April 2018 • Issue #490

AMSTATNEWS

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APRIL 2018 • ISSUE #490

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Amstat News (ISSN 0163-9617) is published monthly by the American Statistical Association, 732 North Washington Street, Alexandria VA 22314-1943 USA. **Periodicals postage paid** at Alexandria, Virginia, and additional mailing offices. POSTMASTER: Send address changes to *Amstat News,* 732 North Washington Street, Alexandria VA 22314-1943 USA. Send Canadian address changes to APC, PO Box 503, RPO West Beaver Creek, Rich Hill, ON L4B 4R6. Annual subscriptions are $50 per year for nonmembers. *Amstat News* is the member publication of the ASA. For annual membership rates, see *www.amstat.org/join* or contact ASA Member Services at (888) 231-3473.

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The American Statistical Association is the world's largest community of statisticians. The ASA supports excellence in the development, application, and dissemination of statistical science through meetings, publications, membership services, education, accreditation, and advocacy. Our members serve in industry, government, and academia in more than 90 countries, advancing research and promoting sound statistical practice to inform public policy and improve human welfare.

features

columns

In honor of National Poetry Month, Larry Lesser of The University of Texas at El Paso offers this poem (on the trending topic of mindfulness):

Mindful Means

An explanatory variable has a response and
The space
Before response is deemed
Freedom,
Sought by degrees:
More time to reflect
If randomness is
Uniform, if correlation is
Causal, chance, or complexity yet
Unnamed.

In the space
To scan
What's there, what else
Could be: mediator or moderator
Variable.
Not bearing burden of being
Certain, we seek habit
To inhabit uncertainty –
To describe, not deny –
And fail to reject.

Conducting a study of one
Being present in the moment,
Not lost in time series,
Letting noise and outliers pass,
Centered in breath,
Eyes shut to better see our mode
Beyond expectation,
Sitting in the lotus,
No longer standing for
Law Of The Unconscious Statistician.

Online Articles

The following articles in this issue can be found online at *http://magazine.amstat.org*.

STATISTICS TEACHER has a new editor! Jessica Cohen is new to the role, but not to the journal — she acted as associate editor for *ST*'s predecessor, *Statistics Teacher Network*. Check out the publication online at *www.statisticsteacher.org*.

IN MEMORIAM Sadly, Sharon Anderson, Lawrence (Larry) Brown, and Truc Truong Nguyen passed away recently. To read these members' obituaries, visit *http://magazine.amstat.org*.

departments

Check out the Math and Statistics Awareness Month poster in this month's **centerfold.**

member news

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Statisticians Leading with Justice for All

In the past two issues of *Amstat News*, I have focused on building the ASA Leadership Institute. This month, I want to highlight another 2018 presidential initiative—expert witness training. The idea for such a program came from our membership.

Early in 2017, Executive Director Ron Wasserstein heard from several members about whether the ASA could help prepare consulting statisticians for service as expert witnesses in a trial or deposition. Around the same time, I had occasion to talk with a former University of North Carolina biostatistics student, Naomi Brownstein, and she described her interest in being an expert witness. Now a statistics faculty member at Florida State University, Naomi had been approached about serving in this capacity. So, Ron and I put our heads together to assess the need for this kind of training and came up with a proposal.

There are areas of the law that involve quantitative expertise. Ensuring there are qualified statistical professionals in the courtroom or otherwise involved with the legal process in those areas would improve the quality of the legal process and increase recognition of the important contributions of statistics and statisticians.

There are many leaders in our field who regularly step up to serve the courts on a variety of important topics, and our sister fields—such as mathematics—are also stepping up to contribute. Gerrymandering of legislative districts, for instance, is one topic that has drawn attention of late (see *https://goo.gl/HW6csM*). Gerrymandering struck a chord with me, living in two states (Maryland and North Carolina) that have been accused of extreme partisan gerrymandering—but in opposite political directions. Other topics include investigations of Medicaid fraud by medical providers and using "risk-limiting audits" to detect problems with elections. These topics often end up in court, and statisticians should be prepared to chip in.

