two can be integrated to solve complex problems in different areas of the insurance business.

Syed Danish Ali gives us an intriguing article on machine-to-machine technologies and their implications for insurance. He discusses what these technologies are, their impact on insurance exposures and the creation of new business models. He expects a new peer-to-peer insurance model with increased efficiency to emerge based on blockchain technology.

With so many fast-paced changes taking place in the industry, Mitchell Stephenson believes that we need to have some principles to guide us in embracing those changes. He is inspired

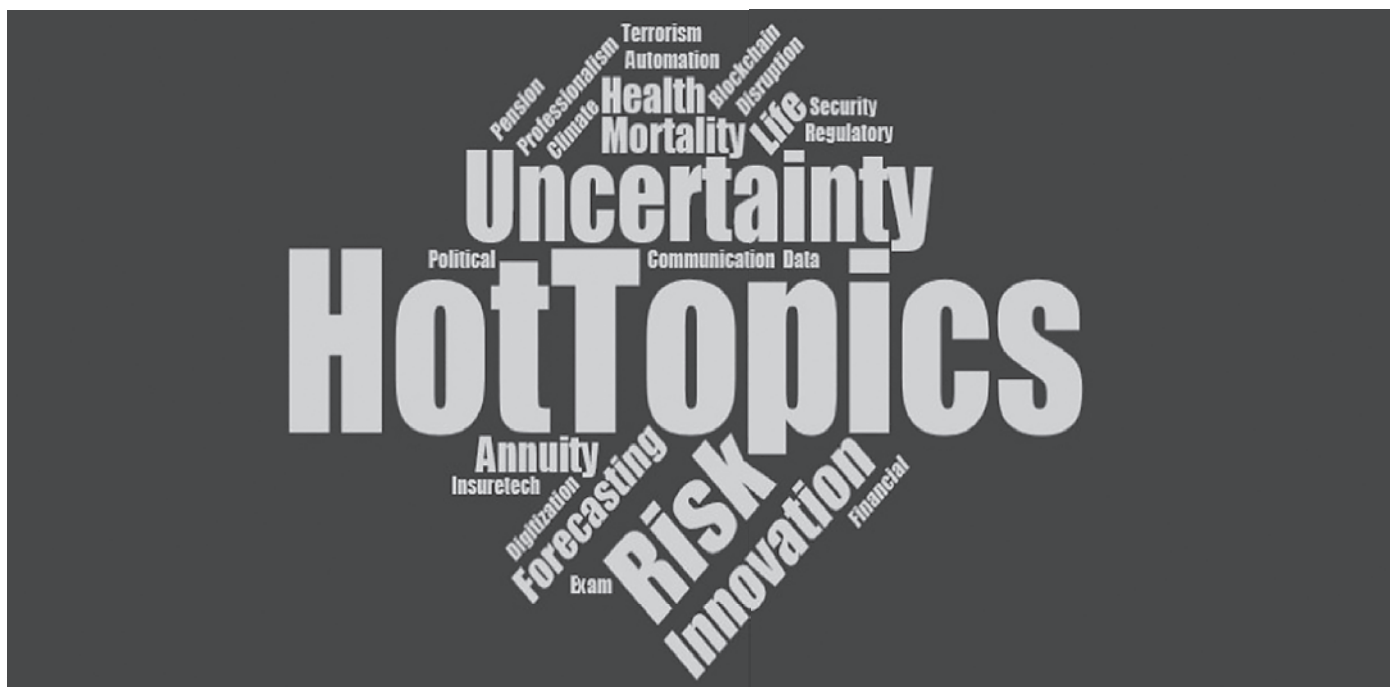
largely by an industry veteran, Jim O'Connor. Being solution-oriented, having a vision and a plan, developing a balanced strategy, and using professional judgment can help actuaries cruise through the changes without being overwhelmed.

Finally, we have an article on the 2017 Actuarial Research Conference (ARC) and an invitation for the 2018 ARC. At this conference, which the AOF is proud to cosponsor, actuarial

scholars, practitioners and educators will discuss the various challenges the field faces. ■



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### AOF Hot Topics

Starting in April 2018, AOF Hot Topics are available in the Actuary of the Future Section on the SOA website at <https://www.soa.org/sections/actuary-of-future/aof-landing/>. AOF Hot Topics will direct you to articles on trending topics, from frequently discussed issues to innovative technologies. We aim to keep you informed with the most up-to-date industry discussions.

### WE WOULD LIKE TO HEAR FROM YOU!

If there are trends you would like us to monitor or topics you want to learn more about, please email us at [aof@soa.org](mailto:aof@soa.org).



**SOCIETY OF  
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# Self-Studying for Actuarial Exams

By Mitchell Tamashunas

If you asked a Fellow of the Society of Actuaries (FSA) what the most difficult part of becoming an actuary was, nine out of 10 would tell you it was taking all the exams. It can be quite a challenging task. Today, many seasoned actuaries argue that it is easier to take exams now than it was 20 years ago because of all the resources available. There is a clear syllabus; there are suggested textbooks, manuals and questions released by the Society of Actuaries (SOA); there are video lessons and actuarial majors; there are even Centers of Actuarial Excellence (CAEs) designated by the SOA to help students pass exams. But that does not make the exams easier. While young actuaries now have many more resources than there were in the past, the exams have also become more difficult. This leaves many wondering: What is the best way to study for exams?

I'm a student at one of the CAEs, where the programs are meant to help students pass exams. Despite this, I haven't taken any of

the classes offered for this purpose. Instead, I have focused on courses that teach concepts not covered on the exams. There are numerous related but relevant disciplines, including accounting, multiple regression, time series, econometrics, economics and large data analysis, to name a few. Despite not being "actuarial" courses, all of these may prove to be critical to actuarial work in some fields. Additionally, while I am only in my second year, I've managed to pass four of the five preliminary actuarial exams—all without the help of any formal coursework! Because of this, and because the majority of candidates do not take exam classes, I want to discuss how to self-study for actuarial exams.

Multiple self-study approaches have been successful for me: manuals, video lessons and the SOA's suggested texts. Let's talk about each of these in turn.

## USING MANUALS

I have found that using manuals to study for exams is similar to using textbooks, except that the former is generally easier to read through because they focus on the topics you will need to know rather than elaborating on abstract points that are not frequently tested. However, after the first few exams, manuals can get rather long. The manuals I used for Exams C/STAM (Construction and Evaluation of Actuarial Models/Short-Term Actuarial Mathematics) and MLC/LTAM (Models for Life Contingencies/Long-Term Actuarial Mathematics) were both more than 1,000 pages long, the latter being just short of 2,000. This can make even the "preliminary" exams seem more than daunting.



If you have found that you learn best through reading textbooks, this may be your best bet for preparing for actuarial exams. It is the method I always go back to if nothing else seems to work. When I was reading these manuals, I focused on a few things to maximize the effectiveness of my study time, which I believe is vital, especially when working full-time. The main thing that I recommend is making sure your study time has no distractions. This means finding a quiet space with no music. If your attention is taken away from studying due to any other activity, you will retain a lot less information. When I was studying for Exam C/STAM, I initially had music playing in the background. I learned very quickly that this was a great way *not* to absorb a lot of the material I was reading.

