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AMSTATNEWS

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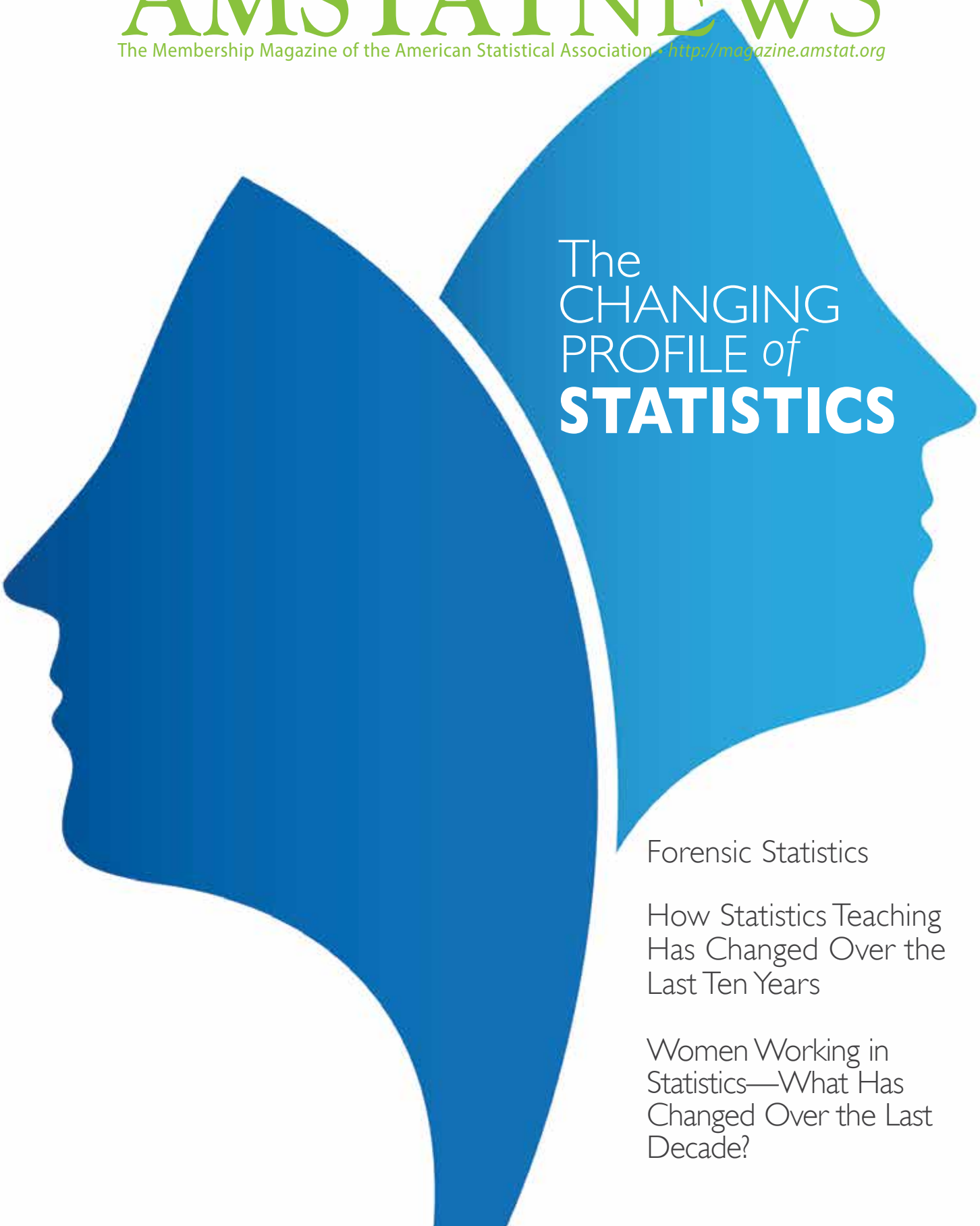


The CHANGING PROFILE *of* STATISTICS

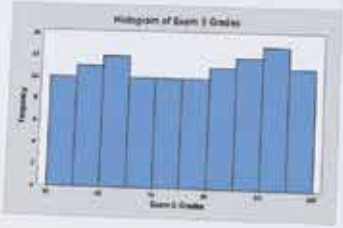
Forensic Statistics

How Statistics Teaching Has Changed Over the Last Ten Years

Women Working in Statistics—What Has Changed Over the Last Decade?

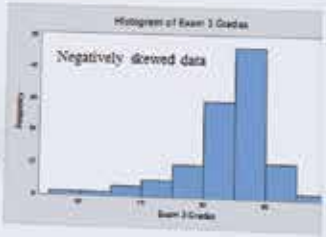
Everything you need to plan your class.

Mean (~71.86) and median (73) are about the same



Mean (~75.04) and median (75) are about the same

Mean (~66.32) is greater than the median (62)



Mean (~83.50) is less than the median (89)

Measures of Spread

mean as the fulcrum point t
ted by the same weight, in pe

modes

Also noted in each picture are the modes (circled) and location of t
definitions of these statistics are contained in the following pages.

Example 1

Ten batteries from brands A, B, and C were tested to determine the

Brand A:	41	289	214	102	38	94	17
Brand B:	39	65	22	64	22	191	99
Brand C:	24	95	139	122	41	360	31

Here are the lifetimes plotted as comparison dotplots in Minitab:

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AMSTATNEWS

SEPTEMBER 2015 • ISSUE #459

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Promoting the Practice and Profession of Statistics®

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CAREER ISSUE

Influential Statisticians

columns

member news

SIDEBAR

The signature 90s hit ("Smells Like Teen Spirit") of Rock and Roll Hall of Fame inductee Nirvana (from the city of last month's JSM) inspired UT-El Paso's Lawrence Lesser to playfully depict some impressions of our subject.

Smells Like Stat Spirit

lyric © 2015 Lawrence M. Lesser
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Those anecdotes of all your friends
Will make you lose if you depend:
You cannot be so self-assured
With an alpha of one-third!

CHORUS:
Hello hello hello how low
Hello hello hello how low
Hello hello hello how low
Hello hello hello.
Without data, it's more dangerous:
I would be an ignoramus!
See the skewness, correlate this!
I need data to explain this:
A priori, it's Pareto,
Bonferroni, a placebo, yeah! Hey!

With data, I do a test:
p-value found, *p*-value blessed.
A little group the sample's been:
I always want a bigger *n*.

(Repeat Chorus, up to last 2 lines)

Simulation, variation, estimation, imputation,
A new trial, a new trial, a new trial, a new trial,
A new trial, a new trial, a new trial, a new trial,
A new trial.

member Q&A

THE SLICE OF HAM
How Do You Know?

David Morganstein

The statistician as skeptic is well typified by Deming's frequent use of the question "How do you know?" I offer a story and two real case studies that represent the value of asking this seemingly basic question. Whether you're working as a statistical consultant or simply trying to improve quality within your own organization, trying to uncover the origins of common practices often reveals opportunities for improvement! You may discover no one has any real evidence, the current practice works, or the rationale for it no longer applies.

I was out in the kitchen one evening helping my wife prepare dinner for the evening's meal with her parents. I observed her unwrap a ham and, with a knife, slice a quarter of an inch off the end and throw the end piece in the trash. Quite surprised, I asked her why she did that, "Did you read about that in a cookbook or see it on a TV show?"

She replied, "I learned it from my mother. She used to do that."

I asked, "Why did she do that?"

After another few moments in thought, she answered, "I think it's something about the end of the meat getting dried out, and you don't want to serve it."

Being curious, I cornered my mother-in-law after dinner and told her I'd been out in the kitchen helping her daughter fix the meal. (Of course, I was hoping to earn a few points from my mother-in-law for sharing the kitchen duties.) I brought up the ham-trimming incident and asked her if my wife had learned that curious culinary technique from her.

"Yes," she replied.

"So, why do you do that?" I asked.

Her answer was that the meat was exposed to the air and that damaged the flavor, a somewhat different explanation than my wife's. "Did you learn that in a cookbook or from someone?" I asked.

She replied, "My mother did that."

Since I'd heard two rather different explanations for this seemingly wasteful tradition, my curiosity got the best of me. The next day, I called my grandmother-in-law and asked her, "Did your daughter see you cut a quarter of an inch off the end of the ham and throw it away?"

After a few seconds of laughter, she replied, "Yes. After the war, the only pan we had was 6 inches long!"

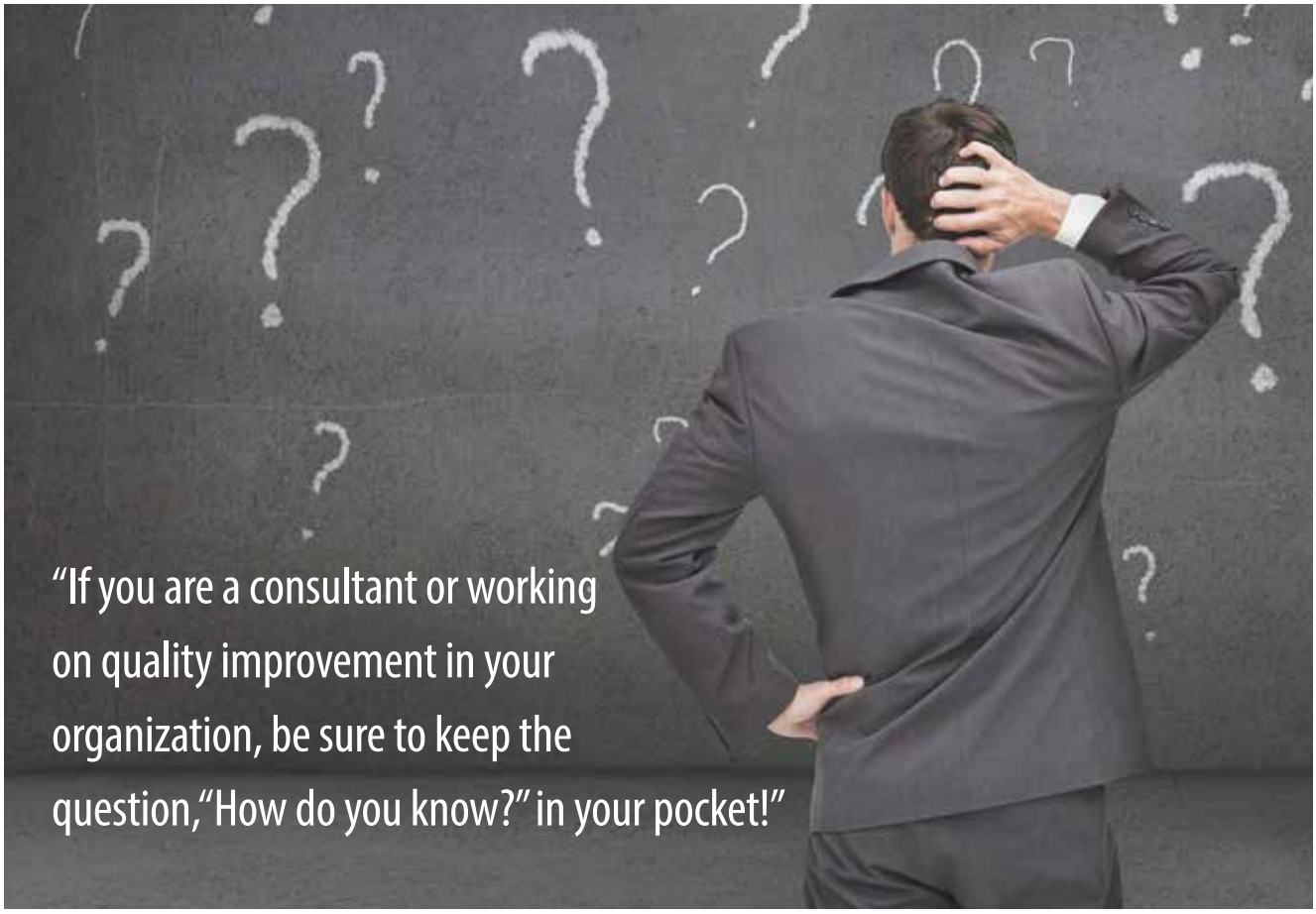
How do you know?

One of my statistical consulting projects took me into a steel operation's rolling mill. We had worked with various units in the steel operation, but the rolling mill was new to us. During a tour of the unit, we saw how the mill took huge multi-ton slabs of steel produced much earlier in a steel-making operation by a continuous caster, heated the slabs red hot in a furnace, and rolled them like Play-Doh into long thin strips that were coiled up at the end of the mill. The width and thickness of each strip defined a specific product for a client.

The first thing the operator did was trim off the leading edge of the heated slab. The operator had a card pasted above him. The card was clearly old and dog-eared and listed various coil dimensions with a number of feet next to it. We asked him how he used the card. He said, "These ingots are created by pouring steel into a mold. When the steel cools, the top of the material oxidizes and converts into some nonuniform material called 'pipe.' We saw off the end with the pipe and throw it back into the steel-making furnaces so it can be melted down and reused."

We commented that we were surprised by this step because we understood the casting operation had been replaced two years ago with a $250 million continuous caster, a process that no longer created the pipe and was one reason for the huge expenditure. The operator looked puzzled at first, then disturbed. He took us to a conference room and asked us to wait for him to return. The operation manager then met with us, saying we had more than earned our consulting fee! Indeed, the continuous caster was intended to save millions of dollars of wasted material that no longer needed to be cut off from the end and recycled. Here, two years on, and the mill had still not changed its practices.

How do you know?



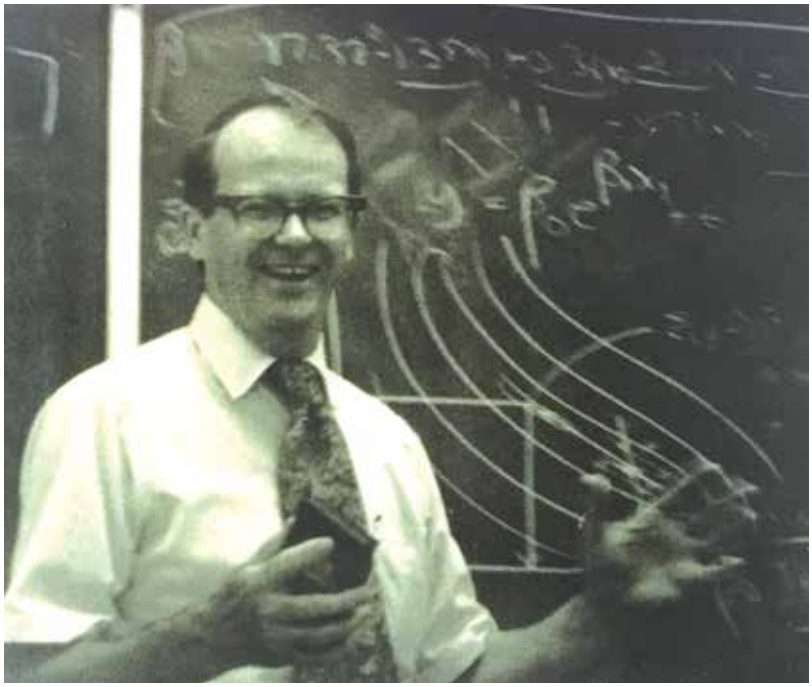
Our second real-world quality improvement example took place some time ago when telephone surveys of households used the Waksberg method of sampling. In this process, using a 100 bank of numbers and the first eight digits of the phone number, a random choice of the final two digits was made and contacted. If this choice was a residential number, the cluster was retained and a fixed number of additional numbers were dialed within it. Waksberg demonstrated that, although the number of residential numbers in the cluster was unknown and related to the selection probability of the cluster, the two-stage process removed the unknown measure of size from the selection probability, creating an equal probability design.

During downtime in the telephone center, interviewers would make that initial call to phone clusters and then "put on the shelf" for future use those clusters that had been identified for retention. However, they chose not to call the initial phone number for a subsequent interview because either time had passed since those numbers were located and they might have converted to nonresidential or, having contacted the household one time, coming back later for an interview would be seen as a burden and adversely affect the response rate.

A sampling statistician on a project asked the question, "Why do you do that (throw away that initial known to be residential number)?" When told the rationale, he asked, "How do you know?" An experiment was then conducted that demonstrated that those initial numbers were virtually always residential numbers and that the households, in fact, were "cooperating" households since they had already participated during the screening so they were more likely to cooperate again. Until this situation had been discovered, roughly one-sixth of all the work was being thrown away, just like the slice of ham and the ends of the steel slabs.

If you are a statistical consultant or working on quality improvement in your own organization, be sure to keep the question, "How do you know?" in your hip pocket!

David Morganstein



Meet Mr. Rogers' Roommate, a.k.a.

Stu Hunter

a Statistics Legend

Amy Munice, ALM Communications

Most ASA members probably don't think of Stu Hunter (J. Stuart Hunter) as a fellow who pulled strings for that hero of children's television, Mr. Rogers, but he did.

Hunter's storied professional credits define him as an influential statistician. He was founding editor of *Technometrics*, co-author of *Statistics for Experimenters*, and author of the statistics textbooks *Design of Experiments* and *Statistics for Problem Solving and Decision Making,* among others. He was also 1992 president of the ASA, a member of the National Academy of Engineering, and a Princeton University professor for nearly a half century.

Yet, talking to 92-year-old Hunter about his career milestones—perhaps because he is just the sort of 'scoundrel' he affectionately called his many young students and consulting associates through the years, or because he is too humble and modest to loudly blow his own horn—Hunter tells you, while chuckling, about the unexpected day when he came to pull strings for Mr. Rogers, instead.

They were roommates of sorts—Mr. Rogers and he—in the Pittsburgh television studios they shared, while each was recording the TV series for which they are famed. When you spend time in Mr. Rogers' neighborhood and the electric train being used in the episode he's filming doesn't work properly, what do you do if not pull strings to make the train move?

True, Mr. Rogers may be the household name, but any statistics professor trying to bring the science alive for students owes it to them to watch Hunter's black and white TV series on design of experiments, circa 1961, which you can find on YouTube today at *http://bit.ly/1CEhSY6.*

ASA Board Member and Williams College Professor of Statistics Dick De Veaux, who is one of so many Princeton University alumni who credit Hunter with first alerting them to the field of statistics, talks with reverence and deep affection about Hunter's teaching techniques. "I had no interest or familiarity with statistics, but signed up for it because it was a requirement in engineering," De Veaux recalled. "He was amazing—so engaging and making statistics come alive! After I took his first course, I took any course he was teaching each semester."