One aspect of the FDA's mission to protect and promote the public health that I did not fully appreciate until working there was the need to ensure product claims made in labeling and advertising were accurate and did not mislead the public. Evaluating the evidence to determine whether product statements are misleading is the subject of FDA guidance documents, but these determinations often end up in court, where a company's first amendment rights in making claims about a product are weighed against the agency's need to ensure such claims do not mislead the public.

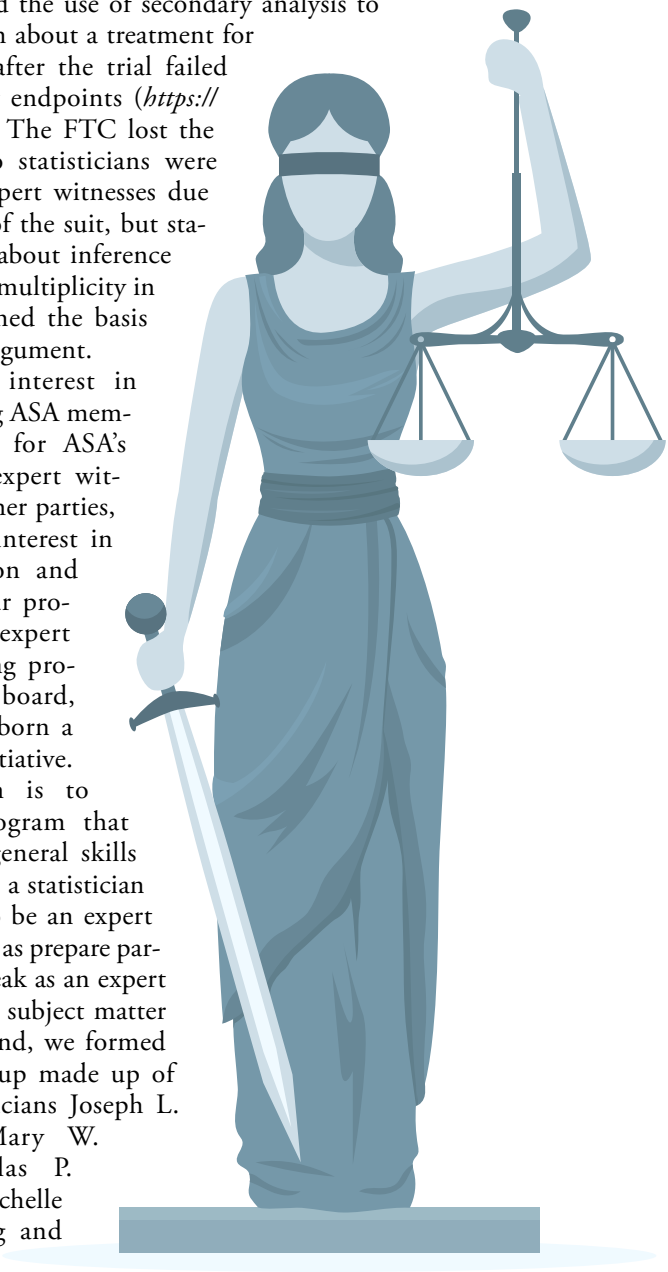
A recent example is the Federal Trade Commission's suit against Quincy Bioscience that questioned the use of secondary analysis to support a claim about a treatment for memory loss after the trial failed on its primary endpoints (*https://goo.gl/64zjP8*). The FTC lost the claim, and no statisticians were involved as expert witnesses due to the nature of the suit, but statistical theory about inference in general and multiplicity in particular formed the basis of the FTC's argument.

Given the interest in training among ASA members, requests for ASA's assistance as expert witnesses from other parties, and my own interest in this topic, Ron and I presented our proposal for an expert witness training program to the board, and thus was born a presidential initiative.