What have I done with all three of the methods I have mentioned? Practice.

My next most important recommendation when using manuals is to take notes—not just on formulas, but on everything. If you are studying for MLC/LTAM, take notes on what each type of insurance means in words. If you are studying for MFE/IFM (Models for Financial Economics/Investment and Financial Markets), take notes on what each option payoff model looks like using a diagram. If you are studying for C/STAM, take notes on the different theory behind each parametric model. If you are studying for ... you get the point. Notes help a lot. I have found that writing down a concept one time is more effective than reading through a topic three times.

My final piece of advice for using manuals is that practice problems are *very* important. When you come across a line labeled “Example 3.1.6,” it is tempting just to read the solution and move on. However, attempting the problem using the formulas given in that section can help cement the formulas in your mind and help you connect each formula to a related one. This will become exceedingly important for the harder preliminary exams that build on earlier topics or that test multiple topics in one problem.

## USING VIDEO LESSONS

Video lessons are a double-edged sword. They can help you learn concepts much more quickly, but they can also cost more and require more attention. A lot of the advice I gave for when you use manuals can also be applied to video lessons, such as

taking notes on more than just formulas. If you are using video lessons to study for exams, I only have one additional piece of advice: Listen! If the video says to pause and attempt a problem, pause and attempt it. If an example is given at the end of the video, work through it. The people who make these videos have a pretty good idea of what they are saying, as it's their job to know what's on each exam. So, follow their advice.

## USING TEXTBOOKS

The last method that I have found helpful is the suggested textbooks. These can work well for some exams but can be much harder for others. Using textbooks will often be the most cost-effective method by far. Manuals will often cost a few hundred dollars, and video lessons will usually cost almost a thousand. On the other hand, textbooks may cost only \$10 or \$20, depending on the website from which you purchase them.

If you choose to use this option, the best advice I can give is to read the material closely and do plenty of practice problems. If this is the method you decide to go with, I recommend studying the released questions extensively. You can also find multiple companies that offer products that are exclusively composed of review problems. These can be much cheaper than a study manual or video lessons.

Furthermore, I suggest giving yourself more time to prepare for an exam than you would with video lessons or a manual. These textbooks are often packed with a lot of information and often a lot of it is unrelated. This is because these textbooks are not always written for actuaries specifically. It can sometimes be hard to determine what information is important and what isn't. Two good ways to determine this is to check the syllabus and pay attention to the types of questions you get on practice problems.

What have I done with all three of the methods I have mentioned? Practice. No one knows how you learn better than you do. Regardless of how you learn, however, practice is the one key to success that is critical for almost everyone. This may cost nothing if you use the sample questions released by the SOA, or it may cost less than \$150 if you use study material with practice exams or an extensive question bank. ■



Mitchell Tamashunas is currently a sophomore at the University of Iowa majoring in statistics and earning a Risk Management and Insurance certificate. He can be reached at [mitchbtam@gmail.com](mailto:mitchbtam@gmail.com).

# Graduating as an ASA

By John Miller

I don't consider myself to be a particularly great student. Entering college, I recognized that I had serious problems with my work ethic. I was often engaged and interested in my classes in high school, but I struggled to complete even the most basic homework assignments from my math and calculus classes.

While I was somewhat confident in my ability to study math and actuarial science, I was also quite nervous to take Calc III at 8 a.m. in my very first semester as a college student. I told my roommate, Sihan, who was in the class with me, that he would have to help ensure that I would commit to completing my math homework. When I started my first assignment, I remember completing just two problems before experiencing a strong urge to stop and resume later—a symptom of the procrastination problems that had plagued me in high school. I started to give myself a PEZ candy as a reward for each problem I completed, desperate to condition myself with positive reinforcement.

Just two weeks into my first semester, I was biking to dinner with a friend and attempted a wheelie. The attempt was a disaster, and the doctor told me I would not be able to write with my right arm for 13 weeks. At this point, I was wondering whether I should drop out of school. After all, I had enough trouble completing my work when I could use my right hand. Instead, I refused to let my injury stop me, and I became determined not only to become proficient with my left hand, but also to fix my work-ethic issues.

I took copious notes with my left hand in classes that didn't require note-taking, and I initially spent three times longer to complete my math homework. The hard work paid off, and I was happy to enter my second semester with a 3.95 grade point average and a much stronger work ethic.

I planned to take my first actuarial exam in May at the end of my freshman year. While studying for it, I remembered that the first actuarial student I ever met told me it took him six attempts to pass the P (Probability) exam, which helped me take things seriously. After I passed exam P, I decided that I would want to pass exam FM (Financial Mathematics) before the start of the school year to maximize my chances of getting an internship in the summer of my sophomore year.



Unfortunately, my old habits resurfaced after I spent a month in France and returned with little time left to study. I would complete two problems, then stand up from my work space and walk around and wander into another room. It was unconscious, but I soon recognized I would have no chance of passing the FM exam if this habit persisted. Understanding my own weaknesses, I put a chair on either side of my work space to make the process of standing up and walking away more difficult. As I would subconsciously consider standing up, I would also subconsciously notice the chairs blocking my movement and continue to work. By simply fixing my unconscious tendencies, I greatly improved my studying efficiency to make it through the manual in 10 days and pass the exam.

I've always tried to be honest with myself about my weaknesses and flaws, as I believe self-awareness can allow you to overcome many self-imposed roadblocks and barriers that would prevent you from realizing your potential. My limited time in college pushed me to recognize that every moment is a development opportunity. I considered organizational skills to be one of my major weaknesses, so I pushed myself to gain a club position that would require me to improve. I sought the corporate liaison role for our actuarial science club, a position that required frequent correspondence with more than 35 employers in planning the annual actuarial career fair.

While I still do not consider organization to be a strength of mine, I have made great strides in continuing to improve this skill every day. My hope is that I can eventually claim organization as a strength because, although it is not something that comes naturally to me, it is a fairly important skill for an actuary in the corporate world.

Through my work on my two major weaknesses entering college, I have turned time management into a significant strength. Here are a few strategies that have been instrumental in passing all of my Associate of the Society of Actuaries (ASA)



requirements and balancing my three majors with multiple job and club responsibilities:

- **Studying material before going to bed significantly increases retention.** I recommend that you research this psychological phenomenon for yourself with a simple Google search.
- **Take breaks and plan strategically.** Similar to other muscles, the brain unfortunately has limited endurance. So, space out your work—if you need to study for two hours and also take a shower, then take the shower between the hours of study to optimize your studying efficiency.
- **Ask questions and be genuinely interested in what you're doing.** While teachers across the world have certainly become annoyed by the question “Why is this important?” I believe that understanding the why leads to greater engagement, energy and passion. Let your curiosity

fuel your learning, and try to look at a topic from a variety of perspectives. This strategy will make studying and working much easier and more enjoyable.