A new Sergeant, Stu Hunter

De Veaux continued, "Today we have so many tools for teaching—interactive graphs and cool software—and he had none of that. All he had to work with were formulas and slide rules, and yet he made it exciting. He had so many real stories, for example as an early investigator of airbags, but no gimmicks like we have today."

It is the report card on teaching by Princeton students that matters most to Hunter as he looks back on his career. "The undergraduates judged the classes they took and *The Daily Princetonian* printed the names of the top 10 professors in the school," Hunter said recently. "I was on the list one or two times, and, on one occasion, I had two courses in the top 10. Statistics was not a popular course, but I was a popular teacher."

JMP/SAS Principal Research Fellow Bradley Jones, who considers Hunter not only a professional colleague but also a friend and who has done joint lectures with Hunter in recent years, comments, "He commands the stage, using his body almost like a dancer to make his points. It's a wonderful thing to watch and listen to.

"Giving a talk with him is great fun too. Once we gave a workshop seminar together where he would pick a topic from the beginning issues of *Technometrics* in 1959 through the 1980s in our joint research area of design of experiments. He'd

talk about how you would accomplish it at first, and I'd then talk about how you could solve the same problems with modern software.... He likes to tell the story of how upset he was with me because, in graduate school, he had spent an entire weekend doing painstaking computations to invert a matrix that I could produce with modern software in just a few seconds."

Even if you take computing for granted in your statistics work today, talk to Hunter and you too will likely be newly awed by how computers have changed the profession.

In 1941, just out of high school and with plans to someday be an attorney, Hunter got his first job with the Prudential Company working in their actuarial department where he did many calculations with IBM punch card computers. He then served in the Army in the Philippines during World War II, specializing in the calibration of heavy ordinance. The Army had earlier sent him to North Carolina State University for special training, and when he got out of the service he decided to return there for his bachelor's in electrical engineering, in 1947, followed by a master's degree in mathematics with a minor in statistics in 1949. During his studies, he worked part time, and then, upon graduating, full time for Gertrude Cox in the computing lab she had established at North Carolina State University.

Hunter says, "I can remember when the 602A IBM computer arrived. It was called a calculating punch, the first computer we had that could be programmed to multiply and divide numbers. Before that machine came, whenever we had to multiply we'd have to sort the cards and put them in an accumulator repeatedly. It took a long time just to get the sum of the squares!

"If I were teaching today, I'd be using statistical software, but that just didn't exist in the 50s and 60s when I was teaching a class and making the videos for Westinghouse. For teaching tools on TV, I had a black felt board and pieces of cardboard that would stick on the felt. All computations were very humble. It's a different world today when you consider the proliferation of statistical software and the availability of color graphics as teaching tools."

Perhaps even more amazing to Hunter are the changes he has witnessed, and played a hand in creating, in worldwide industry. Hunter grew up in Linden, New Jersey, by the New Jersey Turnpike and not far from Newark Liberty International Airport. He says, "We lived in the shadow of oil refinery gas tanks and flare stacks. My father always said that we should never complain about the smell because it meant men were working."

Later, after his PhD (1954) and before George Box invited him to Princeton in 1962, Hunter went to work for the American Cyanamid Co. as an in-house statistical consultant. After he became an academic, Hunter's consulting practice expanded and grew so rapidly that he once quipped to De Veaux that he was forced to retire from teaching because he was too busy.

Hunter, giving a lecture in 1957

Hunter not only did consulting himself, but broke in many younger statisticians to do similar work, describing that aspect of his mentoring by saying, "If I had an afternoon off from teaching available to do consulting I'd invite guys like De Veaux to help me with the lectures. They were all high-energy young men and they also got paid, which they enjoyed a great deal. And I certainly enjoyed their company."

The way De Veaux tells the story, it was actually Hunter who supplied the energy. De Veaux remembers, "One day in 1986 after I started teaching at Princeton, Stu comes into my office to show me his agenda book written with his very precise handwriting that you always remember. One week he had entries that said 'Alcoa, Alcoa, Alcoa,' and also 'Ford, Ford, Ford.' He then said to me, "I can't do both. Which do you want?' We decided on Alcoa, and then Stu calls Brad Novick, who headed statistics at Alcoa, and tells him he has a young associate whom he wants to do the job. Novick, of course, says 'Are you kidding?' and we were then put on a trial run working together. His mentorship meant so much to me—we worked together and separately on those consultations for almost 10 years.

MORE ONLINE
Hunter's black and white TV series on Design of Experiments, circa 1961, originally funded by Westinghouse can be seen on YouTube today courtesy of JMP/SAS at *http://bit.ly/1CEhSY6.*

(Stu) Hunter, (Bill) Hunter, and (George) Box at the Gordon Conference singing "There's no theorem like Bayes theorem." More pictures from this event can be found at *www.amstat.org/sections/spes.GRCPastPictures/*

"I remember another time when we were at Gordon conferences together and he tells me that we will have to miss Tuesday's events. 'Why?' I asked. He then explains we have a consulting job with Scientific Instrumentation Labs. We were in Maine and, when that Tuesday arrived, someone came to pick us up at 6:15 in the morning to drive us to Boston. We had 20 groups, starting at 8 a.m., and it continued until 5:00 in the evening. A group would come in and tell us their issues, and then the next group would come in. Can you imagine a more intensive learning experience? Later, when they drove us back to the conference, he was still going! He's the Energizer Bunny! We had been immersed in it for 12 hours by then and I was totally wiped out. That's Stu."

It wasn't just American industry Hunter touched, but worldwide industry, and perhaps most significantly, Chinese, whose transformation to the industrial behemoth it is today can in part be traced back to Hunter, though he will tell you the change in China he helped bring about stuns him.

It wasn't long after the famed Ping Pong games that opened a door in Chinese and American relations that Hunter nearly became Henry Kissinger's roommate, too. Kissinger, who had been negotiating with China before Nixon's arrival to officially thaw Chinese-American relations, had just vacated an apartment where Hunter stayed in 1980 and 1981 on his way to become a member of the National Center for Industrial Science and Technology Management Development in Dalian, China. Hunter explains, "The U.S. Department of Commerce had decided to create exchanges between Chinese and American industry. This included a five-week course on manufacturing processes for which they asked me to give lectures on quality control and applied statistics.

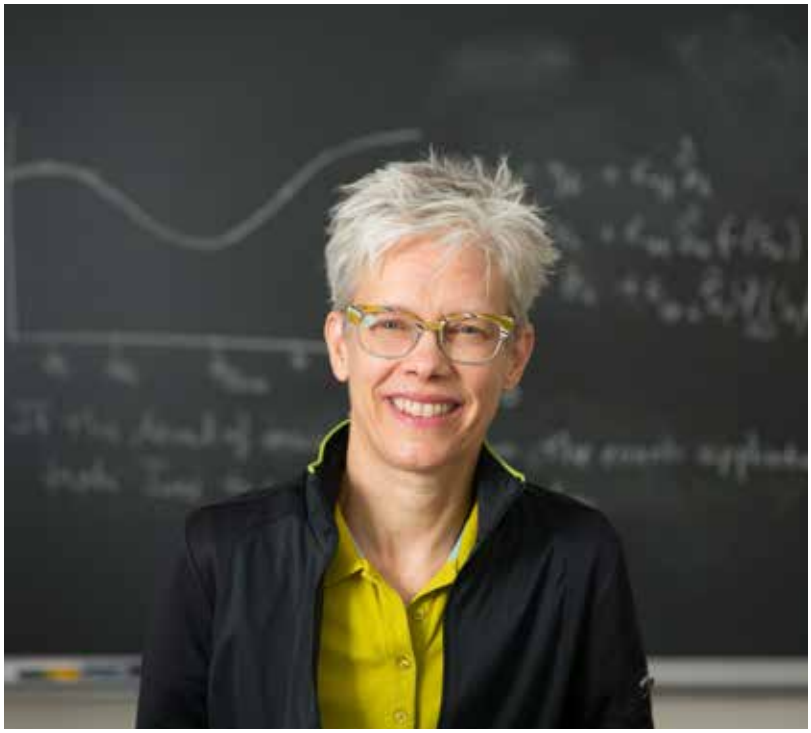
"For two summers, my wife and I traveled to Dalian, China. My wife was the first Western woman that many Chinese people had ever seen. Wherever she went, she'd attract crowds and people would try to touch her. They were respectful, but awed. Also, we had a refrigerator in our apartment. Many Chinese had never seen one of these, either, and they would come to our apartment to see it.

"The Dalian staff translated all my talks—some on statistics and some on design of experiments so that there was a textbook of my talks by the second year, and that's how I came to have a Chinese textbook."

While global travel is relatively commonplace today, it wasn't when Hunter began teaching short courses. Lecturing became a passport of sorts, taking him to South Africa, Australia, Japan, New Zealand, Argentina, Sweden, and Korea. Sometimes he went alone, but he often took his wife and their three young children, who got to see parts of the world their peers could only imagine.

To this day, Hunter marvels at much of what he saw in these travels, such as South-African streets lined with semi-precious stones, discarded because they were near the prized diamond mines with the greater treasure. Or, also in South Africa, mines so deep the rocks were hot to the touch.

It's been quite a career and it's still going. This coming year, Hunter hopes to find an excuse to visit the JMP people in Raleigh, a favorite city where he met and married his wife. He'll also be going to professional meetings in Seattle, and perhaps to the next Stu Hunter Research Conference, of which he says, "I had always complained about national meetings where there are hundreds of 20-minute presentations and no time for conversation during the sessions. The Gordon Conference meetings, in contrast, meet for a week in which there are only two to four papers a day. The speaker has an hour or so to give a talk, during which time he can be interrupted, and then there is a Q and A with debates. It's very leisurely and much more enjoyable. I'm delighted that this new conference follows the Gordon model, though I really didn't have anything to do with setting it up. It's embarrassing that they named it after me when they could have named it after someone important like George Box. ■



In 2014, **Susan A. Murphy** could give students at least 1.75 billion reasons to go into statistics.

This year, she has even more. . .

Meet **Susan A. Murphy**
—On and Off the Hockey Rink

Amy Munice, ALM Communications

Why 1.75 billion? That's the number of smart phones proliferating the planet, creating a window of opportunity for statistics research she enthusiastically points out to students at the University of Michigan whenever she can. Murphy says, "This is a fantastic time to go into statistics. Every time we have figured out a new way to collect data, there is an explosion in both the need for statisticians and great excitement for what can be done with the data. This is one of those historic times! We have all these new ways to collect data via wearable sensors, the Internet, genetics, astronomy, and more, and it's creating all kinds of new problems for data scientists to solve."

For Murphy, the way in which smart phones are opening doors for statisticians isn't just theoretical. Smart phones and other mobile devices are key to her research on Just in Time Adaptive Interactions (JITAI). Whether it's finding ways to help drug addicts, smokers, heart disease patients, dieters, or people with any number of similar chronic health conditions where behavioral change is key to clinical outcomes, Murphy and her many collaborators are looking at ways to use mobile devices for both data collection and as intervention tools.

By implementing micro-randomized trials on various intervention regimens, Murphy helps JITAI clinicians get sound data on what works and what doesn't. Getting it right is no small matter to Murphy, who says she was originally attracted to creating solutions in the addiction field because "these are people who live on the margins of society and [are] usually not viewed with much empathy. From a more scientific perspective, what's really cool is that, in the addiction and mental health fields, we understand how difficult it is for a person to be motivated to change their behavior, like avoiding risky locations and/or taking their medication on time. . . . Things can happen in a person's life that throw them off course."

Murphy talks to new PhDs at the University of North Carolina at Chapel Hill about the importance of communication. If you wish to listen to the speech you can view it on YouTube at *http://bit.ly/1eeqGl9*

Ping the patient too many times and they might turn off or tune out the clinical intervention app. Send messages to de-stress patients whose calendar shows they are having a jam-packed day and you may be spinning your wheels again, or worse—triggering them to figuratively toss their nagging smart phones into the waste bin. These are the kinds of issues Murphy's statistics aim to accommodate, yet still help people improve their health. See her YouTube video in which she gives a pithy summary of how JITAI works—*www.youtube.com/embed/82H4B5ZeucY*.

Listen to Murphy talk and you are immediately impressed by her ability to cut through the complexities within data and data analysis to make both the promise and nuances of JITAI plain. Perhaps that ability was a driving factor for the MacArthur Foundation when they awarded her a MacArthur Fellowship in 2013. Murphy started to transition her research into JITAI mobile health about four years ago, having the usual challenges of gaining credence and getting funding. The Genius Grant changed that. "Now, because of the MacArthur grant, I have much greater cachet with behavioral and clinical scientists, who now are more willing to conduct clinical trials and submit funding proposals related to JITAI," says Murphy. "They know they are taking years out of their life taking on these research projects, and the external acknowledgement of the MacArthur Award has been a swaying factor."

Along with the MacArthur, Murphy gained additional clout with scientists with her election to the Institute of Medicine in 2014. There is a downside to these awards, however. Murphy is now facing an unprecedented number of requests for her time and attention. Her dance card was already quite full, even before the MacArthur award. In addition to her many collaborative research projects involving JITAIs, her duties include teaching and other responsibilities as the H.E. Robbins Professor of Statistics, research professor at the Institute for Social Research, and professor of psychiatry—all at the University of Michigan in Ann Arbor.

Since 2000, she also runs an active lab, the Statistical Reinforcement Learning Lab (*http://bit.ly/1LAu3GF*), which includes another statistician; a behavioral science researcher; and several postdoc fellows, graduate students, and undergrads. The lab not only works on statistics for JITAI development, but also the field that Murphy has pursued before—Sequential Multiple Assignment Randomized Trials (SMART), a type of clinical-trial design for helping clinicians provide the best sequence of treatments, adapted to their patients.

Murphy spends a good deal of her time espousing the benefits of adaptive interventions and JITAI to statisticians, clinicians, and scientific researchers. "A few years ago, we ran a workshop for clinicians at which we coined the phrase Just In Time Adaptive Intervention," she says. "Now we see references to this acronym appearing across mobile health. Our practice starts with how you make intervention design sufficiently precise so that you can improve the intervention by using data. We work to help identify the components of JITAIs so as to help scientists think experimentally about how to manipulate the components so as to improve effectiveness."

She continues, "It was only one year ago that we introduced micro-randomized trials for use in constructing JITAIs, and we already are seeing behavioral scientists moving on these ideas. It's a new world now in terms of how to get ideas out. In the old world, ideas were touted in publications. In the new world, publication remains important, but so are tutorials, doing workshops, meetings, and running brainstorming sessions

that help get the ideas out.

"With micro-randomized trials, our next phase is to collaborate on a series of high-quality trials; these trials will not only provide data to help scientists develop JITAIs, but will also spur us to modify the trial design to increase the usefulness of micro-randomized trials in mobile health. The MacArthur Grant is really helping us develop micro-randomized trials and encourage their adoption."

If you view the research Murphy and her teams are doing through the lens of the national health crisis and runaway costs, you too may start chomping at the bit for results sooner rather than later. Indeed, Murphy comments, "Too much of the morbidity in the U.S. is due to health behaviors. We eat too much. We don't exercise. We don't take the pills that have been prescribed to us. We smoke. We don't manage our lives well. When someone gets a chronic disorder—for example depression or addiction—and they try to deal with it, they often develop maladaptive behaviors. The illnesses themselves are maladaptive."

She adds, "Think of being sedentary. It's easy to be sedentary. The question is: How can we get you some support in your life that will help you be less sedentary and won't aggravate you so much that you just delete the app?

"Wearable devices collect large amounts of data in real time. This is a Big Data problem with challenges such as figuring out which features of this vast amount of data (your location, how busy you are, volatility in stress) we use to do the adaptation as part of the JITAI. What I really want to see in the next 10 years is the development and trialing [sic] of statistical algorithms that will continuously update Just In Time Adaptive Interventions as people experience the interventions via the mobile device in real life. I think of real situations where people's lives change abruptly—their child starts school or their spouse starts a new job. If we are providing support by mobile devices, we will need statistical algorithms that can quickly change when or which interventions should be provided when someone's life has changed in these ways. In a decade, we will hopefully have tested many algorithms, and the ones that enable these interventions will be identified."

"In a decade, we will hopefully have tested many algorithms and the ones that enable these interventions will be identified."

Busy as she may sound—and she is—you'd be mistaken to think Susan A. Murphy is all work and no play. Play she does—last year, three times a week on various ice hockey teams where she gives full throttle to her parallel passion for athletics. Currently on a wing position, she's played both offense and defense. Her teammates include people from all walks of life, including psychiatrists, engineers, and graduate students. Socially, these are her main group of non-work-related friends.

Murphy explains, "Hockey is completely consuming, so you can't think about work. It's a totally different way of using your mind than being a statistician, but it's similar to academic work in that it's very difficult. You have to constantly work at getting better."

She adds, "I try to be on the ice as much as I can.... I'm not the best player in the world because the really good players started when they were four. I used to be a runner, but I tore my knee up and it turns out that ice skating is easy on your knees. Usually, I'm the only gray-haired person on the team!"

Ice hockey might strike you as an unlikely passion for a born-and-bred Louisianan like Murphy, who suffered through the "cold weather" in North Carolina when she earned her PhD at UNC Chapel Hill. But perhaps a window on just how deep Murphy's ice hockey passion runs comes from her husband, Terry Murphy, a former athlete who competed at the state level when they met in college. He comes to her games when he can and is eager to give her pointers. Then again, he can only take so much given Murphy's native abilities. Maybe that helps explain why he has created a rule that she can only talk about hockey for one hour a day. Murphy quips, "If he left me tomorrow, hockey is probably all I'd ever talk about."

Then again, get Murphy talking about mobile health and Big Data and you realize ice hockey is but one passion. Just listen to her talk to newly minted PhDs at UNC: *http://bit.ly/1eeqGI9*.

Where it's SMART or JITAI, statistics-driven health care is always a passion and one reason why the MacArthur Foundation, the ASA, and all those in the know count Murphy as one of the most influential statisticians of our time. ■

ASA LEADERS REMINISCE:

Brad Efron

James Cochran

In the ninth installment of the *Amstat News* series of interviews with ASA presidents and executive directors, we feature a discussion with 2004 president Bradley Efron.