Our vision is to develop a program that provides the general skills and knowledge a statistician should have to be an expert witness, as well as prepare participants to speak as an expert on at least one subject matter area. To this end, we formed a working group made up of leading statisticians Joseph L. Gastwirth, Mary W. Gray, Nicholas P. Jewell, and Rochelle E. Tractenberg and

Photo by Jon Gardiner/ UNC-Chapel Hill

Lisa LaVange



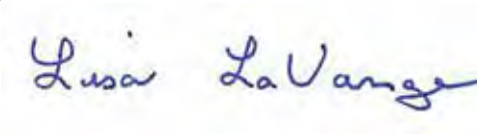
asked Kathy Ensor of Rice University to be the chair. The assembled team includes a lawyer and statisticians with courtroom experience.

I asked Kathy, as chair, to report on the deliberations of the working group to date, and here is what she had to say:

> Leaders in our field have often provided expertise to the courts and Congress, many learning by experience. The objective of this training program for statistical expert witnesses is to help our community, especially those new to our profession, expedite the learning curve on how to best serve the courts as an expert statistician.
>
> There were exciting suggestions for what should and should not be included in a training workshop. Although our experiences varied, several common themes emerged, including the following:
>
> - What it means to be an expert witness
> - What it means to be an expert statistical witness
> - Voicing a clear unbiased statistical opinion at all stages of the legal process
> - Ethical considerations as practicing professional statisticians
> - Common mistakes and pitfalls to avoid
>
> The role our profession has played in the courts throughout history is laudable. The role of the expert statistician emerged strongly in the 1980s. As a young statistician, I recall reading with great enthusiasm the text *Statistics and the Law* by [Morris] DeGroot, [Stephen] Fienberg, and [Joseph] Kadane and then later Jay Kadane's 2008 book, *Statistics in the Law: A Practitioner's Guide, Cases, and Materials*. I guess this speaks to my love of statistics and its application, as I read the books with the deep immersion great novels require.
>
> The vast array of areas in which statisticians interact with the courts simply boggles the mind—areas such as employment discrimination, DNA, medical practice, environmental issues, patent challenges, economic risk, and financial fraud.
>
> The recent creation of the National Institute of Standards and Technology–supported Center for Statistics and Applications in Forensic Evidence (CSAFE, *forensicstats.org*) recognizes the important role statisticians play in forensic science and hence the legal system. The expert witness working group also noted emerging areas that include statistical and machine learning algorithms potentially guiding decisions of the courts and the criminal justice system. Equally as broad as the societal issues statisticians are asked to address are the areas of statistics in which statisticians serve as experts. And given the demand for our expertise, we as a committee were reminded that one important component to serving as an expert is knowing when to decline a request.
>
> We are developing a training program with the following key goals in mind:
>
> - **Quality –** Develop a program that provides excellent training and meets, or even exceeds, the needs of our members
> - **Impact –** Develop a program that can reach a substantial number of people over time
> - **Sustainability –** Develop a program that can be offered regularly and support itself financially
>
> An RFP for training program development will be announced, pending approval by the ASA Board. The general goal is to begin the program either in the fall of 2018 or spring of 2019. Once developed, this program will become part of the ASA Leadership Institute, offered at a frequency deemed helpful to our community.

My thanks go to Kathy and her team for the work accomplished so far, and I look forward to seeing this program roll out in the coming months. I believe the program will be a valuable resource to ASA members, and we have certainly heard from several who are anxiously awaiting its inception. This is yet another example of an area in which strong statistical leadership can have an impact that extends far beyond our membership.

So, here's to statisticians leading with justice for all!



Recognizing the ASA's *Longtime Members*

The American Statistical Association would like to thank its longtime members by continuing its tradition of honoring those who joined the association 35 or more years ago. This year, we recognize the members here for their distinguished and faithful membership.

If you are a longtime member and will be attending the Joint Statistical Meetings in Vancouver, British Columbia, Canada, please join us for a reception in your honor. If your name is not below and you believe it should be, contact Amy Farris at *amy@amstat.org* to correct your record.

Following this list is a Q&A with a few of our longtime members—find out why they have remained members of the ASA for so long.