Finally, figure out what your weaknesses are and work on improving them. One way to help ensure you aren't blindsided by your faults is by being receptive to criticism. If your peers know you appreciate feedback and won't be offended, they will be much more willing to help you by offering you that necessary critique.

Fellow actuary, never stop learning and always seek improvement. ■



John Miller is a senior at Penn State who will be graduating with three majors and an ASA. He is winner of the 2017 Actuary of Tomorrow Scholarship. He can be reached at [miller.johnziv@gmail.com](mailto:miller.johnziv@gmail.com).



## Listen at Your Own Risk

The SOA's new podcast series explores thought-provoking, forward-thinking topics across the spectrum of risk and actuarial practice. Listen as host Andy Ferris, FSA, FCA, MAAA, leads his guests through lively discussions on the latest actuarial trends and challenges.

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Visit [SOA.org/Listen](http://SOA.org/Listen) to start listening.



# The Young ASA: Why Being Overqualified is Subjective

By Tim van Laarhoven

**B**alancing exams, work and knowledge will always be a tricky exercise for young actuaries. “Don’t take too many exams or you’ll overqualify yourself” is a favorite saying of many professors and some peers, but once employed, “I wish that I had finished my exams in school,” or “I would be done if I hadn’t taken a break” become popular adages. The conflict is so great that it makes me wonder whether overqualification is merely a subject for academic-professional debate or whether it is a real consideration in the actuarial community. From a company’s perspective, I understand not wanting to hire an Associate of the Society of Actuaries (ASA) with no experience, as industry-demanded salary may initially outweigh the value-add, but I have yet to see why a company would have issues hiring an ASA or a near-ASA for an internship.



In the summer of my first internship, I was sitting for a June exam while trying to learn as much as possible at work. I was learning so much every day; for example, I had no idea what a continuance table was or why a company would want to use it. All the learning and volunteering at work caught up to me when I made my first attempt at the MFE/IFM (Models for Financial Economics/Investment and Financial Markets) exam. I failed, and that got me thinking—how was I possibly going to manage working and studying at the same time? I decided to get through as many exams as possible in school while I still had limited responsibilities.

I was fortunate that I got a chance to experience two great internships during college that helped me develop as an actuarial student. Internship availability and rigor is generally market dependent, driven mainly by supply and demand. For instance, in Minneapolis there is a good number of actuarial opportunities, but there are also two competing programs—the University of St. Thomas and the University of Minnesota—which increases the number of applicants for open positions. Serious internships, which I prefer to define as those planning to extend a full-time offer to their interns following a successful performance, in Minneapolis generally will only interview you if you have passed two or more exams. In addition, they prefer a prior actuarial internship but will settle for related experience.

What do you do if you can’t meet the rigorous criteria of your market? Here are some suggestions:

1. Study for more exams, particularly if you can’t find an actuarial job. These exams demonstrate to employers that you are committed and willing to work.
2. Try to get job in a related field, such as underwriting or general insurance.
3. Participate in case studies, competitions and/or actuarial clubs.
4. Create reasons to develop your Excel and coding skills. Being able to talk about how you created a blackjack simulation that can run through eight decks in 20 seconds never hurts.

What do you do if you are looking for a full-time position but have “overqualified” yourself by having a high number of exams and little to no professional experience? Having a job in a related field can help, and it’s certainly not too late to reach out to companies and see if they would be interested in having you complete an internship prior to any sort of full-time offer. You will almost certainly be taking a pay cut, but you’ll give yourself a chance to develop your skills and demonstrate to the company that you are a good fit. The company has the chance to bring in

some diverse talent without having to commit completely to a full-time position. Even if this company doesn't extend an offer to you after the internship, now you have real experience to talk about at your next job interview.

There is no replacement for experience, which comes with time, but a candidate or employee can develop industry knowledge through continuing education outside of exams. This means setting aside time to watch webinars, read section articles and ask a lot of questions. The people you work with every day may have a depth of knowledge you haven't tapped, just because you haven't reached out with questions.

Being overqualified is subjective. I believe you are saving yourself loads of headaches in the future by working through the exams when you have the capacity and aren't distracted with

full-time work. Even if you do graduate without a full-time actuarial job, you can certainly work on qualifying yourself through continuing education or engaging in a faux internship at a company before you receive a full-time offer. Finally, once you're on the job, you may find that the letters after your name are not backed by experience. In this case, there are loads of learning opportunities and options available through the Society of Actuaries (SOA) to develop your industry knowledge. Don't let your fear of overqualification stop you from sitting for as many exams as you can. ■



Tim van Laarhoven, ASA, MAAA, works at Wakely Consulting Group, primarily on ACA rate filings. He can be reached at [tim.vanlaarhov3n@gmail.com](mailto:tim.vanlaarhov3n@gmail.com).

# SOA Explorer Tool

## Find Actuaries Around the Globe

The SOA Explorer Tool is a global map showing locations of fellow SOA members and their employers, as well as actuarial universities and clubs.

[Explorer.SOA.org](http://Explorer.SOA.org)



# A Different Pathway to Become an Actuary: Interview With Jacob Pratt

By Minyu Cao

I love hiking. When you go hiking, there are many trails to the same destination—some may be longer but smooth and with fewer obstacles; some may be shorter but come with ample uphill climbs. Likewise, there are many pathways to becoming an actuary. Some of us discovered this profession early and studied to be actuaries; some of us didn't stumble on it until much later in our professional lives.

Jacob Pratt, who is an actuarial assistant at Reinsurance Group of America, presents his unique pathway to becoming an actuary. He didn't take a traditional route to the actuarial profession. As a career changer, it definitely took a tremendous amount of effort and persistence for him to find resources and build up the skills he needed to enter the job market. Jacob can be reached at [Jacob.Pratt@rgare.com](mailto:Jacob.Pratt@rgare.com).