Bradley Efron is Max H. Stein Professor of Humanities and Sciences, professor of statistics at Stanford University, and professor of biostatistics with the department of health research and policy in the school of medicine. He completed his undergraduate work in mathematics at the California Institute of Technology in 1960, and he earned his doctorate in statistics from Stanford in 1964, joining the Stanford faculty that same year. Brad was promoted to full professor there in 1972. He was associate dean for the school of humanities and sciences from 1987–1990, served three terms as chair of the department of statistics, and, since 1980 has served as co-director of Stanford's Mathematical and Computational Sciences Program. Brad has held visiting faculty appointments at Harvard University; Imperial College, London and the University of California, Berkeley. He was elected president of both the American Statistical Association (2004) and Institute of Mathematical Statistics (1987–1988). He is a past theory and methods editor of the *Journal of the American Statistical Association* and was the founding editor of the *Annals of Applied Statistics* from 2006–2012.

Brad is a fellow of the American Statistical Association, the Institute of Mathematical Statistics, the Royal Statistical Society, the International Statistical Institute, the John D. and Catherine T. MacArthur Foundation, and the American Academy of Arts and Sciences. He is also a member of the National Academy of Sciences. A recipient of the Ford Prize of the Mathematical Association of America and both the Wilks Medal and the Noether Prize of the American Statistical Association, Brad was awarded the 1998 Parzen Prize for Statistical Innovation by Texas A&M University. In 2003, he was selected for the first Rao Prize for outstanding research in statistics by Pennsylvania State University.

In 2015, Brad received the National Medal of Science "for his contributions to theoretical and applied statistics, especially the bootstrap sampling technique; for his extraordinary geometric insight into nonlinear statistical problems; and for applications in medicine, physics, and astronomy." In 2014, he was awarded the Guy Medal in Gold by the Royal Statistical Society, an honor bestowed only every three years, "in recognition of his hugely influential contributions to both theoretical and applied statistics." The published citation continues: "He has made seminal contributions to many areas of statistics, including empirical Bayes analysis, the analysis of survival data, applications of differential geometry to statistical theory, and analysis of multiple testing problems in inference for gene expression data. He is best known for his introduction of the bootstrap method of statistical inference. His work is characterized by its depth, simplicity of presentation, geometric insights and by a desire to understand statistical procedures from both frequentist and Bayesian perspectives."

Q Thank you for taking time for this interview, Brad. You earned your BS degree in mathematics from the California Institute of Technology before earning your MS and PhD in statistics from Stanford University. Did any courses that you took in pursuit of your mathematics degree or any of the faculty at the California Institute of Technology motivate your future studies in statistics?

A The number of statistics courses at Caltech during my undergraduate years was close to zero. In my senior year, I prevailed on one of the math faculty guys to let me do a reading course in Cramer's wonderful book *Mathematical Methods of Statistics.* Cramer wrote the book under virtual house arrest in Sweden during the Second World War. It is mostly probability and good old-fashioned math stat, but there I was under statistical house arrest at Caltech, and it very much appealed. It still has an honored place on my shelf.

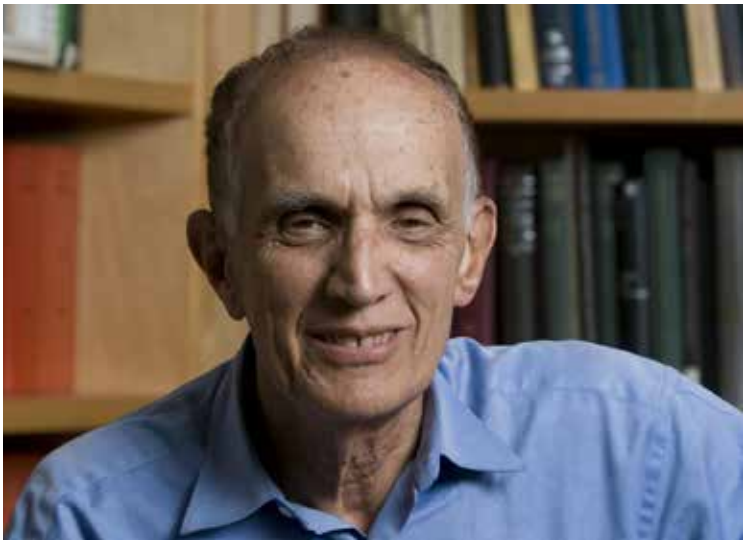
Q You have consulted extensively with several organizations including the RAND Corporation and the Google Analytics Group. What particular projects that you worked on with these organizations were most interesting or challenging?

A In the 1970s, RAND was carrying out the Health Insurance Study. This was an amazingly ambitious randomized experiment on the effects of various levels of insurance—100% compensation, 50% compensation, etc.—on medical usage. The economist Joe Newhouse was the principal investigator, while Carl Morris was the lead statistician. My role, which was vastly enjoyable, was to discuss statistics in general and the Health Insurance Study in particu-

lar with Carl. My main contact at Google was my former PhD student Omkar Muraldiharan. They are almost literally awash in data at Google, to the point where "terabytes" disparagingly describes small data sets. The place is sort of a madhouse of science, numbers, and business. We talked about bringing empirical Bayes methods into play. Omkar and his colleagues have continued to develop such ideas, and much more.

Q In 2007, you became the founding editor of *The Annals of Applied Statistics*. What motivated you to establish this journal?

A Ah, *The Annals of Applied Statistics,* by far my most successful editorial stint. In fact, *AOAS* was suggested by the Council of the Institute of Mathematical Statistics, showing that committees really can have good ideas. They felt, correctly, that the IMS needed to have some presence in the world of statistical applications. My editorial masterstroke was to recruit three world-class "area editors": Steve Fienberg for social science, Mike Newton for biostatistics, and Mike Stein for physical sciences. It's hard to define "applied statistics." Lining up topics from right (pure math stat) to left (direct applications), we took as our remit anything in the line's left half. The hardest thing about starting a new journal is getting enough good papers, or, sometimes, enough papers period. I kept nervous graphs of our submissions, agonizing over random fluctuations downward. After a couple of years, the graphs took a sudden lurch upward, and the rest is history as they say. My parting joke was to put one of my own papers—the paper's not the joke—at the end of my last issue as editor.



2004 ASA President Bradley Efron

Q You have been teaching statistics for more than 50 years. What course or courses have you most enjoyed teaching, and why?

A My favorite course to teach is Exponential Families in Theory and Practice, usually taught to our first year PhD students. It's often required, which guarantees an audience! I start out with a sort of bull's-eye picture—normal theory in the central circle and general asymptotics around the periphery. Then, and this is the dramatic part, I draw in an intermediate circle labelled "exponential families." The point of the picture, and the course, is that exponential family theory is the main way statisticians extend the exact results of the normal world toward more general structures. And it's worth saying that the theory hasn't been left in the dust by modern Big Data statistics, and in fact is prospering even in Google's extra-Big Data environment.

Q In 1983, you were named a MacArthur Prize Fellow. What was the impact of this award on your career as a statistician?

A The money from the MacArthur award was quickly spent, but the effect on my reputation in the general world of science lingered. Compared to other fields, statisticians don't give each other enough awards. The COPSS (Committee of Presidents of Statistical Societies) award, for instance, has had a good effect on highlighting several worthy careers. I very much like that Rao and Parzen have instituted quite successful award series.

Q On what special project are you currently working?

A Right now, my main professional activity involves a book in progress, *Computer Age Statistical Inference,* that I am writing with Trevor Hastie. Our idea was to examine the effect of electronic computation on the development of statistical theory and practice from the 1950s to the present. Each chapter surveys a particular topic—empirical Bayes, survival analysis, generalized linear models, etc.—and tries to say how electronic computation did or did not affect its development. We're into the 21st century at last, with topics such as false discovery rates, sparsity and the lasso, and support vector machines making their appearance. ■

Please return to this column next month, when we will feature an interview with 2006 ASA President Sallie Keller.

Rod Little gives the Fisher Lecture in 2012.

A Conversation with **Rod Little** on His Career in Statistics

Gong Tang, Associate Professor of Biostatistics at the University of Pittsburgh, and Michael R. Elliott, Professor of Biostatistics and Research Professor of Survey Methodology at the University of Michigan

This conversation occurred at Ann Arbor, Michigan, on April 28, 2015.

Student Years

Tang: *Rod, you had a bachelor's degree in math. What made you decide to pursue graduate study in statistics?*

Little: The career advice for mathematicians at Cambridge at that time favored operational research (OR), and when a job didn't materialize for me I was looking to do a master's degree in that field. There was a master's program in statistics and OR at Imperial College, and I applied because of the OR part, and because my girlfriend at the time happened to be in London. The program turned out to be 90% statistics and 10% operational research, so I ended up in statistics. It turned out to be a wonderful move.

Tang: *You finished your master's and doctoral degrees in statistics within three years. How did you finish so efficiently?*

Little: It was not unusual in England at that time. One had a three-year grant, and was expected to complete in that period. I was fortunate to have a very supportive adviser, Sir David Cox. My unofficial advisor was Martin Beale, with whom I ended up working. I was also lucky to have a fruitful research topic.

Early Career

Elliott: *In 1974, you started your career as a faculty member at the prominent department of statistics at the University of Chicago. After two years, you went back to London to work at World Fertility Survey (WFS) for the International Statistical Institute. How did you make those career choices?*

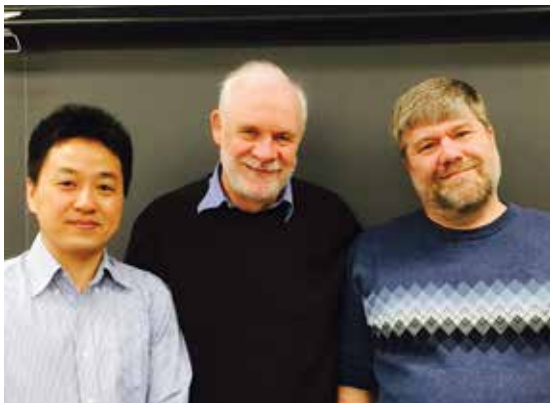
Little: The statistics department at Chicago was looking for people who could help with consulting, and they had the strange idea that English people could analyze data. They contacted Sir David Cox, and he gauged my interest. It was a great opportunity, even though the position was short term. During the second year, Sir Maurice Kendall came through to recruit people to work on this fantastic project that would make everyone famous, the WFS. He encouraged me to apply, and it turned out to be a wonderful way to start a statistics career.

Elliott: *What was good about the WFS?*

Little: It was a real study, the largest social science project in the world at that time. There was a smart young group of demographers, statisticians, and computer scientists, led by a famous and charismatic statistician, Sir Maurice Kendall. I learned a lot from the demographic application about connecting statistics and the real world. It was not too onerous, I had the flexibility to write my own research, and I got to travel and teach widely in developing countries.

Elliott: *In 1976, Don Rubin's landmark paper "Inference and Missing Data" was published with your formal comment in* Biometrika. *You and Don later became close collaborators. How should young researchers think about collaborations and choosing good collaborators?*

Little: I have had the good fortune to learn from and work with a number of top-notch statisticians—Sir David Cox, Don Rubin, and Sir



From left: Gong Tang, Rod Little, and Michael R. Elliot at the UM Department of Biostatistics in 2015

Maurice Kendall, to name just three. If you have a chance to work with one, you should jump on the opportunity, even if other jobs are better paying or have more prestigious titles.

Elliott: *In those early years of your career, you published a few papers about missing data and sample surveys in journals such as* JASA *and the* Journal of the Royal Statistical Society, Series B. *Was the research motivated by your work at the WFS?*

Little: The survey part, yes—missing data were not as serious an issue in the WFS because people in developing countries generally responded. Leslie Kish was involved in the designing of surveys, and there was a big survey sampling component. There was also a modeling component because the demographers used models. So I got interested in the design-based versus model-based approaches to survey data analysis.

Years at UCLA

Tang: *In 1983, you moved to the department of biomathematics in the school of medicine at the University of California at Los Angeles. Can you shed some light on the move and the transition to include medicine in your fields of application?*

Little: After the WFS, I spent three formative years working with Don Rubin at the Environmental Protection Agency (EPA), and then as a fellow at the Census Bureau in Washington, DC. Those jobs were great but short-lived. Wil Dixon, a well-known statistician who started the statistical software BMDP, was at UCLA and formed a good opinion about me from my adviser Martin Beale. He pushed strongly for my appointment as tenured associate professor in the department of biomathematics, although I had not previously held a tenure-track position. I did get another offer from University of Washington at Seattle for a joint appointment between statistics and sociology. But the future funding for that position was uncertain. I decided to go to UCLA because it was tenured. (The UW job was eventually taken by Adrian Raftery, so I think of Adrian as my gift to that university.) The biomathematics program at UCLA was small, but distinguished. I was hired for the statistical component and got more involved in biomedical consulting as part of the switch from statistics to biostatistics.

Tang: *During the next 10 years at UCLA, you were principal investigator on one National Science Foundation (NSF) grant and two National Institute of Mental Health (NIMH) R01 grants. What are important factors for success in securing research grants, especially for young investigators?*

Little: It was a little easier than nowadays. I think one needs to have good ideas, a good publication record, and the ability to write well. You can't win unless you apply, and try to learn from rejections. It is tough but a good way to force yourself to think about what you are doing and where you are going, even if you don't get funded. Persistence is important.

Tang: *During your years at UCLA, you published several influential works on missing data and sample surveys, and established your status in these fields. You also published a classical textbook,* Statistical Analysis with Missing Data*, with Don Rubin in 1987. What stimulated such productivity?*

Roderick J.A. Little is the Richard D. Remington Distinguished University Professor in the Department of Biostatistics at the University of Michigan, where he is also Professor of Statistics and Research Professor at the Institute for Social Research.

He has published four books, more than 200 papers, numerous commentaries, book chapters, and research reports, and has served as thesis adviser or co-adviser for some 30 students. His work focuses on the analysis of missing data, sample surveys, and causal inference with applications across a wide range of disciplines including medicine, demography, environmental statistics, economics, and social science. He is an elected fellow of the American Statistical Association (ASA) and the American Academy of Arts and Sciences, and a member of the International Statistical Institute and the Institute of Medicine of the National Academies. Little was the 2005 Samuel S. Wilks Award Winner for his contributions to statistical research and practice, and the 2012 COPSS Fisher Lecturer.

He was the inaugural associate director for research and methodology and chief scientist of the U.S. Bureau of the Census from 2010–2013. Little has served the statistics community in various roles, including vice president of the ASA from 2010–2012, coordinating and applications editor of the *Journal of the American Statistical Association (JASA)* from 1992–1994, and chair of the Oversight Committee for Handling Missing Data in Clinical Trials at the National Academy of Sciences. This fall he will become co-editor of the *Journal of Survey Statistics and Methodology.*

Born near London, England, and raised in Glasgow, Scotland, Little obtained a bachelor's degree in mathematics from Cambridge University, and master's and doctoral degrees in statistics from Imperial College, London University.

Rod Little sings at a University Musical Society Choral Union rehearsal.

Little: The book with Don Rubin actually started earlier when I was at the EPA—books take a while to complete. The job was mainly doing research, writing papers, and teaching, and I guess I tried to do it well. I was fortunate to have time to teach, do methods research, and work on that collaboration.

Years at Michigan

Elliott: *In 1993, you became the chair of the department of biostatistics at the University of Michigan. Was it primarily because you were interested in leading an academic program, or were you also attracted to Michigan for other reasons?*

Little: It was a combination. I enjoyed Los Angeles, but my wife, Robin, was not so keen on the earthquakes, pollution, and life in the big city. I was attracted to Michigan because of its strong group of faculty and graduate students—I felt there was great potential there. I was acting chair of biomathematics at UCLA for a year, so I got my feet wet with administration. As you know, Ann Arbor is a great town, and Robin and I never regretted the decision.

Elliott: *Besides continuing research in missing data and sample surveys, you started expanding your research in causal inference as well as Bayesian statistics. Can you share with us some thoughts about how you kept developing new research topics and making fresh contributions?*

Little: At the WFS, Sir Maurice Kendall was interested in how to do causal inference in observational studies, and in particular path analysis. Rubin worked on causal inference and stimulated my interest because he viewed causal inference as a missing-data problem. I always have had a pretty broad range of statistical interests, partly because missing data arise in many areas of statistics, and work in missing data led me to consider various areas. Maybe I picked up my taste for broadness from my father, who was a journalist with very eclectic interests. Anyway, I guess my contributions tend to be broad rather than specialized. Others focus on a narrow area and make deep contributions, and that's obviously fine too. My advice is to just do what you do best.

Elliott: *When you were chair, you recruited a number of junior faculty members who later became highly successful statisticians in their own right—including Robert Strawderman, Xihong Lin, and Debashis Ghosh—who are now department chairs. They had different strengths and quite different research agendas. How did you help them to start their career?*

Little: By leaving them alone to do their own thing, while trying to be as supportive as possible. I did not come to Michigan biostatistics with a narrow research agenda for the department, and see the wide range of research interests as a big strength.

Elliott: *Since 1993, the department of biostatistics at the University of Michigan has grown dramatically, producing many outstanding graduates and becoming one of the top graduate programs in biostatistics. What advice would you give a new chair to develop a successful graduate program in biostatistics?*

Little: I had a supportive dean who valued statistics as more than a service discipline. Recruit the best students, staff, and faculty that you can—it's all about the people. We try to nurture a democratic, collegial atmosphere at Michigan, and that helps to recruit good people. As chair you have the responsibility to run the department well, seek input but make tough decisions when needed, and support your colleagues. It's not about you.

Elliott: *From 2010– 2013, you served as the inaugural associate director for research and methodology and chief scientist at the U.S. Census Bureau. What motivated you to take that challenge?*

Little: Bob Groves, who was the head of the Survey Research Center at Michigan, was appointed as the director of the Census Bureau. He previously had a research role in the census and was interested in creating a new research and methodology directorate, to give research more visibility. He knew me from working together on missing data and surveys, and asked me to be the first leader of the new directorate. It was a good opportunity to make an impact on government statistics, which has been an interest of mine. Both Robin and the university were supportive. It was an interesting couple of years. The new directorate was formed, and I believe is playing a pivotal research role in bureau activities. The leadership is rotating under Groves' vision, and I have great successors in Tom Louis, and the person taking over from him, whom I know but is yet to be announced.

Service and Others

Tang: *Mentoring students has been an important part of your career. Do you have any broad guidelines you could share about this process?*

Little: I think there is a wide range of styles and many can work. My approach also depends on the student, so it's not one size fits all. I try not to be too intrusive or put too much pressure on students, since I

think they are usually motivated to succeed without my nagging. The initial research ideas generally come from the adviser, and the objective is to have the student's contributions toward the research grow over time as she or he becomes more mature and understands the field better. I have had great students, and letting them flourish is the main thing.