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Naitee Ting
Ruey-Shiong Tsay
Siu-Keung Tse
Clyde Tucker
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David A. Whitney
Dexter C. Whittinghill
Priya J. Wickramaratne
Christopher John Wild
William E. Wilkinson
Thomas R. Willemain
Jeffrey R. Wilson
William E. Winkler
Luke G. Wolfe
Glenn S. Wolfgang
F. Lennie Wong
John Charles Wurst
Emmanuel Yashchin
Linda J. Young
Elizabeth R. Zell

Longtime Members Offer Wisdom

We interviewed a few longtime members to find out why they remain members of the ASA and how they have benefitted from being a member. Here is what they had to say:

Janet Myhre

Member for more than 50 years

Being a mathematical applied statistician has allowed me to have a career in which I am continuously learning, always involved in problem solving, and never bored. My first interest in statistics occurred as a graduate student at the University of Washington. Z. W. Birnbaum was instrumental in founding my interest in probability and mathematical statistics.

One of my careers has been as a professor of mathematics at the Claremont Colleges and University. My teaching involved instructing courses in probability, theoretical and applied statistics, problem solving, data analysis, and statistical thinking for engineers. Other activities included founding the Reed Institute for Applied Statistics. This institute funded summer research for undergraduates and facilitated the process of obtaining funding for courses in applied statistics. In these courses, problems were elicited from government and business, which involved data and could be solved using applied statistics. A course in applied statistics was designed to analyze one of these problems during a semester course. Students received course credit and provided the client with written and oral reports.

My second career, concurrent with my first career and still active, has been as a statistical consultant to the US Navy. This career has been extremely rewarding. The problems to be solved are often complex and require additional theory. The solutions are made possible by teamwork with exceptionally well-informed and dedicated naval officers, engineers, and scientists.

How has your professional and/or personal life been affected by being a member of the ASA?

The ASA has helped my professional life by providing statistical problem solving information both online and in professional meetings. My years as an associate editor of *Technometrics* and later as chair of the Committee for Careers in Statistics were both informative and rewarding.

Is there anything you wish someone had told you when you embarked upon your career that you would like to tell others now?

One wants to find a career where the work is so enjoyable you never want to stop, where being involved in your work is one of the most rewarding things you do.

Betty Skipper

Member since 1963

I majored in mathematics at Oberlin College, and I was the first in my family to graduate from college.

During my senior year in college, I saw an announcement on a bulletin board about a biostatistics graduate program at Western Reserve University (WRU). A professor from that program came to campus that afternoon to talk to students. I had never heard of biostatistics. It was explained as an opportunity to combine mathematics and science. The coursework consisted of two years of statistics at Iowa State University (ISU) and the first year of medical school at WRU. I applied and received a pre-doctoral fellowship.

As I was finishing my dissertation, a professor at WRU told me he was moving to a new medical school at the University of New Mexico (UNM) and would be hiring biostatisticians. I applied, intending to move back to the Midwest in two years. Forty-eight years later, I retired as a tenured professor from UNM and now work part time. I met my late husband in Albuquerque and have two grown children and four grandchildren.

I have spent my career as an applied biostatistician, collaborating with students and health professional colleagues, as well as teaching biostatistics courses. I am particularly interested in mentoring students and junior faculty and teaching statistical concepts to health professionals who are not statisticians. My combined training in statistics and medical sciences has been an important asset. Over the years, I have seen major changes in statistical practice—from mechanical calculators and computer punch cards to modern computers and statistical software.

Although I didn't start with specific plans for this career, it has been a rewarding career. I have been privileged to work with many students and faculty colleagues at the University of New Mexico.

How has your professional and/or personal life been affected by being a member of the ASA?

Continuing education through local chapter meetings, publications, and short courses.

What or who inspired you to become a statistician?

There was really no one who inspired me to become a statistician. As I mentioned in the career summary, I saw an announcement on a college bulletin board and decided to apply without really knowing much about it.