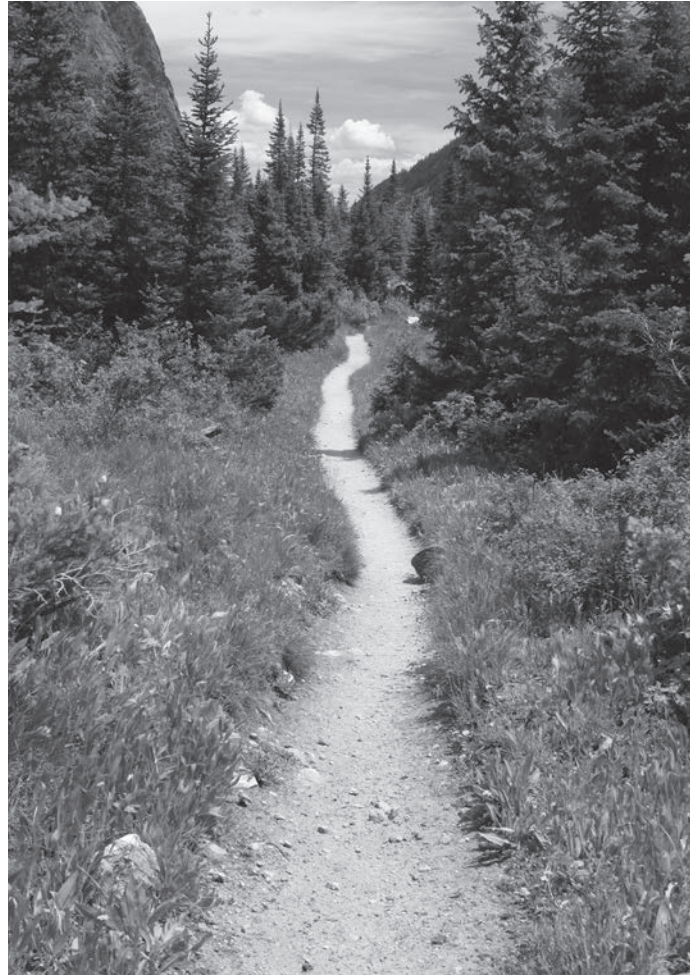
There are many others on pathways similar to Jacob's. Hopefully, his success story will shed some light on how to reach the hoped-for destination.

**Actuary of the Future: What was your profession prior to actuarial science? What made you want to make a career change?**

Jacob Pratt: Before becoming an actuary, I was a high school mathematics teacher. I decided to make the change for several reasons, primarily because I wanted a career that's more challenging, interesting and that allowed me to better provide for my family.

**AOF: How did you hear about actuarial science?**

JP: I have a few friends who work as actuaries and introduced me to this profession. I learned that strong mathematical and analytical skills are essential for actuaries. I also did research online and found that "actuary" is ranked as one of the top jobs in the United States.



**AOF: What kind of research did you do about the actuarial profession? What attracted you to it?**

JP: I read everything I could find about the career and making the transition. I looked at [SOA.org](http://SOA.org), [actuarailoutpost.com](http://actuarailoutpost.com), [beanactuary.org](http://beanactuary.org) and others. I read course descriptions and program descriptions from different colleges where actuarial science programs were offered to see what was covered. I even called professors from local universities, as well as some head-hunting agencies, to ask about the first steps.

**AOF: How did you start? How did you prepare for getting into this new field?**

JP: The most consistent answer that I received was that pursuing a master's degree was much less important than passing exams. So over the course of two semesters, I took four night school classes and studied for Exams P (Probability) and FM (Financial Management). I took economics and financial mathematics classes to prepare for Exam FM. After reading over the syllabus and the materials for exam P, I determined that rather

than trying to fit more classes into my schedule (I was working full-time and have a wife and two kids), I would just self-teach the materials covered in that exam. That was over the fall and spring semesters, and that summer I passed Exams P and FM. I also took time to learn some basic coding languages. I worked through some online courses to become proficient in both SQL and VBA.

On the other side of all that hard work and perseverance is a great career, and it will be worth it.

**AOF: How did you find your current job?**

JP: After I passed Exam P and while I was studying for Exam FM, I started sending out resumes and applications to every local company that had an entry-level actuarial position. I interviewed with one consulting firm several times but wasn't offered a position.

As the summer came to an end without much success, I started to reconsider my strategy. I had passed two exams but wasn't getting a lot of return calls or emails. I had heard that one local university had an exceptional actuarial program with a high full-time placement rate. I reached out to the head of the actuarial sciences department at that university to ask if he would have a meeting with me. His advice was to pursue an internship first before a full-time job. He explained that finding a job without an internship in today's market is extremely difficult. This was tough news to hear since I had been teaching for seven years, and it felt like taking a step backward. However, he also told me that there was an evening open house coming up for college students to learn about actuarial science and internship opportunities at a large actuarial company in the area and that he could include me in that group. Of course, I said yes. I went to that open house and was blown away by the people I met and the incredibly diverse work they were doing. That night totally changed my view of what a career as an actuary could be. I told my wife after I got home that if I needed an internship to get my foot in the door I would gladly do it.

So I applied for the internship at this company. After making my way through a couple rounds of the screening process, I arrived at the final hurdle—the on-site interview. I found myself in a room with 15 to 20 other applicants who all seemed to be traditional students pursuing their actuarial science degree. And there I was, a high school math teacher; it was pretty intimidating. So I just tried to give the best interview of my life to sell myself, my work ethic and my strengths. Luckily, a few days later, I got *the* call that they wanted to offer me the internship over the summer. That summer, I was offered a full-time job.

**AOF: What do you do at your current job? What do you like most about it?**

JP: I'm currently working in asset liability management. My primary focus is analyzing the impact of changes in interest rates. My favorite part of my job is that I feel like I'm always learning something new and working with a great team.

**AOF: From your perspective, what are the most challenging parts to entering this or any new profession?**

JP: In my opinion, the most challenging things about becoming an actuary are the extremely competitive market and the lack of a clear path to getting a job. There isn't a single degree or qualification that guarantees you a job. You need a degree, you need exams and you need some type of experience.

**AOF: What is your advice for those who want to make a career change to actuarial science?**

JP: My advice would be to work hard, keep calling, keep emailing and don't get discouraged. At some point, you are going to fail an exam (I did). At some point, you're going to apply to dozens of jobs without hearing back (I did). Also, at some point, you're going to call and email people numerous times without any response (I did). But on the other side of all that hard work and perseverance is a great career, and it will be worth it. ■



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# What Does Data Science Mean for the Future of Actuarial Science?

By Dustin Verzal

**B**ig data, machine learning and artificial intelligence have been making headlines across industries everywhere, so it shouldn't be surprising to see the impact reach the world of actuarial science as well. It is of the utmost importance for us to understand how data science can influence the industry so we may take an active role in shaping that future.

## ACTUARIAL HISTORY

To understand the future, let's first revisit the past to see how the actuarial profession developed into its current state. Unsurprisingly, people have been trying to quantify risk for quite some time. The first use of the word *actuary* dates back to 1762 when Equitable Life used the term to describe its CEO.<sup>1</sup> All modeling at the time was deterministic. Commutation functions were used to aid in calculations since calculators had not yet been invented.<sup>2</sup> The Actuarial Society of America (ASA) formed in 1889. The magnitude of the financial and ethical implications for actuarial work meant rigorous processes were necessary to qualify professionals and uphold esteem for the profession. Actuarial exam programs began in 1897.<sup>3</sup> The ASA later played a part in the merger with the American Institute of Actuaries (AIA) to form the Society of Actuaries (SOA) in 1949.

In the 1930s and 1940s, the foundation for the stochastic theory was developed, which gave way to probabilistic loss models.<sup>4</sup> The industry saw computation methods evolve from pencil and paper to punch cards to the personal computer systems we know today. Each step forward has improved the accuracy and reliability of the analyses actuaries perform. Regardless of the techniques used at a given time, they all follow a similar pattern, using historical data, mathematical models and judgment to make projections about the future.