Tang: *You published numerous papers in top journals such as* JASA, JRSSB, Biometrika, *and* Biometrics *and served in various editorial roles. Do you have any tips for publishing in and editing for top journals?*

Little: Statistical research varies from theoretical to applied, but being a good writer improves the chance of good publications regardless of where you are on the spectrum. So time spent improving writing is well spent. I have style tips on my web site. I benefited from being the son of a journalist, who was interested in writing clearly and concisely. I see no harm in trying top journals, aside from some damage to one's ego. You will probably get rejected the first few times, but you will learn from the reviewers. Editing also involves good writing, and is a kind of learn-as-you-go process. You have to get on the bandwagon by letting people know that you are interested in refereeing papers. If you do a good job refereeing, you are likely to be invited to be an associate editor down the line.

Tang: *You have served as vice president of the ASA and on many national committees. What are the joys of serving those committees?*

Little: Membership organizations such as the ASA, IBS, ENAR, and WNAR have been a great help to me in my career. I encourage all professional statisticians—in academia, government, or industry—to participate in these societies. As for being ASA vice president, the ASA staff and board members are great, and it is fun to work with smart lively people. In particular, ASA Executive Director Ron Wasserstein has been fantastic and is a pleasure to work with.

Tang: *Besides your work, you also enjoy time with your wonderful family and participate in community activities—including a significant amateur singing career and a leadership role on the board of the Ann Arbor Symphony Orchestra. How do you find that balance between work and other components of life?*

Little: As the old saying goes, "All work and no play makes Jack a dull boy." Doing these other things keeps me happy and more productive. I think people should work hard and they should play hard as well.

Philosophy of Statistics

Elliott: *In the book* This Idea Must Die: Scientific Theories That Are Blocking Progress, *Emanual Derman says "Statistics—the field itself—is a kind of Caliban, sired somewhere on an island in the region between mathematics and the natural sciences." Could you say a bit about how you see statistics fitting into the scientific endeavor, especially given the rise of "data science"?*

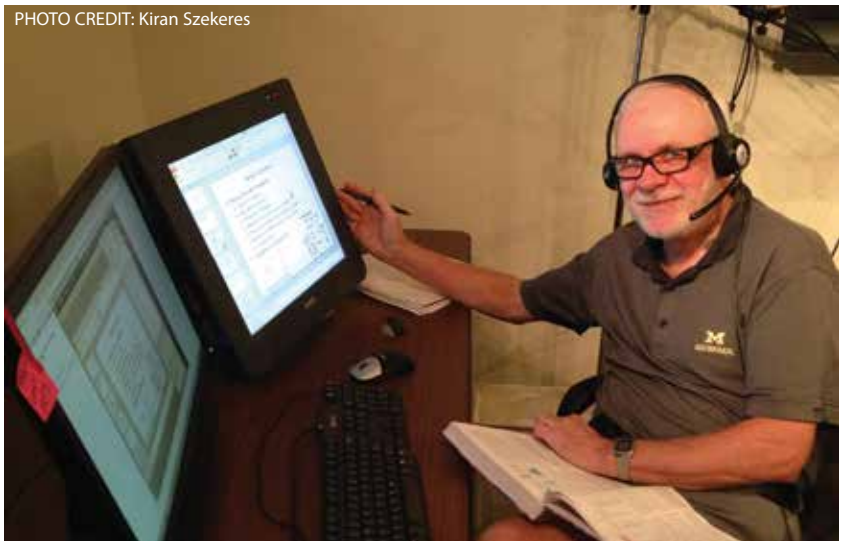


PHOTO CREDIT: Kiran Szekeres

Little teaching online Biostatistics.

Little: Ariel sounds more appealing than Caliban! I touched on this in my Fisher Lecture published in *JASA* a couple of years ago. I started in pure mathematics as an undergraduate, and clearly mathematics is an indispensable basis of statistics. Over time I got much more captivated by the scientific roots and applications of statistics, as in the work of Ronald Fisher or George Box. Statistics is not mathematics, its mathematical basis notwithstanding. The great attraction of statistics is that it can be applied in lots of different areas, and I have had the pleasure of doing this. To be sure I respect people who go deeply into the mathematical roots of the subject, but that is not one of my strengths.

Elliott: *What has stayed constant in statistics over the past 40 years and what has changed? What do you think are likely to be among the most productive lines of research in statistical methodology over the next decade or two?*

Little: I am a fan of a "calibrated Bayes" approach to inference—as espoused by Rubin, Box, and others—and have been advocating this approach for survey sampling, where the design-based approach is less and less compelling, given the growth of Big Data and challenges of obtaining true probability samples. More generally, I think the ideas of statistical theory, having good confidence coverage and the like, and the need for finding useful statistical models for a variety of problems is constant. I think statistics brings rigor to areas like Big Data, where good statistical modeling is constantly needed. What has changed is the enormous development of computational ability and tools. In particular, Bayesian statistics was not very feasible except in relatively small problems when I was a student. The enormous growth of computational power and accessibility to data makes statistics an exciting field to work in these days. ■

MORE ONLINE
Writing a paper? Review Little's style and grammar tips for biostatistics and statistics students at *http://sitemaker.umich.edu/rlittle/files/styletips.pdf.*

TELL US | As a **statistician,** what is your

We asked our Twitter and Facebook followers to respond to the question: *As a statistician, what is your superpower?* Here are some of our favorite responses.

Jon the Statistician
@JWCChristiansen
Good communications skills—the ability to describe complex topics in a simple way

Aaron Springford
@springfordaaron
I like "The Power to Predict Outcomes" http://powerlisting.wikia.com/wiki/Accelerated_Probability Combine with cost appraisal for maximum (expected) benefit!

Paolo Guidici
@Bigdatanalysis
Transforming (big) data into knowledge!

Dr. Diego Kuonen
@DiegoKuonen
Applying statistical thinking and statistical engineering for continuous process improvement

Susan
@SusanAliciaCh
To know that randomness is always part of our lives

Jon the Statistician
@JWCChristiansen
My Bayesian view of the world.

superpower?

Kel Zou
Uniformly Most Powerful (UMP) tests!

Wasiu Biyi Sanyaolu
Regression

Randy Ades
Not sure, skewed

Aniqa Tasnim Hossain
The ability to deal with the people of other fields!

Gavin Stewart
Quantifying ignorance in the face of obsti-nate certainty

CuMhara O Called Kope Figuring out how many animals we can afford, then back-calculat-ing power to IAUC #overlyhonestmethods

Eric Kawaguchi
The power to turn p-values <.05

Cliff Claven
Being able to explain to subject matter experts how statistical methods will solve their problems.

Robbie Emmet
My superpower is Super P (Reject H_0 | H_a true)

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Statistical and Team Leadership: My Career Development Journey

LeAnna G. Stork, Monsanto Co.

LeAnna Stork is the team lead for the Regulatory Statistics Technology Center at Monsanto Co. Stork earned her bachelor's in statistics from the University of Nebraska at Kearney, master's in biometry from the University of Nebraska-Lincoln, and PhD in biostatistics from Virginia Commonwealth University.

My career as an applied statistician at Monsanto began nearly 10 years ago, after completing my graduate degrees. I currently lead a team of statisticians working in an interdisciplinary environment. The pace of my work week is rapid, but I learn something new every day. I knew from Day 1 that I wanted to use my statistical knowledge and develop leadership skills to help solve real-world challenges in an attempt to improve agricultural productivity as a means to feed an ever-growing population. For me, this career goal meant not being simply a number cruncher, but also a collaborator and leader.

When I started my job, I immediately began working in an interdisciplinary environment with many talented scientists in a variety of domains, including agronomy and biology. I soon realized that to be the best statistician and collaborator I could be, I would need to think in ways similar to them and learn as much about the subject matter as I could.

To do this, I began meeting with the scientists, asking them questions about their research and experiments, and visiting the labs and fields where the studies were being conducted. This was vital to helping me better understand the real-world conditions and challenges they faced in conducting agricultural research, as well as the sources of variability that would be important in the statistical models.

The first couple of years in my role, I took on as many different projects as possible and gained a better understanding of how to use the tools in my statistical toolbox to help ask and answer important questions. As tempting as it was to email colleagues with questions about their data, or for help with an analysis, I found it was ultimately most beneficial to walk down the hall or pick up the phone and have a conversation. This provided a collaborative environment for discussion, knowledge exchange, and mutual understanding of the question, challenges, and solutions. It also helped me build professional relationships and expand my network in a meaningful way. These collaborations have led to recognition, several publications, and new and exciting opportunities.

Collaborating in an interdisciplinary environment has been exciting, but not without challenges. Excellent communication skills are essential for any successful collaboration. As a consulting statistician, I need to listen to my customers, understand their goals, and appreciate their challenges. Being flexible is another important skill I often use to help find the balance between statistical theory and real-world application.

During my career, I have not been afraid to work on projects or in teams that require little or no statistical work. In fact, I have taken advantage of as many leadership and professional development opportunities, both internally and externally, as I can.

Examples include participating in mentoring programs as both a mentee and mentor, co-chairing a steering team that developed a two-week scientific strategy training, participating in a three-month business strategy program, serving on a Women in Science leadership team, and serving as the chair of the ASA's Conference on Statistical Practice Steering Committee.

These opportunities have had a positive effect on my career development because they have encouraged me to expand my networks, broaden my knowledge of the business and industry, increase my visibility, and use my skills and strengths in new ways.

It is important for statisticians to develop skills to clearly and concisely present their proposals, methods, results, and recommendations to their stakeholders and

leadership for mutual understanding and approval.

Giving presentations to large groups does not come naturally for me. To help overcome this challenge, I find as many opportunities as possible to give presentations to large groups. The topic of the presentation does not always need to be technical. In fact, I recently gave a safety presentation to a group of more than 100 people on distracted driving. Participating in these types of speaking opportunities has helped enhance my public-speaking skills and confidence. I also recently joined Toastmasters International, which empowers members to develop communication and leadership skills.

Identifying coaches and mentors has been, and continues to be, a critical component in my career development. Technical coaches have helped me think about scientific problems and solutions in ways I may not have considered otherwise. They also have helped me expand my knowledge of subject matter in other scientific disciplines. In addition, I have had numerous mentors who have helped me broaden my understanding of the business, shown me how to work through challenging situations, and helped me refine my career development goals.

> "Career development is a continuous and evolving process . . ."

My career development journey has been exciting and rewarding. As a statistician team lead, I have the opportunity to use my statistical tools and leadership skills. I have done this while working in an interdisciplinary environment to help solve the real-world challenges presented by an ever-growing world population. Career development is a continuous and evolving process that I will continue to make a priority, and I would challenge any statistician to do the same. ■

The CHANGING PROFILE *of* **STATISTICS**

Since the dawn of the Internet, the job of a statistician has expanded. One of the newest fields created for statisticians in the past 10 years is forensics.

As well, statistics has broadened for educators and women. Students are learning more statistics before they head to college, and the demand for data analysis also has grown.

On the following pages, we look at what is new in statistics and how the discipline has changed.

Forensic Statistics

Christopher Saunders, Assistant Professor at South Dakota State University

Forensic statistics, as the name suggests, is fundamentally the application of statistics to forensics problems. Over the past 100 years, a number of distinct approaches have been developed for quantifying forensic evidence that favor statisticians with strong backgrounds in mathematical statistics and statistical pattern recognition.

Forensic statistics wasn't a subfield of statistics about which I was aware during my graduate school years. It wasn't until Donald Gantz from George Mason University contacted me to discuss a project focused on the "interpretation and presentation" of the results from a computationally complex statistical-pattern-recognition system that I became aware of the field.

The handwriting identification system, developed by a group led by Gantz and Mark Walsh of Sciometrics, was designed to determine the writer of a handwritten note. After I grasped what the problem required, I was excited to realize forensic statistics was an area in which I could use everything I had learned—from asymptotics to subjective Bayesian methods to computational methods and even experimental design—in a seamless whole.

Out of my discussions with Gantz regarding the methods for approaching the handwriting problem, I was offered an Intelligence Community Postdoctoral Research Fellowship to work with him on providing statistical support to the FBI and broader intelligence community. This fellowship is where I received my training in forensic evidence interpretation, machine learning, and statistical pattern recognition. My mentors throughout have been JoAnn Buscaglia of the FBI Laboratory Division, John Miller at George Mason University, Kathi Taylor, and Gantz.

During my fellowship, I found statistics applicable to many topics within the forensics field, such as estimating the accuracy of new forensic technologies for handwriting identification and trying to define what forensic scientists mean by "individuality." Toward the end of the fellowship, I started to consider myself a forensic statistician specializing in forensic evidence interpretation related to the identity of source.

Forensic evidence interpretation is a specialized area of forensic science related to summarizing or quantifying the value of forensic science to decisionmakers, so that they can make a selection between competing propositions for how the forensic evidence has arisen. There are a number of renowned statisticians who have worked in this area over the years; however, there is still a distinct divide on how forensic scientists think they should present forensic evidence, with most falling into one of two camps. On one hand, a number of the evidence interpretation experts focus on using subjective Bayesian inference as proposed by Dennis Lindley in his paper "On a Problem in Forensic Science." The second major group uses a fusion of Neymann-Pearson and Fisherian-like "*p*-values" in a process known as the "two-stage process."

The role I have fallen into as a forensic statistician has mainly been to help forensic scientists choose and/or develop methods for presenting and interpreting forensic evidence in a manner that is both statistically rigorous and has a high degree of fidelity to the manner in which the forensic scientist chooses to think about the forensic identification process. I have found there is a major lack of formally developed statistical methods for interpreting and presenting the complex evidence forms that have become commonplace in forensic science. This lack of formal statistical methods has led to a proliferation of ad hoc methods for evidence interpretation, which, in turn, has led to a large number of open statistical research questions.

While helping in this work, I tend to rely on my training in

Saunders, originally from California, is an assistant professor of mathematics and statistics at South Dakota State University. In 2006, he was recruited to do work for the FBI in pattern recognition and handwriting identification and spent the next two years as an intelligence community postdoctoral research fellow at George Mason University.

The views expressed here are those of the author, and not necessarily those of the Federal Bureau of Investigation.

The Different Paths in Forensic Statistics

While working on this article for *Amstat News*, I was attending a session on forensic statistics at the University of Salzburg and asked two of the speakers to provide short narratives about their experiences working in forensic science. The first is Jeanette Leegwater, a forensic scientist at the Netherlands Forensic Institute who is pursuing her PhD at the intersection of statistics and forensic science. The second is Mark Lancaster, an assistant professor at Northern Kentucky University. He has served as a program manager for various research enterprises in forensic science for the federal government.

Jeanette Leegwater

My career in forensic science grew out of a childhood love of numbers, puzzles, and solving challenges. After studying biology and completing a bachelor's degree in mathematics at the University of Amsterdam (UvA), I was drawn to forensic science. More than the other sciences, forensic science posed questions that challenged my problem-solving abilities; these were puzzles worthy of and needing to be solved. Furthermore, it is an exciting area of expertise, in which you encounter a broad range of disciplines, and I could apply all of my previous scientific knowledge.

During my time in the master's of forensic science program at the UvA, I had an interest in forensic statistics where the interpretation of evidence using a probabilistic framework is central. This motivated me to do a reading course with Marjan Sjerps, a forensic statistician at the Netherlands Forensic Institute (NFI). We studied Bayesian Networks, which can provide insight into the probabilistic reasoning of a forensic statistician using a graphical model. I did an internship at the Latent Fingerprint Department of the NFI, where I measured ridge density in fingermarks and studied its use in forensic casework. Here, I began to develop the programming skill set necessary to computationally measure the ridge density of a large number of prints. After the internship, I successfully applied for a position as a scientific researcher within the latent print department of the NFI.

Besides blinding case files and assuring quality in case work, the main goal of my work is to objectify the comparison of fingerprints using modern statistical methods. Currently, the fingerprint experts at the NFI are estimating the evidential value of a fingerprint comparison using their knowledge and expertise, and it is essential that their statements are supported by objective and statistically rigorous research.

Mark Lancaster

My introduction to forensic science was through the Intelligence Community Postdoctoral Program, where I worked on issues involving handwriting recognition in the context of questioned documents at George Mason University. This work later led to a short career as a federal employee program manager during which I worked on solving similar statistical problems in the nation's best interest.

I credit my successes in forensic science research primarily to the university consulting experiences I had while learning mathematical statistics at the University of Kentucky and applying what I learned from those experiences at George Mason University. As John Tukey said, "The best thing about being a statistician is that you get to play in everyone's backyard." Of course, it is nice to be invited to play, and even better to be allowed to bring over more friends. Without a strong foundation in learning how to help other scientists with their statistical analyses, "playtime" in forensics would be limited.

As the questioned document research team at George Mason gained understanding in how statistics had been applied to forensics, we found there were many ways to improve on the analyses were being used. We also found that the underlying theory behind some of the calculations was incomplete and further research would be needed to justify them. By being able to explain these issues to practitioners of forensic science, our "playtime" and access to data increase. Only by carefully uncovering and explaining these underlying issues have we been able to make progress in improving the application of statistics to forensic science. Based on these successes, a new group of graduate-level statistical-forensic-science researchers is being educated by Christopher Saunders and Cedric Neumann at South Dakota State University.

Returning to academia at Northern Kentucky University, I am delighted to restart research that applies statistics to forensic science. There is still much work to be done in understanding and statistically characterizing trace evidence, including creating systems that process various forms of evidence to assist forensic examiners and statistical forensic scientists. With my dearest and best friends, I am introducing new undergraduates to these issues, hoping to continue the creation of more statistical forensic scientists.

MORE ONLINE

Read about Saunders' work at the South Dakota State University website: *http://bit.ly/1ecFEyt*

Ian W. Evett wrote about the two-stage process, but is now one of the strongest and most elegant proponents of the subjective Bayesian approaches to forensic evidence interpretation. His publications can be found at *www.researchgate.net/profile/Ian_Evett/publications.*

the different statistical paradigms related to hypothesis testing and model selection. A secondary role I have taken on has been to provide estimates of the performance of an evidence-interpretation method in a given population. This usually takes the form of estimating the rates of misleading evidence in favor of the prosecution and defense for Bayesian or likelihood-based approaches.

My recommendations for a statistical education for someone with the goal of becoming a forensic evidence interpretation expert is to focus on mathematical statistics (including both Bayesian and frequentist methods), computational statistics (it is usually computationally difficult to calculate the statistics necessary to interpret forensic evidence), and statistical pattern recognition. Sampling theory is also incredibly important in building the reference databases needed to assess the performance of the methods in different populations.