Janet Myhre

Betty Skipper

Dennis Boos

Dennis Boos

Member since 1974

How has your professional and/or personal life been affected by being a member of the ASA?

The ASA has been the central professional organization in my career. I have attended most JSMs over the last 40 years. In fact, we often made the JSM a family vacation. (My children loved the hotels when they were young!) I have been involved in a number of committees and have appreciated the organizational professionalism of the ASA. Of course, *JASA* and *TAS* have been important journals for me, and I still get hard copies.

What or who inspired you to become a statistician?

In the summer of 1973, I visited the department of statistics at Florida State looking for a career change. My undergraduate degree was in physics, but I had become disillusioned with the heavy dependence of physics on the defense industry for funding. I first talked to a math professor friend about applied math, but he suggested walking down the hall and talking to someone in statistics. (He saw the future!) So, the associate head, Fred Leysieffer, told me about statistics—I had no clue about the field—and I applied to graduate school soon after.

Is there anything you wish someone had told you when you embarked upon your career that you would like to tell others now?

I guess it would have been nice for me to understand the entrepreneurial nature of an academic career. As a junior, I wasn't proactive enough in making connections with scientists and other statisticians. Fortunately, North Carolina State is a warm and nurturing environment for young faculty.

Calvin Zippin

Calvin Zippin

Member since 1947

In 1947, upon graduation from SUNY-Albany with majors in biology and mathematics and a course in statistics, I was hired by the Sterling-Winthrop Research Institute—the research arm of a large pharmaceutical firm—to do a variety of chores, including statistical analysis of laboratory and clinical data. That same year, I joined the Albany Chapter of the ASA. Three years later, with a full tuition scholarship, I began graduate work in biostatistics at Johns Hopkins under the revered William G. Cochran.

With my ScD degree in hand, I accepted a faculty position in the school of public health at the University of California, Berkeley in 1953 and transferred in 1955 to the school of medicine in San Francisco (UCSF) with appointments in the Cancer Research Institute and the department of preventive medicine. In addition to teaching and research, I served as the campus' only consulting biostatistician. This resulted in involvement in a great variety of fascinating research areas. I continued to be active with the San Francisco Bay Area Chapter of the ASA.

As head of the UCSF cancer registry and with ties to state and national cancer data systems, my work became focused on the biometry and epidemiology of cancer. Long-term continuing support from the National Cancer Institute fueled my research and led to travel throughout the world and service on national and international committees.

Some of the ways in which I was further rewarded was election to fellowship in the ASA, service as president of the Western North American Region of the Biometric Society, membership in COPSS, and receipt of a lifetime achievement and leadership award from the National Cancer Institute. I am currently professor emeritus of epidemiology in the department of epidemiology and biostatistics at UCSF.

How has your professional and/or personal life been affected by being a member of the ASA?

Attending ASA meetings in the early days brought me in contact with persons with similar and diverse interests within statistics, and subject matter talks helped me try to keep current on developments within the field.

Membership in the ASA provided much of the basic grounding for my career. Rather than cite an individual experience, I will list several that stand out in my memory:

- Four trips to the Soviet Union during the Cold War for an international cancer congress and as part of a US-USSR collaborative project on breast cancer
- Participation in an international World Health Organization meeting on the importance of teaching statistics to medical students held in the unusual location of Karachi, Pakistan
- Meeting with staff of the Atom Bomb Casualty Commission in Hiroshima, Japan, while doing research on late effects of radiation
- At the request of the American Association for the Advancement of Science, I interviewed in 1978 in Buenos Aires mothers of missing abductees (some scientists) during the so-called "dirty war" in Argentina.

What or who inspired you to become a statistician?

I credit Lloyd C. Miller, my boss at the Sterling-Winthrop Research Institute, with inspiring me to go into biostatistics. Although he was primarily a pharmacologist, he had worked with Chester Bliss of Yale on bioassay and became aware of the critical

importance of statistical methodology in research. He went on to become director of revision of the United States Pharmacopoeia for 20 years. His encouragement led to my going on to graduate work in biostatistics.