## WHAT IS DATA SCIENCE?

Enter data science—an emerging field touting exciting new ways to analyze and derive value from data. Determining what constitutes data science has engendered a bit of disagreement, as there is no consensus on the definition of its curriculum.

Broadly speaking, it is the unification of statistics and data analysis, which grew out of the need to grapple with tremendous volumes of data that are generated on a daily basis. What has emerged from this struggle is a group of people now referred to as “data scientists” (that is, a group of curious and analytical computer gurus). Data scientists use historical data, mathematical models and judgment to predict and understand the future. Sound similar to your profession? I thought so.

## WHAT WILL DATA SCIENCE CHANGE?

This new wave of data analysis techniques brings a significant degree of automation to the development of predictive models. New algorithms include mathematical feature selection to identify independent variables with a valuable signal. Advanced decision-tree-based models allow for nonlinear relationships and interactions to be captured implicitly. Neural networks mimic the human brain's ability to find abstract relationships in data. Models can scale to millions of input variables with relative ease. These methods are being applied not only to the insurance industry, but also to the markets they support. Here are a few examples:

- **Auto.** Insurers are using machine learning on data captured via accelerometers and gyroscopes to predict driver risk.
- **Health.** Researchers are developing neural networks to analyze images to help identify cancer or heart disease.
- **Life.** Insurers are exploring the use of predictive modeling to provide real-time quotes on a limited set of underwriting variables.
- **Employers.** Predictive models rank workers' compensation claims into buckets by expected severity, which are then used to target claimants with an expected high-cost trajectory.



Although data science and actuarial science are technically two different fields, they are not mutually exclusive.

#### HOW IS IT RELATED TO ACTUARIAL SCIENCE?

Although data science and actuarial science are technically two different fields, they are not mutually exclusive. Both sides can benefit from collaboration and cross-training in each other's discipline. As many of you know, the SOA has recently altered the exam syllabus to include predictive analytics. It recognizes the valuable opportunities gained by applying these techniques to actuarial problems. I urge you to embrace this vision and explore beyond the exam requirements. Actuaries already possess the mathematical fortitude required to learn and apply data science and have access to extensive datasets. Most important, though, they already have expert domain knowledge of the insurance industry, allowing them to connect problems to the proper solutions. The upshot is that actuaries are in a unique position to leverage data science to answer extremely interesting and valuable questions, such as the estimation of incurred but not reported (IBNR) claims, the prediction of likely hospitalization, the prediction of pharmaceutical market opportunity and the prediction of substance abuse.

#### WHERE SHOULD WE START?

Many sources on the internet identify how to begin the journey into data science and predictive modeling. One search engine query will return more study material than you will likely have time for. The key is not to focus upfront on which algorithms or programming language to use, as they are just a means to an end.

I believe the first step is finding a problem that excites you—something that will fuel your appetite for learning. Explore how data science is being used in the world already and think about what types of problems you want to solve. If you need some help, check out *Kaggle.com*. Kaggle is a data science playground filled with predefined problems and datasets where people can build predictive models to compete for recognition and even cash prizes. Some of the competitions have even been put together by insurance companies seeking innovative solutions. I recommend that you explore some of these competitions to get a feel for the types of problems data science is trying to solve. I suspect you'll find something that speaks to you. After that, if you're still interested, read "Learning Data Science From an Actuary's Perspective" in the 40th issue of *Actuary of the Future*.<sup>5</sup> The journey into data science will not be an easy one, especially if you're working on actuarial exams, but I promise the results will be rewarding. ■



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# The Dawn of the Machine-to-Machine Age and Its Implications for Insurance

By Syed Danish Ali

**M**achine-to-machine technology (M2M) essentially involves sensors in an internet of things (IoT) environment where data is sent wirelessly to a server or another sensor. That other sensor or server uses artificial intelligence (AI) to analyze and act on the data automatically in real time. The actions can be anything from sounding alerts and warnings to changing direction to braking and even making transactions. As M2M increases exponentially, we will soon see a reinvention of whole business models and customer relationships. Indeed, the applications will be limited only by the imagination of businesses.

This article will explore the following:

1. An overview of key M2M technologies and their disruptive potential
2. M2M transactions—a whole new revolution where machines can transact directly with other machines, leading to a machine economy
3. An insurance business model of the future, with Insurtech start-ups based on blockchain

## AN OVERVIEW OF KEY M2M TECHNOLOGIES

Imagine some real-life scenarios:

- Your car senses your travel itinerary and automatically buys insurance on an on-demand basis by the mile (meaning a machine buys its own liability insurance as needed).
- Wearable exoskeletons give law enforcement and factory workers superhuman strength and agility.
- Intelligent computer interfaces merge with our brains to create superhuman intelligence (for example, Elon Musk's Neural Lace).
- We take smart pills and don health wearables that directly assess our mortality and morbidity risks.
- You get life insurance from taking a selfie that is analyzed by an algorithm that medically determines your biological age through the image. (This is already being done by start-up Lapetus Solutions' Chronos software.)
- Your refrigerator understands your regular shopping and stocking habits. It finds that some item like milk is past its use-by date, so it buys milk directly through an online shopping site. Your fridge is continuously restocked based on your most common purchases. You can continue to buy new products and unusual items independently and stock them in your fridge as usual.
- Self-driving cars interact with each other on the smart grid to avoid accidents and collisions.
- Your robot senses that you are getting more upset and depressed lately, so it tries to cheer you up. It tells your health coach bot to increase content for emotional resilience.
- Sensors sense that a pipe in your home is about to burst and send for a repairman before this can happen.
- Your chatbot is your personal assistant. It does your shopping, senses when you need to buy insurance (for example, when you are traveling), handles your daily chores and





keeps you updated on your daily schedule, which you have made in collaboration with the bot.

- You have a 3D printer for making new toothbrushes. The current smart toothbrush senses that its filaments are about to be worn out, so it sends a signal to the 3D printer to make new filaments.
- Instead of bird swarms, we now see drone swarms flying off to carry out their tasks with collective (swarm) intelligence.
- A machine plays chess against itself without any training data and beats just about everyone and everything. (AlphaGo Zero already does this.)

Two meta-themes arise out of M2M technologies: prevention and convenience. Self-driving cars can eliminate or radically reduce accidents as the majority of car accidents are caused by human error. Wearables can lead to a healthier lifestyle, home sensors detect water or gas leaks and other issues before they occur and rectify them. These types of prevention decrease traffic accidents, morbidity and other adverse events. Convenience is an overarching aspect in that almost everything happens automatically from one machine to another, and in few cases, it is still augmented with human expertise and attention. The machine learns what it is programmed to learn on its own using data from its sensors about our behaviors over time. It carries

out its tasks automatically in the background to free up our time for human endeavors like being creative.