All in all, I have found the statistics associated with forensic evidence interpretation to be one of the most enjoyable activities I have done as a statistician, mainly because it is an area in which I can apply multiple statistical subdisciplines. ■

How Statistics Teaching Has Changed Over the Last Ten Years

Randall Pruim, Chair of the Department of Mathematics and Statistics at Calvin College

When I was asked to reflect on how the way we teach statistics has changed over the past 10 years, my first thought was to get some data to inform me. But for an association of statisticians, we have surprisingly little data available to answer questions about how we (collectively) teach and how well it is working. For the most part, I'm left to fall back on a small, biased convenience sample of what I know best, combined with some personal reflection and speculation.

So, how have things changed? There have been several trends that have affected statistics teaching over the past decade and seem likely to continue to have an effect for the next 10 years.

Student Preparation

More students are learning more statistics before they go to college. That much is clear. The number of students taking the AP Statistics exam has nearly tripled over the last decade—66,000 in 2004 to 184,000 in 2014. In addition, the Common Core State Standards Initiative has increased the pressure to include more statistics throughout the U.S. school curriculum. It is reasonable to expect this trend to continue for the foreseeable future.

It's less clear what impact this is having. The most obvious changes I have seen in my students are an increased familiarity with a wider range of graphical displays of data and an increasing number of students who do not take any statistics in college because they have "gotten out of statistics" by taking AP Statistics in high school.

Some institutions are reporting an increasing number of students beginning their college statistics with a course that has intro stats as a prerequisite.

But I don't know of any reliable data from which to learn how AP Statistics is shaping student impressions of the statistics field as a career option, how many AP students take courses at the university level, how many AP students repeat intro stats (by which I mean a course with no statistics or calculus pre-requisites) rather than begin with a more advanced course, how many university statistics courses AP students take, or whether AP students do better or worse than their non-AP counterparts.

In addition to changing the population of students who enter college statistics courses, the increased emphasis on statistics in elementary and secondary school increases the importance of training in statistics and the teaching of statistics for prospective teachers. The recently published "Statistical Education of Teachers" (SET) was commissioned by the ASA to clarify the recommendations for the statistical preparation of teachers proposed in the Conference Board of the Mathematical Sciences' "Mathematical Education of Teachers II" report.

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SET outlines the opportunities and challenges to preparing the next generation of teachers, describes best practices, and suggests model curricula and assessment items.

Advances in Technology

Perhaps the most obvious change over the past 10 years has been the advancement of technology to support the teaching of statistics. With the exception of the ubiquitous Texas Instruments calculators, all forms of technology that might be used in support of teaching statistics have improved markedly. Installation of statistical software has become much simpler, interfaces have improved, and online alternatives such as RStudio Server, SAS OnDemand, and StatCrunch make it possible to teach entire courses in which all statistical analyses are performed "in the cloud."

The number and quality of other technological resources have also increased, and there are now freely available online tools that make it easier than ever to perform analyses, prepare reproducible reports, visualize statistical methods, access interesting data sets, and conduct student-designed experiments. The challenge is for instructors to select from and take advantage of what has become available.

Curricular Focus

Looking back, we will see this past 10 years as the decade when simulation-based inference became possible for the masses. Calls for a shift to this approach by George Cobb and others have been answered by improved technology and the availability of textbooks such as *Statistics: Unlocking the Power of Data* and *Introduction to Statistical Investigations, Preliminary Edition* to support it. The next decade will tell us whether this approach, with its promises of improved conceptual understanding, will become the dominant approach to introducing statistics to students, or whether it will be an approach zealously espoused by its advocates but ignored by the majority of instructors.

Meanwhile, rumbling in the distance are calls for other sorts of change. In her 2013 James R. Leitzel Lecture, Ann Watkins listed three approaches she sees as competing with the currently dominant curriculum for the future of intro stats: the simulation-based approach already mentioned, a modeling approach, and a Bayesian approach. Technology will likely play a key role in determining whether a Bayesian approach is viable, but a modeling approach—one that emphasizes multivariable and complex data early—depends more on a mind set shift among statistics educators.

Collectively, we invest an enormous amount of time and energy in intro stats. But there are signs we are beginning to invest more in other areas of the curriculum, as well. Enrollments in statistics majors and minors are up at many institutions. Many smaller institutions that a decade ago did not offer these have introduced them. Other institutions have revised their major and minor programs or introduced additional flavors—generally moving in the direction of programs with a more applied focus and often making the development of computational skills more central to the program.

Indeed, for the next decade, the most important curricular question for undergraduate statistics programs may well be how to provide students with the computational skills and conceptual frameworks necessary to learn the tools that will allow them to "think with data." For a more thorough discussion of the opportunities and challenges for the undergraduate statistics curriculum, see *www.amstat.org/education/curriculumguidelines.cfm*.

The Importance of Making Connections

Statisticians have a long history of collaborating with people from a variety of other disciplines in academia, industry, and government. Our track record in making these sorts of connections in statistics education is not as strong. It is interesting to note the similarity in the themes of the 2005 and 2015 U.S. Conference on Teaching Statistics. In 2005, the theme was "Building Connections for Undergraduate Statistics Teaching," and in 2015, simply "Making Connections." A review of the presentations at each of these conferences suggests progress here has been measurable, but slow.

Statistics educators face an interesting and important challenge when trying to make these connections. There is a general sense in many disciplines that statistical training is important for students. But curricular pressures; a level of dissatisfaction with the current state of statistics courses; a large number of students and faculty in other disciplines who do not feel comfortable working with data, mathematics, or computers; and the siloing of education within academic departments all contribute to a state that is less than ideal.

Interestingly, one commonly proposed solution is to have students take *fewer* statistics courses and move statistical topics into

courses within other disciplines. See Nicholas Schlotter's "A Statistics Curriculum for the Undergraduate Chemistry Major" in the *Journal of Chemical Education* for an explicit call for this in the context of chemistry. To counter this trend, it is crucial that statistics educators collaborate with educators in client disciplines to ensure the courses we offer serve students well in the context of their major programs and career goals and the principles and methods being taught in statistics courses are being appropriately used and reinforced in other courses.

The Arrival of Data Science

We may not know exactly what it is or how long it will go by that name, but data science has arrived. No sooner had Hal Varian proclaimed statistics "the sexy job in the next 10 years" than the wrangling began over what data science is and whose it is. In truth, Varian's comments already hinted at this.

Now we really do have essentially free and ubiquitous data. So the scarce complementary factor is the ability to understand that data and extract value from it. I think statisticians are part of it, but it's just a part. You also want to be able to visualize the data, communicate the data, and use the data effectively.

The impact of Big Data; the emphasis on communication and visualization; the necessity of new computational tools; and the connection to real, important, large-scale problems in business, science, and society are only beginning to be felt in statistics education. But if we respond now to the voices calling us to move in these directions, this has the potential to be the source of the biggest changes to statistics teaching in the next decade.

Looking Forward

The next decade promises to be an important one for statistics education. We appear to be at a golden moment of opportunity and the stakes are high. This is because movement in (statistics) education is slow, while movement in the world of data and technology is much faster. We can't slow down the latter, so we will need to pick up the pace of the former. Data are plentiful and statistical skills are in demand, but if we don't deliver the desired skills to the people who need them, someone else will. ■

Further Reading

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WOMEN Working in Statistics

What Has Changed Over the Last Decade?

Dalene Stangl, Duke University

Dalene Stangl has been on the faculty at Duke University since 1992. She has held editor positions for *JASA, Bayesian Analysis,* and *CHANCE* and served as chair of the Committee on Women in Statistics. Last year, she orchestrated the first Celebrating Women in Statistics conference. Her website is *www.dalenestangl.com.*.

For this article, I was asked to assess what has changed over the last decade for women working in statistics. My first thought was how much could have changed, really, in just a decade? As this review will suggest, such skepticism is misplaced. Since 2005, there have been big changes for women in statistics, paralleling those in the workforce generally.

One of the biggest changes has come from the younger generations, both men and women, who are demanding better work/family/life balance. They take vacations, take maternity/paternity leave, go home for children's events, and are less wedded/handcuffed to their work. The young are teaching us older folk to live a better balance, too.

We have learned two other things, as well. We have learned we can't place women into a male-aligned culture and expect them to rise to the top by emulating the men. We have learned it is preferable to put less focus on demanding/expecting that men and the male-aligned culture change and more focus on thinking about what women need that is different from what the current culture provides, and then provide it to help women empower themselves.

Throwing women into a male-aligned work culture—a culture that evolved when those working outside the home were predominately men—and expecting them to rise to the top by emulating the men might work for a few women, but generally it does not. Women emulating men works only if the same actions are perceived and reacted to in the same way for both genders. Power in women is viewed differently than power in men. A woman self-promoting is viewed differently than a man self-promoting. A woman's service to others is viewed differently than a man's service to others. A woman's work is evaluated differently than a man's work, even if it is performed at the same level of competence. The list goes on and on. The research is abundant. The differences play out in graduate admissions and evaluations, hiring and promotion at every level. While we see 40% or more of the PhDs in statistics/biostatistics going to women, fewer than 20% of the distinguished chairs, editorships, research awards, citations, and keynote and invited talks are going to women. Sexism has declined, with fewer conscious overt intentional acts of harassment and discrimination. However, more subtle biases, which we all have, continue to shape how we perceive and act in professional settings.

Ten years ago, when I chaired the statistics group at Duke University, my leadership was challenged both inside and outside the department. Just before I started the position, a prospective faculty member started his recruitment interview by saying, "I don't know why we were scheduled for an hour. What do we possibly have to talk about?" After I set up our first faculty retreat, one faculty member's response was, "If there is any touchy-feely stuff, I won't participate." Early on, I was asked by a prominent senior male with a quizzical look on his face, "Do you realize you are heading up a world-class statistics department?" Their comments were not isolated ones. Many others also reflected puzzlement over a woman being chosen to head the statistics group at Duke. At the same time, these responses were not universal. Responses from other men ran the gamut from passive-aggressive non-support to full active support, although the scale felt far from balanced.

During this same time, I was working with Keith Crank to turn the Caucus of Academic Representatives into a formal ASA group. Then, I was one of only a handful of women who had

headed academic statistics groups. I could name a few others who had traversed that path. Lynne Billard and Mary Ellen Bock pop to mind. It was easier to think of women who had headed biostatistics programs—Donna Brogan, Nan Laird, Louis Ryan, to name a few. But now in 2015, there are many more. There are also many more highly visible women in leadership outside academia, such as Nancy Geller, Christie Chung-Stein, Jing Shyr, Janet Wittes, Bonnie Ray, Sally Keller, Maura Stokes, Stacy Lindborg, Telba Irony, Diane Lambert, and Susan Paddock. We have become more accepting of women in leadership positions, and more accepting of the differences in how they lead.

As noted above, another important lesson is that we are figuring out what women need that is different from what the current culture provides and now providing it in a way that enables women to empower themselves. In May 2014, we held our first Celebrating Women in Statistics conference. The following October, a *New York Times* article (*http://nyti.ms/1yDIEM4)* discussed how conferences designed for women were becoming mainstream. "Conferences promoting women's empowerment are on the rise and haven't had this kind of cachet since the feminist movement encouraged consciousness-raising groups in the 1970s," the *Times* reported. "This time, however, the booster sessions are not being run by friends in their living rooms, but by media companies looking to align themselves with a generation of working women—and corporate sponsors—eager to celebrate their achievements and push for new career heights." The aims of Celebrating Women in Statistics aligned with those in the *Times* article, but there were no media companies—just a group of statisticians supported by the ASA, Duke and other universities, the National Institutes of Health, and corporate sponsors trying to push the culture, trying to create a space in which women could find their voices, trying to provide a space in which we could internalize the notion that what we have to say and do is important. It is about inspiring change from within the individual.

Celebrating Women in Statistics was met with some skepticism and outright hostility. There was criticism by some women for not including men on the board, few as speakers, or, until late, as targeted attendees. It was argued that if we didn't include the male decisionmakers, our efforts would be futile. There were some who judged our conference as being just as sexist as the many conferences in our field in which the list of invited speakers has a token woman or two. Some women expressed nervousness about attending. Would it be productive for them? Would they be viewed negatively by men and even other women? Not until these women got to the event did they experience the "Ah-ha" moment when they recognized the emotional comfort of being in a female-aligned culture. The tensions women experience in a male-aligned culture were removed. The women were there to share ideas, to cooperate, to take in the scene and participate more fully than they currently do in male-aligned environments. Many women described using their voice and being heard and acknowledged in a way they had not previously experienced—ever.

Beyond these lessons learned, I have four brief pieces of advice to women and men advancing through their careers.

"Cultural change can be fast or slow, but without action, it is neither."

1 Assess your values honestly, regardless of whether they mesh with male-aligned culture, and then walk the walk.

Women succeeding without emulating men works only if we value what women do as much as what men do—and we stay authentic. We give a lot of lip service to appreciating and nourishing diversity, but not as much as is needed to walk the walk. Ask members of almost any selection committee and they will tell you they have been trying to promote more women and increase diversity. The intent and the social need are there, but why is the change so slow?

When my dean started discussing unconscious biases at a department chairs' meeting in 2002, several of the men commented, *"Didn't we solve these issues in the '70s?"* Well, the term "glass ceiling" was coined in the '70s, so indeed we have been talking the talk for many years, but if these issues were truly solved in the '70s, we would see the percentage of women earning PhDs matching the percentage of women giving invited talks, garnering the research awards, sitting in distinguished chairs, and being promoted to leadership positions in government and industry.

Overcoming sexism requires action, not just words. The next time a position needs to be filled or a promotion made, instead of recruiting from places that are familiar and similar to your own (i.e., replicating non-diversity), think carefully about what skill set is needed. There are highly qualified women with all these skills. Acknowledge the benefits their diversity brings to the group. Hire them. And women: Apply! Not just for those jobs for which you are unequivocally qualified, but also for those that seem like a stretch! Walk the walk, and insist others join you.

2 Actively fight sexist comments.

Each time after I was offered chair positions of academic programs, male colleagues insinuated the reason I made it to the shortlist was because I was female. What's equally problematic is that I typically kept silent. Instead of letting them know their statements undervalued the skills I brought to those positions, I let them slide. I regret that. The first time, shame on them; the second, shame on me. I should have been ready the second time. Be prepared. Find your voice and use it.

3 Strengthen your armor.

People will without conscious intent make demeaning comments about women and question their skills. If we are to move to a culture that truly values diversity, all must come to grow more accepting of women and how we do our jobs and lead. But in the mean time, have your armor strong and polished.

4 Seek out those with whom you identify and who inspire you.

For me, inspiration came through Gertrude Cox. She was elected ASA president the year I was born. Both of us were born in Iowa and ended up in North Carolina—she via education at Berkeley, me via education at Carnegie Mellon. She took a circuitous route into statistics, after a start in social sciences, as did I. Just these seemingly tangential commonalities allowed me to visualize success for myself, see how similar obstacles could be overcome, and imagine someone up ahead rooting for me.

Cultural change can be fast or slow, but without action, it is neither. ■

We wanted to know what it takes to develop and design a survey, so we interviewed Mario Callegaro and Gordon Willis, two research scientists. Both men will be featured speakers at the International Conference on Questionnaire Design, Development, Evaluation, and Testing, which will take place in Miami, Florida, in November 2016. For information about the QDET2 conference, visit *www.amstat.org/meetings/qdet2/conferenceinfo.cfm.*

Survey Research Scientists Tell Us What It Takes to **Design a Survey**

Mario Callegaro is senior survey research scientist at Google UK, London, in the quantitative marketing team. He works on web and telephone surveys focusing on survey and market research projects, including measuring advertisers' customer satisfaction. He also consults with numerous internal teams regarding survey design, sampling, questionnaire design, and online survey programming and implementation.

Can you briefly explain your research background?

I started my career with a bachelor of arts in sociology at the University of Trento, Italy. During that time, I helped open a small data archive, assisting students to locate and access survey data sets. What really jump-started my research career was working as an interviewer supervisor for a computer-assisted telephone interviewing (CATI) survey we did in collaboration with the University of California, Berkeley. The results were published in *The Outsider: Prejudice and Politics in Italy*. There were many embedded question-wording experiments that made me think a lot about experimental design and question-wording effects.

After my BA, I worked for the department of sociology and social research at the University of Trento, still running CATI studies, designing surveys, and analyzing data. I then moved to the University of Nebraska-Lincoln, after I was accepted into the newly started survey research and methodology (SRAM) master's program. My internship at the cognitive interviewing lab of the National Center for Health Statistics (NCHS)—working with Barbara Wilson, Paul Beatty, and Kristen Miller—was another key research event, as that is where I learned firsthand about how respondents interpret closed-ended questions.

Together with another student, I was part of the first PhD cohort from the SRAM program. I had the opportunity to work with Robert Belli on event history calendars, comparing this to standardized survey interviews. Event history calendars are an effective interviewing technique that can help respondents remember and reconstruct events better than standardized question wording. Incidentally, we also found something that still amazes me: The same technique is used in other fields with different names, very often with minimum overlap in citations (see *http://bit.ly/1IkD71g*).

My first job after getting my PhD was as survey research scientist for Knowledge Networks (KN), now GFK-Knowledge Networks, a company running a probability-based online panel representative of the U.S. population. At KN, my research agenda changed a lot, this time focusing on online panels, web surveys, and address-based sampling (ABS). Together with my manager, Charles DiSogra, we moved the company recruitment method from random digit dialing (RDD) to ABS mail recruitment.

Two years later, Google Mountain View was looking for a survey research scientist for its quantitative marketing team and approached me via LinkedIn. I answered their email and here I am, six years later, still at Google but now working from the London office. My research agenda has shifted to measuring customer satisfaction and topics related to market research. However, I am still working on survey quality in different areas, including online panels and web surveys.

Be part of the QDET2 program! We are accepting invited speaker proposals. Submit your abstract online today: *http://bit.ly/1TUGPkb.*

How did you get into survey methodology?

My passion for survey methodology started when I took a class on research methods during my BA in sociology. I loved it so much that I took the same course twice (something you could do at the time in Italy), the second time as a tutored seminar focusing on questionnaire design only. I still remember reading *Asking Questions* by Sudman and Bradburn cover to cover, and then *Survey Questions: Handcrafting the Standardized Questionnaire* by Converse and Presser.

Not content with this, I went to the Michigan Summer Institute in Survey Research Techniques, where I took one of the first classes on cognitive aspects of survey methodology (CASM) taught by Norbert Schwartz and Robert Belli. I came back from Michigan with a suitcase full of books and CASM papers. That was the basis of my BA dissertation, and I have not detoured from survey methodology since.

Did you have a mentor? If so, what was the most effective advice he/she gave you?

In addition to my PhD supervisor, Robert Belli, I did have very influential mentors in my career, but the most influential remains Allan McCutcheon of the University of Nebraska, Lincoln. I am doing this interview basically because of Allan. Allan has taught latent class analysis at the Essex Summer School in Survey Research in the United Kingdom for more than 20 years. When I was still working for the department of sociology and social research at the University of Trento, I had a chance to attend the Essex Summer School and talk to Allan about my career. He made me aware of the Nebraska SRAM program (it was new at the time) and strongly encouraged me to apply. Allan made an arrangement with the Gallup organization for some assistantships. Without these research assistantships, I could not have afforded the master's and PhD programs, so Gallup is another influential entity in my career. Attending Nebraska was the most effective advice he gave me, and the second was to continue studying for the PhD and not stopping at the master's level.

What interested you about your current position at Google?

I still remember the email from Google via LinkedIn. I was shocked that they were looking for a survey research scientist. This was the same job title I had at Knowledge Networks! To be honest with you, I wasn't aware Google was interested in surveys at the time, but it quickly became clear that a company like Google needs survey research expertise to collect feedback from users and clients and improve its products. It also became clear that Google was running many market research projects and my expertise was valued. Finally, what interested me was the opportunity to work for an international, influential company that was helping shape technology in the 21st century. Once I was hired, their mission and environment were engaging and exciting, and this has kept me motivated to continue working with Google.

What motivated you to get involved with QDET2?

I was excited when I heard about the QDET2 conference because it reminded me of the incredible opportunity I had to attend the first QDET conference in Charleston, South Carolina, in 2002. At the time ,I was still a student in the SRAM program and I applied for a fellowship to attend the conference. I recall the stressful moments preparing the application letter and waiting for the outcome of that request. I was accepted, together with a great group of international students, some of whom I am still in touch with.

In the current survey context, where low response rates are driving attention to improving survey participation, it is important to ensure equal attention is given to careful question design, a pillar of survey quality. Even though the efforts of the CASM and QDET meetings greatly helped advance question design and pretesting knowledge, there is still room for discussion about the best techniques for question evaluation and how to integrate information from different pretesting techniques. Continuing work on this area is crucial. In addition, challenges for question design have arisen from the adoption of new modes and devices for data collection; the QDET conference will be a fantastic opportunity to get together and discuss the research conducted in the last decade.

What are some of the challenges in designing survey instruments to collect "good data"?

Web surveys are becoming more and more popular, and their usage increases every year, with a parallel decline in other methods of data collection. Technological changes have made us lose control of what device respondents use to answer web surveys; it can now be a desktop/laptop, a tablet, a smartphone, or other Internet-enabled devices. Designing a web instrument that does not create "device

effects" is challenging because this does not only involve the technology used, but also how a question is designed and how it needs to be evaluated and tested. Another challenge is that, in emerging markets, web surveys are mostly done using smartphones, as these have a higher penetration than laptops/desktops or tablet computers.

Do you have funny examples of bad survey questions?

I have some funny examples from a survey conducted at the event Burning Man. In a paper questionnaire administered in 2009, the instruction says: "If you have a short attention span, please focus on filling out the front and back pages."

I also found two survey questions asking about *la playa* (the beach) very funny:

1) Have you ever embarked on a romantic relationship with someone you met at *la playa*?

[ ] No
[ ] Working on it
[ ] Yes

2) Were you married on *la playa*?

[ ] No
[ ] Yes, in a pretend wedding
[ ] Yes, in a real wedding

Not all surveys are designed by survey scientists. What tips can you give to people outside the profession for creating better survey instruments?

The first tip I give non-survey scientists is to try to write down an answer to these three questions: What concepts do you want to measure? What is your target population? Do you want to conduct a quantitative (e.g., survey) or qualitative (e.g., in-depth interviews, focus groups) study, or both? You will quickly realize that answering these three questions is not easy. And if you're working in a team, very likely there will be many disagreements about how to answer these questions.

The good news is there are good textbooks nowadays that can guide people outside the profession in designing a good survey, together with more online training. Further, because of the new programs in survey research, more students are trained in survey research and can help design surveys in their job place.

What does the future hold for questionnaire designers?

First, questionnaire design is tied more and more to technology. Second, data-collection methods are moving to self-administered questionnaires. These two interrelated trends govern the future, as questionnaire designers must develop instruments that can be properly completed by the respondent unaided by an interviewer and on a variety of devices. Questionnaires will also be increasingly augmented by the passive data collection of respondents' behaviors. This trend holds lots of promising research and insights for questionnaire designers. Once the quality of passive data collection is up to acceptable standards, I envision questionnaires asking less about past behaviors and more about attitudes and opinions to understand the "why" for which behavioral data cannot provide an answer.

What advice can you give to someone who would like to pursue a career as a survey methodologist?

There are excellent programs in survey research. Until now, these have been found mostly in the United States, but new

programs have started to appear in Europe, as well. A two-year master's-level program can provide lots of knowledge and skills to work in the industry. However, given the new promises Big Data and social media research offer, I would suggest students augment their training by studying social informatics classes and database management—and by learning some programming languages—as the new data sets will be a combination of survey data, paradata, Big Data, and possible social media signals. ■

Further Reading

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Gordon Willis has worked for more than 25 years to develop and evaluate methods in questionnaire design, cognitive interviewing, and survey pretesting. He is a cognitive psychologist at the National Cancer Institute and National Institutes of Health. Previously, he worked at both the Research Triangle Institute and the National Center for Health Statistics/U.S. Centers for Disease Control and Prevention. He attended Oberlin College and Northwestern University.

Can you briefly explain your research background?

I began my research career in graduate school at Northwestern, back in the old days of traditional experimental psychology, before the wave of cognitive psychology really hit. Until his retirement, I worked under Benton Underwood, who was a giant in the field of psychological research throughout the '60s and '70s. So I feel very much like I came from the waning stage of a previous era, where the theories, equipment, and research procedures now seem remarkably antiquated. However, the underlying logic of designing studies and conducting research hasn't changed at all, so those old-school ways presented a good grounding in research methodology. I then migrated into the field of early childhood mathematics education research—primarily because my adviser's spouse was an education professor who needed an assistant—where I learned how to conduct intensive qualitative research, consisting of cognitive interviewing of young children on how they solved math word problems. I leveraged that into my first government job at the National Center for Health Statistics, where I got into the business of studying response error in questionnaires in a big way within the first U.S. federal cognitive lab devoted to developing and testing survey questionnaires. It was only at that point that I dealt with surveys at all, and have developed that interest further, first at Research Triangle Institute International and then at the National Cancer Institute within NIH. Mine is an example of an evolving research background that hits different substantive areas as one goes through a professional life—although the common theme has been the development and evaluation of new methods.

How did you get into survey methodology?

I'm not sure if I should freely admit this. It was unintended, or at least unplanned. I was finishing grad student and looking for a job—and my wife, who was also a psych graduate student—noticed an advertisement in the *American Psychological Association Monitor* for a cognitive psychologist at NCHS, where the focus was on conducting intensive interviews to study how people answer survey questions. I don't know how she picked up on the connection, but she recognized that the interviewing I had done of children was essentially the same thing, just applied differently. I decided to follow up on her ingenious insight, the difficulty being that I, in fact, knew virtually nothing about surveys. But I was a good student who knew how to learn quickly, so right before my NCHS interview, I went to the library and read up on survey methods and questionnaire design. At my interview, I was fully prepped to spout back all of that recently obtained knowledge, and I got the job. Fortunately, my wife was correct about the transferability of skills, so I didn't feel like a stranger in a strange land. The only strangeness is the seemingly nonlinear way in which I ended up where I am. But I'm convinced that much of life is unplanned and unintended—and when the football bounces to you, pick it up, because you're now a running back.

Did you have a mentor? If so, what was the most effective advice he/she gave you?

Early in my career at NCHS, Monroe Sirken very effectively mentored me, especially concerning how to fit survey research into the special world consisting of the federal government. Monroe showed that—contrary to a common assumption—it is possible to be innovative, and even a leader, in survey research within government. For one, he shepherded the development of the Questionnaire Design Research Laboratory at NCHS, based simply on the belief that this could have a tangible positive impact. I think the ensuing years have proven him correct. The most effective advice I got from Monroe wasn't direct, but through observation. He was (and probably still is) forward thinking and always ready for some new methodological development—definitely a think-outside-the-box type. There were times when others would scoff at some of these ideas, but I saw he wasn't all that concerned about naysayers—he had enough faith and confidence in his own ideas to stick with them. Sure enough, I have seen those ideas ultimately vindicated. So what I learned is to stick with what you believe, despite the headwinds, and your

good ideas will persist down the road. Of course, they may only bear fruit after you are retired and gone, or well beyond the point that anyone remembers or cares it was your idea, but you just need to be okay with that.

What interested you about your current position at the National Institutes of Health?

I have always believed NIH to be an exceptional research entity—a model for how federal government can work effectively on behalf of its citizenry. I was drawn to the National Cancer Institute specifically because I got to know my former supervisor, Rachel Ballard, who was trained as a physician and in public health, but who was also incredibly open-minded and drawn to interdisciplinary approaches to population-based cancer prevention research. I decided the integration of questionnaire design into the world of cancer research was a compelling basis for a research position. Fifteen years later, I still believe that.

What motivated you to get involved with QDET2?

I could answer this in terms of the importance of advancing survey methods, as the field is at a methodological crossroads, or the natural fit for me concerning the heavy emphasis in QDET2 on questionnaire design and information collection methods and so on. But following Margaret Mead, I believe most any scientific event, enterprise, or advancement is really due to the vision and energy of a small set of individuals who make things happen. For QDET2, I would credit Amanda Wilmot at Westat, who has from the start provided the vision and motivation for the conference. I also find it incentivizing to work with an effective group of international researchers on the conference organizing committee. We have Paul Beatty at the U.S. Census Bureau; Paul Kelley at Stats Canada; Jose-Luis Padilla at the University of Granada, Spain; Debbie Collins at NatCen in the UK; and Lyn Kaye at Statistics New Zealand. This is an interesting and eclectic group. The only downside is trying to arrange a conference call across the continents so someone doesn't have to join at 3:00 in the morning!

What are some of the challenges in designing survey instruments that collect "good" data?

A key challenge is that resources are always stretched, and we need to attend to the problem of appropriate balance—in modern parlance, the key concepts are Total Survey Quality and Fitness for Use. All of us who work on surveys are to some extent subject to the "when all you have is a hammer, everything looks like a nail" phenomenon. Everyone has their favorite source of error—whether related to coverage, sampling, nonresponse, or measurement—and it is challenging to achieve the best mix. So what I face is the problem of deciding on the appropriate type and amount of attention paid to questionnaire design, pretesting, and evaluation. We could pretest forever to produce a (maybe) perfect instrument, but that does little good when the data were really needed five years ago—but we're not in the field yet. We need to find something between a "minimal standard" consisting of the lowest bar one could get away with setting versus a set of "best practices" that may represent a shining example of optimal design, yet is utterly infeasible in practice.

Do you have any funny examples of bad survey questions?

I try to keep in mind that nothing is funny to the project director, client, or data user. They are stuck with the data produced, and in the extreme case in which a question is found to be completely flawed subsequent to data collection, I have seen where a researcher has chosen not to make use of their carefully collected information. But of course part of the fun in questionnaire design derives from an appreciation of the amazing sources of miscommunication that sometimes get through the design process, only to emerge later through some form of qualitative investigation. For example, the respondent who explained she was "bisexual" because "it's just me and my husband." Another sad but funny case is a question that seems fine on the surface, but ultimately proves to be "bad" because it doesn't provide any useful information. Once after teaching a course, I was presented the results of a teaching evaluation item that had asked my students if I had "spent the right amount of time" on a number of topics. Note that I had no way of knowing whether those answering "no" wanted more … or less.

The most compelling examples of bad questions seem to come from the cross-cultural context, either because a translation is so terrible or because cultural differences render the question useless for some respondents. As an example of the former, the literal translation of "Are you feeling blue?" into Spanish produces a term ("azul") that is precise and totally equivalent to the color blue, but that carries no connotation of mood. So the effect is no different that asking an English speaker whether he or she is now feeling orange or purple. The lesson is that our objective should be to translate meanings, rather than words.

"[I]t's a good time to be a questionnaire designer or survey methodologist ... for those who are ready to face an eclectic mix of new challenges."

Concerning a flaw due to cultural issues: For a project on racial/ethnic discrimination, I was involved in the cognitive testing of the item, "Were you treated unfairly at school because you are [self-reported race/ethnicity—e.g., Vietnamese]?" This seemed unremarkable until an immigrant who was asked the question responded simply "Uh, no.... I went to school in Vietnam..." So question flaws tend to develop because of limited imagination of the designers, who are thinking only of the cases in which the question makes sense (here, for those experiencing the U.S. school environment). These problems are always obvious—in retrospect—which is why it helps to test our items using real people.

Not all surveys are designed by survey scientists. What tips can you give to people outside the profession for creating better survey instruments?

Keep in mind that survey questions are not like everyday speech, because with standardized survey questions, we have no way to "repair" the conversation in the manner described by Grice back in 1975. The biggest downfall of survey items is usually vagueness—everyday terms and phrases can be interpreted in several ways, so try to think of those variants. My advice would be to at least ask several people—friends or colleagues—their interpretation of the question. For example, a colleague on a professional networking website recently attempted to gather some informal qualitative information by posing the question, "How do you feel before you go to work each day?" I pointed out that this could be interpreted in terms of (a) "How do I feel before I have to face my commute?" or (b) "How do I feel about my job when I begin working, once I am ready to do that?" He then changed the question to ask about how respondents feel before they "start work," which hopefully works to narrow the range of interpretations.

What does the future hold for questionnaire designers?

One thought is that because the survey world is changing—quickly, and to some extent in ways that make our lives as survey professionals more difficult—we don't have the luxury of worrying about question design, as we have to be focused on response rate and whether the sample survey can survive as opposed to going the way of the dodo bird. But I would argue that questionnaire design will be, if anything, even more important as the survey world evolves. There is certainly still a need for self-report-based information. Even though we may be able to make use of sensor-based devices or other technological developments, there are types of information that can only be obtained through self-report, such as attitudes and lifetime behavioral history. Plus, the continued development of complex forms of information collection on web-based instruments and mobile devices puts heavy demand on the designer to maximize usability, clear directions, and other issues of measurement error. To the extent that the old rules of question design even exist, these are becoming obsolete, and designers need to be very open to the cognitive and other demands on questionnaire design associated with our new devices and technologies. Overall, it's a good time to be a questionnaire designer or survey methodologist generally for those who are ready to face an eclectic mix of new challenges.

What advice can you give to someone who would like to pursue a career as a survey methodologist?

Become a specialist in a particular area, rather than attempting to be a jack of all trades. Not at first, though. Start by learning about all phases of the survey data collection cycle and develop a notion of Total Survey Quality to appreciate the type of balance I mentioned above. But ultimately, I would follow the path you find most appealing, especially because the skills required for different aspects of survey measurement vary so much—from the very statistical/quantitative on one hand to the qualitative, communicative, and cognitive on the other. My own career has largely involved the niche area of cognitive testing, within the realm of pretesting, within the larger field of questionnaire design, which itself exists within the over-arching world of survey research. But I have found that specialization to have sustained me through the course of a varied and rewarding career. ■

Who Inspires You?

Why did you become a statistician? What skills do you need to succeed? We asked some of our members those questions and here is how they responded.

William E. Winkler

Principal Researcher
U.S. Census Bureau

What or who inspired you to be a statistician?

I had a PhD in probability, which made it much easier to teach statistics at the university. I then went on to statistics as a profession.

What is the most exciting part of your job?

Working with good people on very challenging problems where we produce new methods and computational systems that were in our decennial censuses (3) and our economic censuses (4 going on 5). The systems and closely related methods/systems are used in other areas of applied statistics.

Name a few specific skills you need to do your job?

Willingness to work hard as part of a team doing data analyses and developing new computational algorithms in generalized systems for analysis and production. Willingness to produce new computational algorithms that are 10–100 times as fast as previously used algorithms so the systems meet minimum speed requirements for production.

What do you do in your job now that didn't exist 10 years ago?

We developed theory and new computational algorithms for generalized systems for clean-up and preliminary analysis of sets of national files. With the new algorithms, a set of skilled individuals can analyze a set of national files in 3–6 months; with algorithms that are 100 times as slow, it is not clear how long the analysis would take.

Name one or two favorite blogs or books you have read and would recommend to others.

For certain areas of statistics, I recommend reading recent research in CS and OR, particularly as it relates to implementations of the Fellegi-Sunter model of record linkage and the Fellegi-Holt model of statistical data editing. Books on algorithms such as those by Sedgewick and Wayne and Knuth are very helpful.

What advice would you give to young statisticians just beginning their careers?

Learn pertinent theory and become good at computation as it applies to data analysis. ■

Vipin Arora
Senior Research Adviser
Eli Lilly and Company

What or who inspired you to be a statistician?

Reading newspapers (we didn't have Internet in those days), the weather chart, the amount of data included on every page. My inspiration came from my father and high-school math teacher.

What is the most exciting part of your job?

Directly working on the strategy to develop effective and safe treatments for patients with various diseases. It is extremely fulfilling when I meet someone who has benefited from treatments in diabetes or cardiovascular or immunological disorders for which I played a key role in development, approval, and/or post-marketing efforts.

Name a few specific skills you need to do your job?

Analytical thinking, people management, collaborating with a cross-functional and diverse team, and readiness for new challenges both internal and external.

What do you do in your job now that didn't exist 10 years ago?

Extensive use of visual analytical tools, virtual meetings, and coworking and collaboration spaces.

Name one or two favorite blogs or books you have read and would recommend to others.

ASA Connect (a discussion forum in the ASA community) and *Harvard Business Review*.

What advice would you give to young statisticians just beginning their careers?

See where your passion is, keep working at it, and soon you will achieve your aspirations. Always be positive, even in the most adverse situations. Make the best of every opportunity to learn, no matter where you are and with whom are you collaborating.

What do you enjoy doing in your spare time?

Exercise, cooking, gardening, and watching 007 movies. ■

Kimberly Sellers
Associate Professor of Mathematics and Statistics
Georgetown University

What or who inspired you to be a statistics professor?