These emerging technologies are leading to changes in exposure and have huge impact on insurance. There is a large number of touch points where the insurer can engage with the customer; there is less focus on personal coverage and more on commercial aspects (for example, if a self-driving car malfunctions, a home assistant gets hacked or a smart pill poisons someone instead of providing real-time data to dynamically assess mortality and morbidity risks). The frequency of claims is set to decrease radically, but the severity of claims can be more complex and difficult to assess because various stakeholders will have to be taken on board to assess the damages and see how the share of loss coverage varies in proportion to the faults of different stakeholders. Cyber hacking can be expected to flourish, which will lead to new opportunities for insurers in the machine economy.

These technologies don't exist in a vacuum; capitalism cannot exist without constantly revolutionizing technology and, thus, our relationship with it. If you need proof of this, see how algorithms and technology are molding our thinking and attitudes, our behavior and actions, and see how rapidly all this technology evolves. What's surprising is that this observation was made by Karl Marx, someone who lived from 1818 to 1883, which shows that all the tech in the world is no substitute for deep thinking and erudite wisdom.



Social changes go hand in hand with technological changes. Now we are seeing peer-to-peer (P2P) business models that focus on social impact (Lemonade, for example) instead of just making the rich richer. The sharing economy is boosting the use of technology as it gives us access (but not ownership) on an on-demand basis. The millennial generation is also very different from previous generations, and we have only started waking up to what millennials demand and how they want to shape the world around us. The sharing economy can mean that machines with their own “wallets” can perform services for humans on an as-needed basis and carry out transactions independently.

### M2M FINANCIAL TRANSACTIONS

Our future customers will be machines with wallets. A crypto currency called IOTA (Internet of Things Application) aims to propel the machine economy into our everyday reality by allowing IoT machines to transact directly and automatically with other machines (see IOTA’s website at <https://iota.org>). This will lead to the rapid emergence of machine-centered business models. IOTA does this by removing blockchain and adopting a “Tangle”-distributed ledger that is scalable and lightweight and has zero transaction fees, which means that microtransactions are viable for the first time. The key advantages of IOTA over current blockchain systems are as follows:

1. To allow a clear idea, blockchain is like a restaurant with dedicated waiters (miners) that bring you your food.<sup>1</sup> In Tangle, it’s a self-service restaurant where everyone serves themselves. Tangle does this through a protocol whereby a person has to verify his or her previous two transactions when performing a new transaction. Thus miners, the new middlemen building up immense power in blockchain networks, are made useless. The promise of blockchain is that middlemen exploit us whether they comprise the government, money-printing banks, or other institutions, but another class of middlemen “miners” (especially those in China) are becoming powerful, leading to a huge concentration of power in a small number of hands. Bitcoin mining takes as much energy as the electricity produced by more than 159 countries,<sup>2</sup> so it is a huge waste because huge computing hardware is required to crack complex crypto mathematical codes to validate a transaction.
2. As mining is time-consuming and expensive, it doesn’t make sense to perform micro- or nanotransactions. The Tangle ledger allows transactions to be validated in parallel and requires no mining fees to allow the IoT world to conduct both micro- and nanotransactions.
3. Machines are “unbanked” sources in today’s time, but with IOTA, machines can generate income and become economically viable, independent units that can purchase insurance, energy, maintenance and so forth on their own.

IOTA provides a know your machine (KYM) process for secure identities, similar to the know your customer (KYC) regulations currently used by banks.

IOTA is a new breed of crypto currency that aims to solve problems that previous cryptos were not able to solve. The Tangle ledger is a nickname for a directed acyclic graph. An acyclic graph is a cryptographic decentralized network that is supposedly scalable to infinity and resists attacks from quantum computers (which are yet to be fully developed and used in mainstream life) by using different encryption forms of hash-based signatures.<sup>3</sup>

We will soon see a reinvention of whole business models and customer relationships ... the applications will be limited only by the imagination of businesses.

It can be reasonably forecast that many cyber physical systems such as supply chains, smart cities, smart grids, shared computing, smart governance and health care systems will emerge and be based on artificial intelligence and IoT. One country with very ambitious and aggressive plans to become well-known in AI, beside the United States and China, is the United Arab Emirates (UAE). The UAE has instituted many AI initiatives such as drone police, plans for driverless cars and hyperloops, and governance based on blockchain. It is even the first country in the world to have a state minister for artificial intelligence.<sup>4</sup>

The quest for efficiency was the quest that first drove capitalism, and now that same quest is working to end capitalism. Three-dimensional printing and a sharing economy are radically lowering costs and upgrading efficiency levels, and the machine economy is the next logical step. For the first time, a machine will be an economically independent unit, earning income by performing physical or data services and spending on energy, insurance and maintenance. The on-demand economy will boom because of this distributed trust. Three-dimensional printing will radically bring down the cost of making materials, and robots and economically independent robots will soon start providing humans with services on demand.

### INSURTECHS OF THE FUTURE

To make the process seamless, agile, robust, invisible and as easy as child’s play, blockchain technology is used with smart contracts that self-execute when prescribed conditions are met. This new P2P insurance model is doing away with traditional premium payments, using instead a digital wallet where every

member puts his or her premium in an escrow-type account that will be used only if a claim is made. In this model, none of the members carry an exposure greater than the amount they put into their digital wallets. If no claims are made, all digital wallets keep their money. All payments in this model are done using Bitcoin, which further reduces transaction costs. Teambrella claims to be the first insurer using this model based on Bitcoin,<sup>5</sup> and it is not alone. There are many blockchain-based start-ups targeting P2P insurance and other areas of human activity. Here are some of them:

- Etherisc
- InsurePal
- Aigang
- REGA
- Bit Life and Trust
- Unity Matrix Commons

Thus, a lot of crowd wisdom is used as the insurer “Learns from the people, / plans with the people, / Begins with what they have / And Builds on what they know” (Lao-tzu).

Instead of maximizing profits for shareholders, sitting isolated from ground realities, lacking skin in the game, and having far less access to awareness (i.e., data) of people relative to their peers, this P2P process empowers the crowd and taps into its wisdom (instead of getting wisdom from books), which is far better. There are also no unfair pricing practices such as ratings based on gender, pricing optimization that charges you more if you are less likely to shift to another insurer and so on. The giant insurers cannot know you better than your peers do, it’s as simple as that.

This same P2P insurance can also be carried out on non-blockchain-based distributed ledgers such as IOTA, Dagcoin and Byteball, with the additional technological benefits of these new ledgers over the current blockchain. These digital tokenization start-ups promise to radically reinvent business models where transactions, pooling and just about everything gets done for the community and by the community in an automated, fully trustworthy manner with no middlemen like governments, capitalist businesses, social institutions and so on. Peer-to-peer insurance is just one part of the whole program.

Smart contracts have built-in conditions that are automatically triggered when a contingency occurs, and claims are paid

instantly. The need for a highly qualified labor force that essentially does clerical work is removed to build a sleek, autonomous organization of the future. The middlemen called “shareholders” are avoided, which means that consumer interests are acted on by providing convenience, low prices and good customer support. In this peer-to-peer setting, the benefits go to the community instead of to shareholders. IoT provides the main source of data to these pools to develop protocols about when (not) to release claim payment. The same tokenization means that anyone anywhere can have access to the insurance pool instead of being limited by geography and regulations.