I was always drawn to a life in academia; my father is a retired professor and was dean of the Howard University College of Fine Arts while I was growing up. I'd say the more appropriate question for me is "Who inspired you to consider a career in statistics?" The answer would be Piotr Mikulski from the University of Maryland College Park. I initially entered graduate school to pursue a PhD in mathematics at Maryland and had predetermined two qualifying exam areas of study to be numerical analysis and ordinary differential equations; however, I still needed to identify one more exam area to round out my areas of study. Because I had taken and performed well in an undergraduate-level mathematical statistics course as an undergraduate, I decided to register for Mikulski's mathematical statistics year-long course sequence in order for the statistics exam to serve as my third area. He made the material so interesting and enlightening that I loved the course! He was so personable and pleasant to be around; he even made the most abstract and/or challenging portions of the class enjoyable. Unknown to me and the rest of my course cohort at that time, we would wind up being the last group of students instructed by Mikulski; he passed away the following year. It's been more than 15 years since his passing and I still think of him often and fondly and thank him for the significant impact he made on my life!

What is the most exciting part of your job?

The most exciting part of the job to me is traveling around the country and the world, presenting my work and meeting other colleagues. I love to travel, and this is a great way to see the world!

Name a few specific skills you need to do your job

Obviously, you need a strong mathematical ability to do this work, but perhaps more importantly, you need to be able to communicate and promote your work effectively. In essence, you can think of yourself as a marketer. You want to get others as excited about your work as you are. Why should people care? What significance does the work have? Why is this important? Such issues must be addressed in all aspects of the job, whether it's with grant-writing, authoring manuscripts, giving talks, or teaching. Likewise, a strong ability to explain your work (or any other relevant material) clearly and effectively also greatly contributes to your success in this career.

What do you do in your job now that didn't exist 10 years ago?

I am using technology more and more as time progresses. I am developing R packages in association with my research projects and developing and/or using online course management tools for instructional continuity (e.g., Blackboard, Lecture Capture, etc.). For all these answers, while the tools may have existed 10 years ago, I wasn't using them in the ways I do now.

Name one or two favorite blogs or books you have read and would recommend to others.

A blog that I would recommend to others, particularly those interested in a career in academia, is "Tomorrow's Professor" (*http://web.stanford.edu/dept/CTL/Tomprof/index.shtml*). I have come across several posts that serve as valuable real-time reading and/or are helpful for future reference.

What advice would you give to young statisticians just beginning their careers?

Take advantage of the various opportunities that exist for young statisticians! Most environments offer some sort of one-on-one mentorship for young statisticians. Also, various statistics conferences (e.g., JSM) offer special meetings for young statisticians with opportunities for those just starting in their careers to ask questions and seek guidance from more established statisticians in their respective careers. One can always gain new tips of the trade that can prove helpful. More generally, get involved in an ASA committee and/or chapter. It's a great way to meet and get to know other statisticians.

What do you enjoy doing in your spare time?

I enjoy lots of activities. I enjoy all types of fine arts, particularly music and dance performances. I also like sports (I'm a basketball fan) and traveling. I can easily name other activities too—I have rather broad and eclectic interests. I think much of that comes from just being open to trying new things and having different experiences, but that's what life is all about, right? ■

Jill A. Dever
Social Statistics Programs Director, Division for Statistical & Data Science
RTI International

What or who inspired you to be a statistician?

If I start at the very beginning, I have to blame it on those aggravating math flash cards. My parents worried about my slow progress in class, so every afternoon, instead of letting me watch "Rocky and Bullwinkle," my father would sit with me at the kitchen table and quiz me while I grumbled. "Three times five? Nine times two?" Then there was the desire to keep up with my favorite, super-smart big brother, who helped me with calculus in high school.

Flash forward a few years. I'm a junior at the University of Louisville working toward a bachelor's in mathematics. I walk into one of my favorite professor's office, Steve Seif, and ask, "What in the world am I going to do with this degree?" "Well," he said, "you like health and medicine. Ever thought about being a statistician?" So off to UNC Chapel Hill for a biostatistics master's degree.

My UNC biostat adviser, Keith Muller, told me to seek out a career either in preclinical trials or that "survey stuff" I was learning at the (then named) survey research unit with Bill Kalsbeek. So, my fate was set as a survey statistician.

What is the most exciting part of your job?

The opportunity to learn new statistical techniques (e.g., dual-frame RDD, ABS, and nonprobability studies) and then apply them to actual surveys. To date, I have worked on a variety of surveys that address issues of our times, including smoking cessation, physical therapy, erectile dysfunction, Gulf War Illness, and STEM education.

Name a few specific skills you need to do your job?

Communication skills are paramount; I would suggest this as a critical need for anyone. A solid foundation in survey research and programming skills is important. I would also add flexibility to the mix. I'm a planner, and sometimes your plans for the day are changed within the first 10 minutes. This was (and is) a difficult skill I learned on the job.

What do you do in your job now that didn't exist 10 years ago?

That's a tough question. Several methods for conducting surveys existed 10 years ago, but were not commonplace, including address-based sampling, the use of paradata, responsive designs, total survey error, and nonprobability web panels.

Name one or two favorite blogs or books you have read and would recommend to others.

Apologies for the self-promotion, but I would recommend *Practical Tools for Designing and Weighting Survey Samples* by Valliant, Dever, and Kreuter. This book is geared toward survey researchers at all levels with an eye toward reality. The historic textbooks assume perfection, such as complete participation from a nonresponse follow-up sample. Thankfully, we live in imperfection, or as I like to call it, job security. Also, this book highlights two fantastic researchers—Rick and Frauke—who are dear to me.

Also, I would recommend *All Passion Spent* by Vita Sackville-West. This is one of the books that taught me years ago to really live life and enjoy the ride.

What advice would you give to young statisticians just beginning their careers?

My young colleagues bring a fresh perspective to the science sometimes through seemingly innocent questions: "So why have we always done it this way?" Their energy is infectious. I thoroughly enjoy putting challenges before them and watching them flourish beyond their own expectations.

I have a few words of advice for young statisticians. First, cheat off of someone else's paper. What I mean by that is you are no longer in school, so ask questions, borrow computer code, and mimic good writing styles. Second, pretend you *are* in school. Keep learning new skills and challenging the status quo. Finally, identify at least one mentor. It's great to have a variety of support systems and perspectives.

What do you enjoy doing in your spare time?

My husband, Vince, and I enjoy working in the flower garden of our Capitol Hill home. I like to cook, especially when I have time to experiment with new recipes. I love to play with my three-year-old Labradoodle, Hero (named after the heroine in *Much Ado About Nothing*); traveling with my extended family; attending the theatre; and watching weird TV. Listening to music and dancing are great pick-me-ups when my energy is low. I also like to exercise, including yoga where I've learned to laugh at myself and stand on my head. My latest adventure is biking in DC. Karol Krotki is cheering me on. ■

Katherine J. (Jenny) Thompson
Methodology Director, Complex Survey Methods and Analysis Group, Economic Statistical Methods Division, **U.S. Census Bureau**

What or who inspired you to be a statistician?

I am an accidental statistician. My journey started when I entered college as an all-but-declared English major. On a whim, I decided to (re)take calculus I for the "easy A"; I'd taken calculus as a high-school junior. That first semester, my calculus professor was dynamic and interesting, and my English teacher was less so. Next semester, I signed up for calculus II with the same professor and took a little vacation from English class. The short-term vacation from the English department extended throughout college. By calculus III, I was hooked on applied mathematics. I declared my math major at the end of my sophomore year. For the record, although I could commit to a *single* major, I couldn't do the same for a minor: I graduated with minors in dance and French, four credit hours short of a third minor in history.

My freshman calculus teacher became my adviser. I took every calculus class offered by the math department; I enrolled in every class that included the word "calculus" in the course description. Then, I left school for a semester to study in France during my junior year. When I returned, my adviser gently suggested I take a few classes that applied my math training in other ways (he was a little concerned about the obsession with calculus and the lack of physics classes).

So, during my senior year, I added operations research, probability and statistics, and data analysis to my schedule. I liked operations research and probability. I *loved* statistics and data analysis. More important, I discovered I had some ability. Every data set I studied told a story. Every theorem I learned had an application I could use. Many of my classmates were appalled at the idea of an expected value ("What—the probability of a point estimate being correct is zero?"), a measure of uncertainty, or a statistical relationship. In contrast, I embraced the confidence interval and accepted the reality of more than one plausible model for the same independent variable.

As graduation loomed, my statistics professor talked to me about pursuing graduate studies. He offered himself as a reference and contacted a few programs on my behalf. However, the idea of continuing my studies without any real practical experience frightened me. What if I was good at statistics classes, but not at statistics applications?

Instead, I decided to seek full-time employment at the U.S. Census Bureau and pursue concurrent graduate studies (part-time). If my undergraduate experience inspired me to consider being a statistician, my employment experience convinced me. One way or another, I've worked with survey sampling issues since I joined this agency, both on household surveys and economic programs. I've been blessed with career mentors and brilliant peers, all of whom share my passion for tackling theoretically interesting statistical problems applied to real-life data sets. And yes, I did finish that graduate degree in applied statistics—focusing primarily on survey sampling and estimation.

What is the most exciting part of your job?

That is a difficult question, as my job has evolved over time. Currently, I'm the methodology director for the Complex Survey Methods and Analysis Group in the economic statistical methods division. This position has administrative and research responsibilities. I supervise three separate branches of statisticians, whose work covers a wide range of topics, from sample survey estimation/variance estimation to seasonal adjustment to disclosure avoidance methods. I also conduct my own research projects and lead larger group research projects.

If you had asked this question 15 years ago, I would have

sworn unequivocally that the most exciting part of my job was implementing methods or techniques that I had developed in live surveys. For example, the Survey of Construction's housing starts indicator uses an estimator I helped redesign. The software I wrote to develop ratio edit limits using exploratory data analysis methods in 2000 is still used by Economic Census program managers for the 2012 collection. That's pretty gratifying.

It's a harder question to answer now. Years ago, I enjoyed conducting solo research. Now, I really look forward to collaboration. Over the past 25 years, I have been privileged: in-house, I have worked on many long-term (publishable) research projects and collaborated on several other projects with the academic community and other fellow federal employees. Collaboration sharpens my skills and broadens my horizons as a statistician, forcing me to keep up with new methods and techniques. Publishing our findings promotes the science (especially in survey methods) and publicizes the interesting problems and varied data I work with. Sometimes, I feel I have become an informal ambassador on the challenges of working with business survey data, which are sampled from highly positively skewed populations. Of course, there's always a thrill to seeing your name in print in a refereed journal!

That said, I think the most exciting part of my job these days might be serving as team leader for directorate-wide research projects. Not only do I get to direct relevant research, but I get to consult with diverse sets of peers of varying experience and expertise. I have learned to use plain language to describe technical concepts to our subject matter experts, who are not statisticians. I have learned to delegate tasks while mentoring teammates. When I was younger, I sought the tangible benefits of my research. Now, I value the intangibles, where my coaching or directions provide leadership opportunities, learning and knowledge-sharing, or innovation from others.

Name a few specific skills you need to do your job.

Not to be glib, but the most important skills in my job are "reading, writing, and arithmetic," plus some programming skills. Reading is absolutely crucial, especially in the area of survey research methods. With an increasingly tight budget climate and decreasing response rates, survey statisticians are responding with adaptive collection designs, alternative imputation methods, and increased use of Big Data. To keep our programs relevant, we need to use these emerging cutting-edge methods to the greatest extent possible. Writing is just as important—not just for publishing, but for communicating with project stakeholders. In planning and execution, I need to get feedback from a statistically literate audience and industry (subject matter) experts who prefer an "equation-free" language. My arithmetic skills are always in play, whether for verifying a colleague's results, deriving a linearization variance estimator, or validating proofs provided in a manuscript. Finally, applied statistics requires number-crunching. Programming skills are essential, especially for conducting simulation studies. I am a more-than-adequate SAS programmer these days, but I hope to learn R soon so I can talk the same programming language as the latest generation of statisticians.

What do you do in your job now that didn't exist 10 years ago?

I'm a little weak on the actual history, but 10 years ago, I didn't know anyone who owned a smartphone or tablet. Now I don't know anyone who doesn't! The Census Bureau has kept pace with these emerging technologies by developing mobile apps. If you haven't seen it, I highly recommend you download the "America's Economy" mobile app available for Apple and Android devices *(www.census.gov/mobile)*. This application provides real-time updates for 20 key economic indicators released from the U.S. Census Bureau, Bureau of Labor Statistics, and Bureau of Economic Analysis. The updates include a dashboard of the current indicator values with graphical information indicating the direction and significance of the change from the previous value, line plots of selected series, and access to the Census Bureau's Economic Indicator Database.

I was involved in the development and testing of the graphics. Since the Economic Indictor Database was introduced to the

public in 2009, it has undergone continuous enhancements, such as adding more programs' series, offering different file formats for data set extracts, and providing interactive graphical displays for the series. I co-led a team that developed the requirements for these graphical displays, looking for simple-to-use data visualization tools that were implemented while maintaining strict compliance with the Census Bureau's statistical standards. While the Economic Indicator Database team worked on adding these (user-requested) features to our Internet applications, the communications directorate was conducting parallel efforts, creating an eye-catching "indicators dashboard" for the Census Bureau's home page and developing the accompanying mobile applications. Eventually, both teams joined forces. Ten years ago, I never would have imagined you could fit up-to-date information on 20 indicators on the screen of a tiny phone, let alone present it in an intelligible way! Now, I can't imagine why you wouldn't.

Name one or two favorite blogs or books you have read and would recommend to others.

It's hard to narrow down the list to two books, let alone blogs! I cut my survey sampling teeth on William Cochran's *Sampling Techniques* and still consult it frequently. However, I usually recommend Sharon Lohr's *Sampling Design and Analysis*, which covers the same content in a more modern way (with real-life examples) and provides both the design-based and model-based perspectives. Once you've selected your probability sample and are ready to analyze the data, I highly recommend reading *Applied Survey Data Analysis* by Stephen Herringa, Brady West, and Patricia Berglund.

"Your education shouldn't end when you attain your degree. If you can, try to get hands-on experience while you are earning that degree."

What advice would you give to young statisticians just beginning their careers?

Be prepared for some tedium! The more interesting projects are often earned by proving you can perform the less glamorous tasks cheerfully (or without complaining loudly) and carefully—such as running simulations, examining plots, and preparing summary tables. Look at what others around you are working on and see if you can eventually visualize yourself doing similar work. Ask questions and invite review before you share your work with a larger audience. Be grateful, not embarrassed, when someone catches an error in your work, and pat yourself on the back if the error was caught early. Keep reading. Your education shouldn't end when you attain your degree. If you can, try to get hands-on experience while you are earning that degree by participating in a consulting program if offered by your school or through an internship. Finally, be open to change. Give everything time, but try to get a variety of experiences.

What do you enjoy doing in your spare time?

I'm a pretty active person outside the office. Running is my staple, alone or with a partner. In 2014, I finished two marathons, and I hope to complete another in 2015. I also like 10Ks, half marathons, and the rare metric marathon. I indulge in the occasional bicycle ride and practice yoga. I'm also really trying to learn to enjoy golf. This is much more difficult, as I have little or no hand-to-eye coordination, truly awful eyesight, and absolutely no patience. I'm a voracious reader of both nonfiction (mostly statistical journals) and fiction (especially mysteries and thrillers). Mostly, I enjoy spending time with my family. Both my teenagers have been involved in extracurricular activities, so I support them as a spectator, chauffeur, and volunteer (when needed). We also enjoy traveling together, especially if we can get two separate hotel rooms! As of September 2015, I'll have a half-empty nest, with my son enrolled in college. This might give me a little more spare time, especially since I've promised my daughter I won't devote all that extra time to her. ■

Professional Opportunity listings may not exceed 65 words, plus equal opportunity information. The deadline for their receipt is the 20th of the month two months prior to when the ad is to be published (e.g., May 20 for the July issue). Ads will be published in the next available issue following receipt.

Listings are shown alphabetically by state, followed by international listings. Vacancy listings may include the institutional name and address or be identified by number, as desired.

Professional Opportunities vacancies also will be published on the ASA's website (*www.amstat.org*). Vacancy listings will appear on the website for the entire calendar month. Ads may not be placed for publication in the magazine only; all ads will be published both electronically and in print.

Rates: $320 for nonprofit organizations (with proof of nonprofit status), $475 for all others. Member discounts are not given. For display and online advertising rates, go to *www.amstat.org/ads*.

Listings will be invoiced following publication. All payments should be made to the American Statistical Association. All material should be sent to *Amstat News*, 732 North Washington Street, Alexandria, VA 22314-1943; fax (703) 684-2036; email *advertise@amstat.org*.

Employers are expected to acknowledge all responses resulting from publication of their ads. Personnel advertising is accepted with the understanding that the advertiser does not discriminate among applicants on the basis of race, sex, religion, age, color, national origin, handicap, or sexual orientation.

Also, look for job ads on the ASA website at *www.amstat.org/jobweb*.

California

■ The Quantitative Sciences Unit seeks a biostatistician to join the department as assistant or associate professor of medicine in the non-tenure research line. Applicants should have a PhD in Biostatistics, Statistics, or related field, and an outstanding record doing collaborative biostatistics, with an emphasis in oncology, cardiovascular medicine, neurosurgery, preventive medicine and public health. Submit CV and a brief letter of interest to: *facultyapplication.stanford.edu.* Stanford University is an EOE.

Missouri

■ Assistant/associate Professor, statistics department, University of Missouri, tenure track assistant/associate position; all areas of statistics are encouraged to apply. PHD in statistics required by August 15, 2016.Apply online at *http://hrs.missouri.edu/find-a-job/academic.* Upload cover letter, CV, research & teaching statements. Deadline: December 1, 2015. Have three letters of recommendation sent to *umcstatfacsearch@missouri.edu*. The University of Missouri is an equal opportunity/affirmative action/ADA employer.

New Hampshire

■ Postdoctoral training program, Quantitative Biomedical Sciences in Cancer, Geisel School of Medicine at Dartmouth invites applications for a multidisciplinary program preparing quantitative scientists for careers in cancer research. Candidates are appointed 2 yrs/min, stipends provided. Applicants must possess a PhD or MD degree and be citizens, noncitizen nationals or permanent residents of the U.S. Send applications to: *Vicki.Sayarath@Dartmouth.edu*. Or visit *www.dartmouth.edu.* Dartmouth is an affirmative action/equal opportunity employer.

South Carolina

■ The Statistics Department USC, Columbia invites applications and/or nominations for an assistant professor position in statistics. The research focus for this position is in the theory, methodology, and computational aspects related to data science/analysis of big data. For details see *www.stat.sc.edu.* Review of applications will begin 11/30/2015.

Williams College
Assistant Professor

The Williams College Department of Mathematics and Statistics invites applications for two tenure-track positions in statistics, beginning fall 2016, at the rank of assistant professor (in an exceptional case, a more advanced appointment may be considered). We are seeking highly qualified candidates who have demonstrated excellence in teaching and research and who are committed to working with an increasingly diverse student body. The candidates will become the fourth and fifth tenure-track statisticians in the department, joining a vibrant and active statistics group with a newly established statistics major. The teaching load is two courses per 12-week semester and a winter term course every other January. In addition to excellence in teaching, an active and successful research program is expected. The candidate should have a Ph.D. by the time of appointment. We welcome applications from members of groups traditionally underrepresented in the field.

Candidates may apply via interfolio.com by uploading their vita and having three letters of recommendation on teaching and research uploaded to *http://apply.interfolio.com/30206*. Teaching and research statements are also welcome. Evaluations of applications will begin on or after November 15 and will continue until the position is filled. All offers of employment are contingent upon completion of a background check. Further information is available upon request. For more information on the Department of Mathematics and Statistics, visit *http://math.williams.edu/*.

Williams College is a coeducational liberal arts institution located in the Berkshire Hills of western Massachusetts. The college has built its reputation on outstanding teaching and scholarship and on the academic excellence of its approximately 2,000 students. Please visit the Williams College website (*http://www.williams.edu*). Beyond meeting fully its legal obligations for non-discrimination, Williams College is committed to building a diverse and inclusive community where members from all backgrounds can live, learn, and thrive.

Faculty Positions Available

STATISTICS
TEXAS A&M UNIVERSITY

The Department of Statistics at Texas A&M University anticipates multiple open-rank faculty positions (tenure/tenure-track) to begin September 2016. Salary is open depending upon qualifications presented. Completion of all requirements for a PhD/DSc degree in Statistics (or a closely related field) prior to beginning employment is required. The department encourages persons from all areas of research to apply, but is particularly interested in areas at the interface of statistics and computer science (i.e., big data, computational statistics and data mining) and in spatial statistics. Successful candidates will have a strong commitment to research and teaching. Excellent computing facilities are available and highly competitive startup funding is anticipated.

The department has a tradition of outstanding theoretical and interdisciplinary research. Current faculty members actively collaborate with colleagues in the Colleges of Science, Agriculture and Life Sciences, Engineering, Geosciences, Medicine, Public Health, Veterinary Medicine, and with the Faculties of Genetics, Nutrition and Toxicology. For more information on the department and the research interests of its faculty, please visit www.stat.tamu.edu. **To apply, please visit** AcademicJobsOnline.org**.** Applications will continue to be accepted until the positions are filled.

Texas A&M University is an equal opportunity/affirmative action employer. The university is dedicated to the goal of building a culturally diverse and pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, individuals with disabilities and veterans. Texas A&M University has a partner placement program and is responsive to the particular needs of dual career couples. The Department of Statistics is interested in candidates who can contribute to the diversity of the academic community through their research, teaching and/or service.

UTHealth | School of Public Health
The University of Texas Health Science Center at Houston

Biostatistics
Professor & Department Chair

The University of Texas School of Public Health (UTSPH) is seeking an energetic and visionary leader to become chairperson of the Department of Biostatistics. A strong candidate should have the ability to continue to develop a long-term vision for the department, develop new programs, increase and complement the success of existing programs, mentor UTSPH junior faculty and students, and engage in collaborative research with other faculty members.

Candidates must have a doctoral degree in biostatistics, statistics, or a related field, and the qualifications/credentials commensurate with an appointment as a tenured, full professor at UTSPH. Candidates should also have a strong record of independent and collaborative research, history of securing extramural funding, outstanding interpersonal and communication skills, and an excellent record of leadership and team-building skills.

The UTSPH Department of Biostatistics (https://sph.uth.edu/divisions/biostatistics/) has over 45 years of excellence in teaching and research. It is composed of 21 full-time faculty members, 10 staff members, and 120 students. Faculty research interests are broad and include Bayesian statistics, bioinformatics, computational biology, design and analysis of clinical trials, longitudinal data analysis, spatial modeling, statistical analysis with missing data, statistical genetics, stochastic modeling, survival analysis, and time series. The Coordinating Center for Clinical Trials (CCCT), with a mission to design and conduct large multi-center controlled clinical trials, is closely associated with the department. The CCCT was established in 1971 by biostatistics faculty members at UTSPH and has provided an avenue for both conducting clinical trials and developing related methodological research. The CCCT has played a leading role in cardiovascular diseases, diabetes, ophthalmology, and neurological research.

UTSPH is an integral part of The University of Texas Health Science Center at Houston (UTHealth). Located in the Texas Medical Center, UTSPH has five regional campuses (Austin, Brownsville, Dallas, El Paso, and San Antonio). Currently, three biostatisticians in the Department of Biostatistics are located on three of the regional campuses.

Salary is competitive and commensurate to rank, experience, and qualifications. An excellent comprehensive benefits package is available. Candidates should apply online by uploading a letter of interest (describing qualifications and research interests), CV, and contact information for three professional references to: http://jobs.uth.tmc.edu/applicants/Central?quickFind=104917. For inquiries: write to Dr. Wenyaw Chan at Wenyaw.Chan@uth.tmc.edu. The application will remain open until the position is filled; screening will begin on September 1, 2015.

UTHealth is an EEO/AA employer. UTHealth does not discriminate on the basis of race, color, religion, gender, sexual orientation, national origin, genetics, disability, age, or any other basis prohibited by law. EOE/M/F/Disabled/Vet. Minority and women are strongly encouraged to apply. This is a security-sensitive position and thereby subject to Texas Education code 51.215. A background check will be required for the final candidate.

NC STATE UNIVERSITY

Tenure-Track Faculty Positions

The Department of Statistics at North Carolina State University invites applications for three tenure track positions to begin in August 2016: one Assistant Professor and two open-rank positions. For outstanding candidates, the open-rank positions may be combined with named professorships.

Applicants must have a Ph.D. in Statistics or Biostatistics. Responsibilities include teaching, research, and doctoral student research supervision. Candidates for Associate or Full Professor must have an established record of funded research, collaboration, and exemplary teaching.

To apply for the Assistant Professor position, go to https://jobs.ncsu.edu/postings/55131, and for the open-rank positions, go to https://jobs.ncsu.edu/postings/55266.

Questions may be directed to the Search Chair, Dr. Ana-Maria Staicu (stat_search@stat.ncsu.edu).

Non-Tenure Track Faculty Position - Teaching Assistant Professor

The Department of Statistics at North Carolina State University invites applications for a non-tenure track position at the Assistant Professor level to begin in August 2016.

Applicants must have a Ph.D. in Statistics or Biostatistics. Experience and excellence in teaching is required. The initial appointment is expected to be for two years, but the position is eligible for subsequent appointments, and promotions in rank are possible.

To apply, go to https://jobs.ncsu.edu/postings/53972.

Questions may be directed to the Search Chair, Dr. Roger Woodard (teach_stat_search@stat.ncsu.edu).

Processing of applications will begin November 20, 2015 and continue until the positions are filled.

NCSU is an equal opportunity and affirmative action employer. In addition, NC State University welcomes all persons without regard to sexual orientation or genetic information.

Applications/inquiries for the position should be sent to Faculty Search Committee/ Department of Statistics, USC, Columbia, SC 29208. *FacultySearch@stat.sc.edu*. The University of South Carolina is an affirmative action, equal opportunity employer.

CANADA

Quebec

■ Tenure-track position in statistics. HEC Montréal, Department of Decision Sciences, in collaboration with the Canada Excellence Research Chair in Data Science for Real-Time Decision Making. PhD in statistics or in a related field (data and decision science, data mining, statistical learning). Deadline is October 1st, 2015. See *www.hec.ca/en/job_offers/professor_statistics_juin2015.html* for details. Send CV, teaching evaluations (if available), names of three references to *genevieve.gauthier@hec.ca*. HEC Montréal has an equal access employment program and we encourage women, aboriginal peoples, visible minorities and people with disabilities to submit job applications. All qualified candidates are encouraged to apply; however Canadians and permanent residents will be given priority. ■

UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

Pranab K. Sen Distinguished Visiting Professorship

The Department of Biostatistics at the University of North Carolina at Chapel Hill (UNC-CH) is seeking to recruit an aspiring international scholar in statistical science for the Pranab K. Sen Distinguished Visiting Professorship in Biostatistics. The position is for the spring semester beginning January 2016 for a period lasting up to six months or for the fall semester beginning August 2016 for a period lasting up to five months. Preference will be given to applicants from developing countries as defined by the Departments of Biostatistics and Statistics and Operations Research and in consort with the dean of the Gillings School of Global Public Health. The visiting faculty, who will come from an area of statistical science, broadly defined, including bioinformatics, will come to UNC-CH to conduct research, possibly teach, and interact with faculty, students, and the university community. The major benefit will be an intensive interaction of the visitor's strong methodology background with applications to interdisciplinary research underway at UNC-CH. The visiting professorship, at the assistant, associate or full professor level, offers salary support commensurate with the rank. Financial support for other expenses such as travel is negotiable. Ideally, the visiting scholar will return to his or her home country for at least one year upon completing the appointment to further expand the reach of interdisciplinary work begun in Chapel Hill. Applicants should hold a PhD in statistics or biostatistics or have commensurate educational background.

To apply, send your CV, cover letter, and research statement to Betsy Seagroves (email: *bseagrov@bios.unc.edu*).

Candidates must also arrange for three letters of recommendation to arrive via email at *bseagrov@bios.unc.edu*.

The deadline for applications is October 1, 2015.

NYU School of Medicine
NYU LANGONE MEDICAL CENTER

DIRECTOR, DIVISION OF BIOSTATISTICS

NYU School of Medicine seeks to recruit a **Director** of the **Division of Biostatistics**. This is a unique opportunity for an accomplished biostatistician to shape and expand biostatistics in a dynamic academic environment characterized by growth, collaborative spirit, and high impact science.

The Division of Biostatistics, with 10 faculty members and 7 staff biostatisticians, leads a strong program of extramurally funded research in methodology, theory, and application in biomedical research. The Division also serves as a vital hub of collaboration and consultation to the entire NYU School of Medicine community, engaged in major research initiatives in cancer, environmental medicine, cardiovascular and pulmonary disease, neuroscience and mental health, among other areas. The Division leads the biostatistics cores of key NIH-funded centers including the NYU Clinical and Translational Science Institute, the NYU Cancer Institute, the NYU NIEHS Center, and a new initiative that houses Statistical and Data Coordinating Centers and Clinical Coordinating Centers for multicenter clinical trials and registries. The Division is engaged in a wide range of education and training initiatives, across multiple levels, including a PhD program in Biostatistics. The Department of Population Health (**http://pophealth.med.nyu.edu/**), founded in 2012, is academic home to the Division, and committed to supporting its robust trajectory of growth through methodological and collaborative research.

We seek a Division Director nationally recognized for his/her scholarship and with a successful record of administrative leadership in academic medicine or public health. The Director will lead the Division in strategic planning, significant growth, and identification and pursuit of new funding initiatives in translational and novel methodological research. Additional responsibilities will include developing and administering biostatistics infrastructure to support and accelerate the institutional research mission, representing the Division effectively within the NYU School of Medicine and beyond, administering and managing the growth of Division resources, and recruiting, retaining, mentoring and promoting Division faculty. The Director will also forge collaborations at the University level, including with the College of Global Public Health, Center for the Promotion of Research Involving Innovative Statistical Methodology (PRIISM), NYU Center for Data Science and Courant Institute of Mathematical Sciences.

Core qualifications include: excellent track record in research, strong interpersonal and administrative skills, and significant academic experience and accomplishment including in a leadership role. Candidates must have a doctoral degree in Biostatistics or Statistics and be eligible for a tenured appointment at the rank of associate or full professor.

Send cover letter and CV (addressed to Marc N. Gourevitch, MD, MPH) referencing "search biostats" to **kathryn.nyland@nyumc.org**

NYU Langone Medical Center is an equal employment/affirmative action employer.

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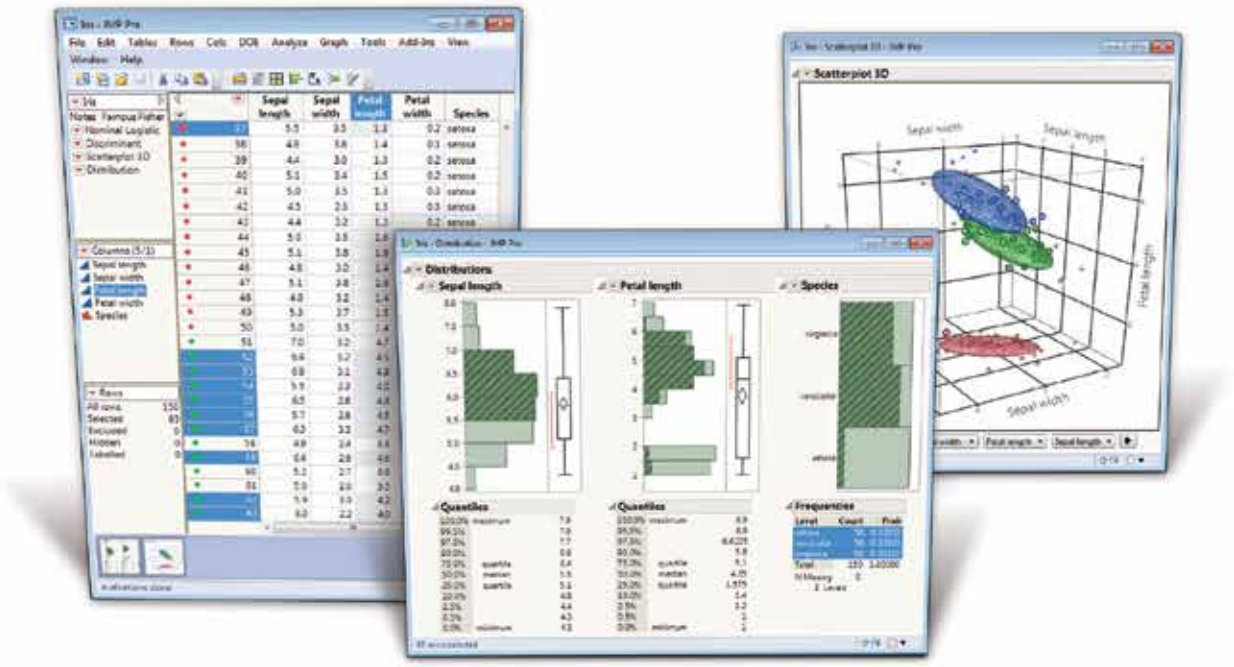

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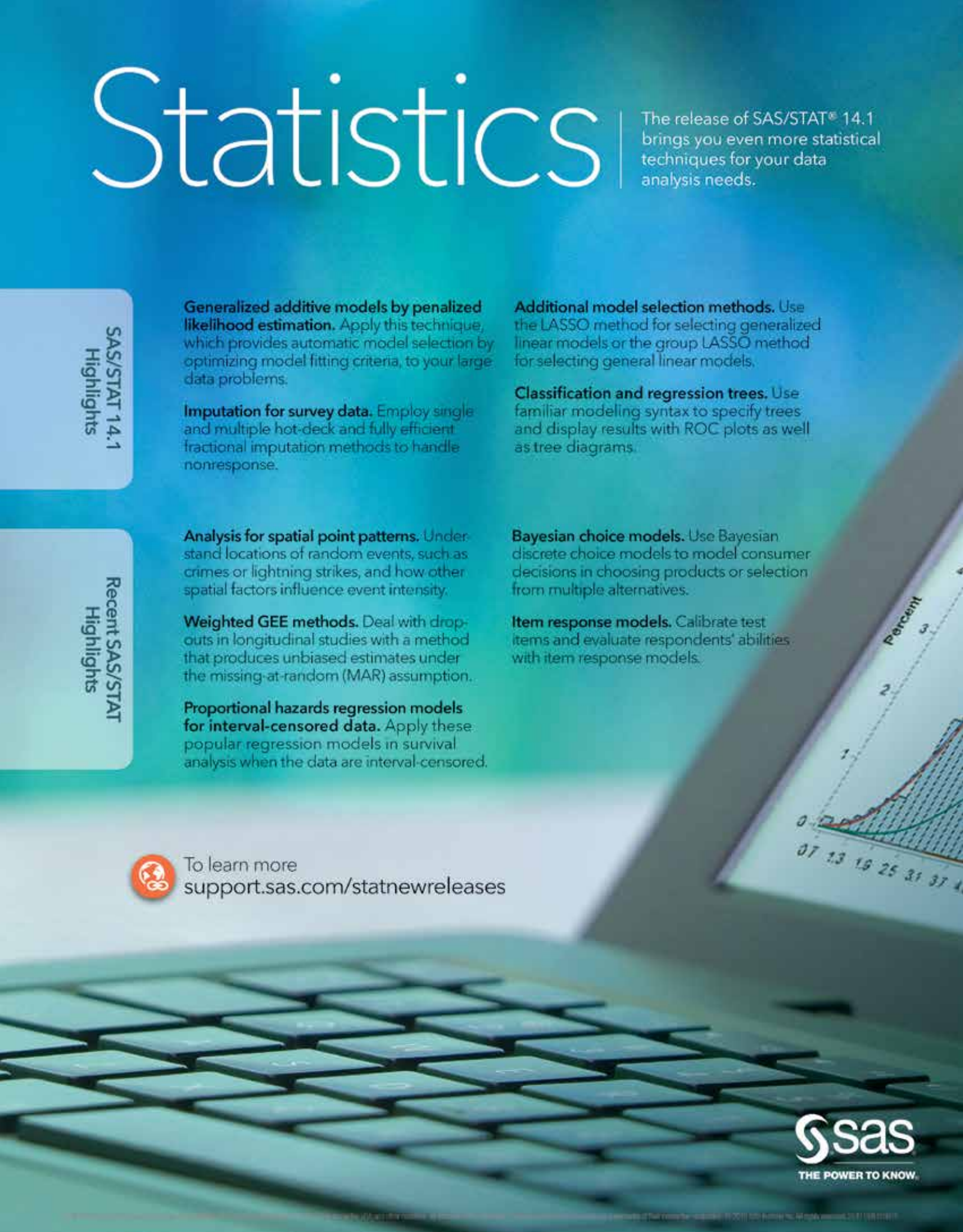

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