## CONCLUSION

The scenario pictured here of M2M transactions and the machine economy will seem distant to many, especially as the current realities of insurers are still the same as they were 200 years ago. The machine economy is still nascent and emerging, but exponential results can mean that it will become a large part of our lives very soon. The current insurers have yet to embrace emerging trends with more immediate impact that don’t use blockchain, such as Trov, Lemonade, Verify and many others. We await the full-blown use of IoT and M2M, and we are certainly seeing the dawn of their influence. ■



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# A Change Will Do You Good

By Mitchell Stephenson

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**D**uring my time at Prudential Financial, I was fortunate to work with Jim O'Connor. Up until his recent retirement, Jim was a vice president and the domestic chief actuary for the company. Over his four-decade-long professional career, he was part of a leadership team that took the organization through demutualization, acquisitions, historically high interest rates, market crashes and significant advancements in technology. Jim is an advocate for embracing change effectively. He was gracious enough to sit down with me to discuss that topic.

There is a cartoon going around social media. It features a presenter asking a group of professionals, "Who wants change?" Every person in the room raises their hand. Then the presenter asks, "Who wants to change?" Not a single hand goes up.<sup>1</sup> This human inclination to resist change is natural. Recent research on the brain shows that resistance to change is not only psychological, but physiological.<sup>2</sup> This means that confronting change can make us feel physically uncomfortable. Our natural way to combat this response is to resist change, and to revert to what we have always done. It is human nature.

Yet, drastic change is coming, especially in technology. The Institute of Electrical and Electronics Engineers estimates that by 2040, 75 percent of all vehicles will be driverless.<sup>3</sup> NASA has recently revealed a plan for the first humans to live on Mars within a few decades. Artificial intelligence is already in use today, and the capabilities are growing. The future can seem scary if we are unwilling to embrace change. As French poet André Gide wrote, "Man cannot discover new oceans unless he has the courage to lose sight of the shore."

To think about how best to overcome our natural resistance to change in the future, it helps to first look backward in time. There have been significant changes that we've already weathered in the past few years and decades. O'Connor recently reflected on the workplace technology that was in use when he began work in the 1970s. While they were no longer used, he

recalls seeing Friden calculators on his floor. These machines resembled those that NASA used to perform the calculations necessary to send the first astronauts into space.

Through the late 1970s, users fed 80-hole-punch cards into what would be considered massive computers by today's standards. To get output from these large machines, users would input lines of code and data characteristics onto the punch cards. They would need to wait, sometimes for hours, to see if the code executed successfully before they could see output. As technology progressed, people still relied heavily on basic four-function calculators to perform manual calculations, as well as to check computer output, until the mid- to late-1980s. It wasn't until then that personal computers first appeared in the workplace.

Fast forward to the present. The amount of data in the entire world is doubling every two years.<sup>4</sup> Most cars today possess more computing power than the entire system that guided those first astronauts to the moon in 1969.<sup>5</sup> In fact, the phone in your pocket is millions of times more powerful than all of NASA's combined computing technology at the time of the moon launch.<sup>6</sup> These changes have had significant impact on the way that we live, communicate and work.

"Man cannot discover new oceans unless he has the courage to lose sight of the shore."

The rapid change in technology is not the only drastic change in the financial industry. The entire Fortune 500 competitive landscape has almost completely turned over in the last six decades. Of the 500 companies listed in 1955, only 60 remained on the list in 2016.<sup>7</sup> Companies disappeared for various reasons, one of which was the failure to embrace change.

Why were companies that were once so successful unable to carry that success forward with them decades into the future? Sometimes, O'Connor said, the reason for companies failing to keep up with change is simple: "They get attached to success. It's a type of hubris that suggests they know best."

Fortunately, there are some specific things that individuals and organizations can do to prepare for, guide and embrace change into the future.

- **Be solution-oriented.** How do you solve any problem? Identify three basic things: where you are now, where you want to get to, and how you're going to get there. "When you get right down to it, every problem and every project all follow that simple model," said O'Connor. It seems

straightforward. Yet, many of us don't take the time to clearly identify these three critical components of any problem on which we are working. Over the decades, this process of thinking through a problem and being solution-oriented has remained the most effective way to problem-solve. "Our technology is different. What we can do is different, but the way we should be thinking about what we're doing, that really hasn't changed," he added.

- Have a vision and know how to implement it.** Some companies that have had tremendous success over the last few decades owe it to a few individuals with a concrete and executable vision. An obvious example to point to is Apple, the world's most valuable publicly traded company. When it started out in the late 1970s, Apple sold personal computers. Because of the vision of Steve Jobs and others, the products and the company evolved into something entirely new and different. It set the trend for the whole industry as opposed to following trends set by other companies. "Vision is great. You need it," said O'Connor. However, it's not enough. You need a plan of attack. The rubber hits the road as you implement the vision. That's where the execution comes in. "We can design the greatest whiz-bang ever," he said. "If it doesn't sell, it doesn't matter."
- Balance matters.** When it comes to embracing change, there are the extremes, and there is everything else. On one extreme are individuals and organizations that resist change at all costs. On the other, there are those that follow all trends without remaining focused on their original vision. "Neither one of them is a very successful strategy," said O'Connor. Individuals and organizations need to find a sweet spot between these extremes that works for them. A company that resists change at all costs will eventually get overwhelmed by the world around it, go out of business, or lose significant market share. Some recent examples of this are Blockbuster, Kodak and Borders. On the flip side, it's important not to follow every trend just because it's there. You lose your vision if you do this, and spread yourself too thin. This is another recipe for failure.
- Use your judgment.** As actuaries and technical professionals, no matter what happens in the future, we will need to rely on our judgment, and our ability to communicate the implications of modeled results. This will become especially true as automation and artificial intelligence become more prevalent in the insurance and financial industries. "Judgment is one of the things that we bring to the table that is unique," said O'Connor. "When you think about what are the core things that we as a profession provide, it is that understanding. It is the judgment. It is how the world

of insurance works." We will also need to always keep in perspective that doing the right thing should rise above all others as the primary reason for making business decisions. When it comes to making the right decisions, he said, "In our profession, we've got lots of things that help us. We have a code of professional conduct, Standards of Practice, study notes, peers and resources all the way up to—and including—the ABCD (Actuarial Board for Counseling and Discipline), which can help counsel, or if it needs to, discipline," he said. "All of that structure is there to enable those of us in the profession to do the right thing."

It's a certainty that the world around us is going to change, and that we're going to have to deal with it. It's something that we've all dealt with before. All of us experience change in our lives, at one time or another. In recent decades, we've gone through significant changes in the ways that we live, communicate and work. Sometimes we don't give ourselves enough credit for how rapidly we've adapted.

"We have so many examples where people say they don't like to change, and then they pull their cellphone out of their pocket," said O'Connor. "We change all the time. Let's just recognize the fact. We're more talented at this change thing than we believe." ■



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# MARK YOUR CALENDAR



## UPCOMING SOA EVENTS

### **Life and Annuity Symposium**

May 7–8, 2018 • Baltimore, MD

### **Asia-Pacific Annual Symposium**

May 24–25, 2018 • Seoul, South Korea

### **China Annual Symposium**

May 28–29, 2018 • Beijing, China

### **Health Meeting**

June 25–27, 2018 • Austin, TX

### **Underwriting Issues & Innovation Seminar**

July 29–31, 2018 • Chicago, IL

### **Valuation Actuary Symposium**

Aug. 27–28, 2018 • Washington, DC

### **SOA Annual Meeting & Exhibit**

Oct. 14–17, 2018 • Nashville, TN

Learn more at [SOA.org/Calendar](http://SOA.org/Calendar)



# The 52nd Actuarial Research Conference (ARC) and an Invitation to ARC 2018

By Daniel Bauer, David Buechner and Bruce Jones

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The 52nd Actuarial Research Conference (ARC 2017) took place at Georgia State University in Atlanta, with the theme “Actuarial Research at the Crossroads: Transcending Disciplines.” Increasing amounts of data, global trends in climate, interest rates at or below the zero bound, changing regulatory frameworks, and so on, make the actuarial profession evermore challenging. ARC 2017 brought together more than 150 actuarial scholars, practitioners and educators to discuss these challenges and to exchange ideas on the latest development in actuarial research.

The lineup of invited speakers reflects the theme of the conference, and their presentations showcased the relevance of methods beyond the traditional actuarial toolkit for facing the aforementioned challenges. Christian Gollier, Professor of Economics at the Toulouse School of Economics, presented ideas on “Evaluation of Very Long-dated Assets, Interest Rates and Climate Change.” In particular, Christian explained what advanced economic theories have to say about these very topical problems for actuaries. Damir Filipovic, Swissquote Chair in Quantitative Finance and Ecole Polytechnique Fédérale de Lausanne and Senior Chair at the Swiss Finance Institute, described how results on chaos expansions of random variables can be used in implementing the “Replicating Portfolio Approach to Capital Calculation.”



Additionally, Jim Guszczka, Chief Data Scientist of Deloitte, provided his views on “Actuarial Science in the Age of AI.” Jim further discussed the relevance of analytical tools in actuarial science as a panelist in a plenary discussion session. The other panelists were Jed Frees, Hickman-Larson Chair of Actuarial Science at the University of Wisconsin-Madison and Rodrigo Martinez, graduate student at Georgia State University. The discussion benefitted from a very active participation of the audience.



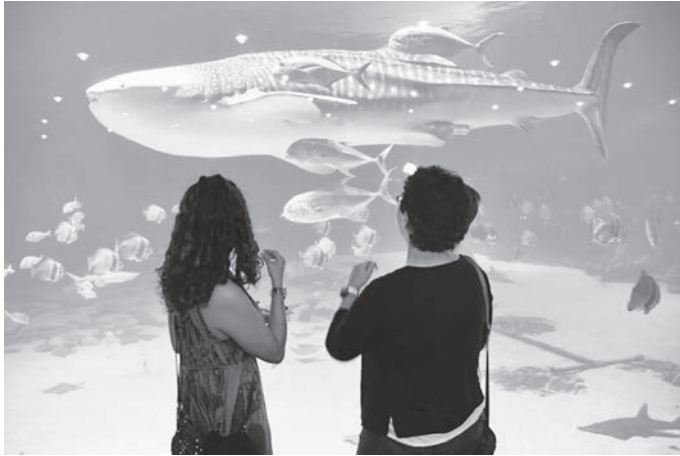


Braithwaite and Society of Actuaries (SOA) Past President Craig Reynolds gave the attendees updates on the latest developments in these actuarial associations.

The conference venue, situated in downtown Atlanta, was close to the three evening social events. The opening reception was held at the Center for Civil and Human Rights, a new museum dedicated to chronicling the civil rights movement. Atlanta was the home of Martin Luther King Jr., and the civil rights struggles in the southern U.S. were headquartered within blocks of the center. Conference attendees toured the facility, which recalls the champions of the civil rights movement and the violent events that occurred during that time. Thursday night's activity was a basketball game played in the GSU Sports Arena, home of the GSU Panthers of the Sun Belt Conference. Though there was no admission charge, the crowd got their money's worth as the teams made up of conference attendees and presenters competed fiercely. The Western Actuaries team edged the Eastern Actuaries team by two baskets and a good time was had by all. A special thanks to Brian Hartman for his help in organizing the event.

In addition to the plenary presentations, we had more than 75 contributed presentations on diverse topics including actuarial education, climate risk, health insurance, agricultural insurance, financial modeling, cyber risk, longevity risk and pensions. Furthermore, Casualty Actuarial Society (CAS) President Nancy





Finally, Friday night's banquet was held in the Atlantic room of the Georgia Aquarium, North America's largest. The aquarium tank has 25-foot whale sharks and rays with 15-foot wingspans, along with the usual compliment of smaller fish. Beluga whales playfully entertained on the other side of the room, making some lasting memories for those who attended.

Bruce Jones' invitation for ARC 2018 at Western University made us all excited for next year. The 53rd Actuarial Research Conference will be hosted by Western University, which is conveniently located in London, Ontario, within driving distance of much of central Canada and the midwestern United States. ARC attendees will experience both the City of London and the Western campus. The conference will kick off on Wednesday, Aug. 8, with an evening reception at Museum London overlooking the Forks of the Thames and the Walter J. Blackburn Memorial Fountain. Also planned are a poster session in the renovated atrium of the Physics and Astronomy Building, one of the original two campus buildings, and a banquet at the University's Great Hall.



The Actuary of the Future Section is honored to be a sponsor of ARC 2018. We invite you to attend ARC 2018 at Western University on August 8–11, 2018, for a stimulating conference and an enjoyable visit to London, Ontario, and the surrounding area!

#### INFORMATION ON THE HOSTING DEPARTMENTS

The Risk Management and Insurance Department at the Robinson College of Business of GSU is devoted to the study of risk from different angles. One of the inaugural schools to be named a Society of Actuaries Center of Actuarial Excellence, it has undergraduate and graduate programs in actuarial science. The Ph.D. program is supported by the SS Huebner Foundation, which is dedicated to advancing the teachers of risk sciences. The GSU risk management program is ranked #4 by *U.S. News & World Report* and has been ranked within the top 10 for more than 10 years. ARC 2017 was co-sponsored by the GSU Risk Management Foundation with support from the Casualty Actuarial Society, SCOR, Willis Towers Watson, The Principal, Aetna and Lincoln Financial.

Founded in 1878, Western is one of Canada's largest and most research-intensive universities. Actuarial science at Western began in 1922, and is currently housed in the Faculty of Science. The Department of Statistical & Actuarial Sciences offers well-established programs in actuarial science, financial modeling and statistics, as well as recently developed joint programs (with the Department of Computer Science) in data science. Western currently employs six actuarial science faculty members. ■



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