Is there anything you wish someone had told you when you embarked upon your career that you would like to tell others now?

For anyone interested in concentrating on an applied area of statistics, I would emphasize the importance of learning as much about the subject matter of that field as well as that of statistics.

I was interested in biology and the health sciences. At the time of my graduate work at Johns Hopkins, we were required to take courses comprising most of the first two years of the medical curriculum in addition to work in biostatistics. For me, this was a blessing.

Also, I would say a career in statistics can open itself to the most exciting and unexpected avenues of fulfillment. Keep your sights high. Expect the unexpected!

Steve Ascher

Member since 1974

I earned my PhD in 1978 from SUNY at Buffalo. My first job was as an assistant professor at Temple University (1978–1983). At Temple, I revived the undergraduate major in statistics, which had been dormant for many years.

In 1983, I decided to go into industry and joined McNeil Pharmaceutical as a statistician. It was there that I learned about the complexities of drug development and how incredibly complex it is to get a new drug on the market. From 1993–1999, I worked at IBRD and Covance (two contract research organizations (CROs)). I received my first managerial experience at both organizations as I headed two small statistics groups.

Working on both the client side and the contractor side gave me a better understanding of how to build beneficial relationships between clients and CROs. I returned to Johnson & Johnson (Janssen) in 2000 to build a phase 4 statistics/programming/data management group.

My CRO experience was helpful, as our business model at Janssen was to use CROs. While at Janssen, my group supported numerous worldwide neuroscience trials. We also assisted in writing posters, abstracts, and manuscripts. In addition, I co-founded a mentoring program for J&J statisticians and programmers. During my J&J tenure, I became involved with the ASA New Jersey Chapter and served as president for four years and vice president for two years. I am currently secretary. We sponsor workshops, webinars, and career days for statistic graduate students and high-school students.

I retired in May of 2016 and still keep active with the ASA New Jersey Chapter and review papers for two veterinary journals and one sports in statistics journal. In addition, I do horse show announcing and keep busy with my sports memorabilia collection.

How has your professional and/or personal life been affected by being a member of the ASA?

Being a member has allowed me to keep up with the latest advances in statistics through subscribing to journals, belonging to various chapters and sections, and attending events for knowledge and networking. I have recommended membership to students and colleagues throughout my career.

Will you share an experience that stands out to you regarding your ASA membership?

What stands out for me is getting more involved in the ASA New Jersey Chapter. I have been president (four years), vice president (two years), and am currently secretary. I have gotten to work with my wonderful and dedicated officers and have always been very appreciative that all of the speakers we have had at various events do this for no financial gain. The volunteer spirit and giving back to the Statistics VC-Community is alive and thriving! Through the New Jersey Chapter, I have also gotten involved in career days for both statistics graduate students and high-school students. The future of our profession lies with them.

Steve Ascher

What or who inspired you to become a statistician?

I was good at math growing up and, as a baseball fan, wondered how baseball statistics were computed. Whereas many of my friends wanted to be doctors, lawyers, etc., I wanted to be the statistician for the New York Mets. When I started my undergraduate studies at SUNY at Buffalo in 1970, I was a math major. A friend thought I might like to take a statistics course as a way to apply math. I did and earned my BA in math/stat in 1974, my MS in statistics in 1976, and my PhD in statistics in 1978—all from SUNY at Buffalo.

Is there anything you wish someone had told you when you embarked upon your career that you would like to tell others now?

The importance of written and oral communications. I stress this when I give presentations at career days. Today, communications all too often are in tweets, emails, Instagram, etc., where people "talk" in shorthand (e.g., LOL, UR, etc.). The art of face-to-face communication seems to be fading. As I learned during my career, one needs to be able to present findings to people in a clear and concise manner. Statisticians do not just compute *p*-values! ■

Q&A with Industry Leaders

Statistician and data scientist continue to be ranked among the top jobs, most recently by *U.S. News & World Report* in 2017, which listed statistician as #1 on both its lists of Best Business Jobs and Best STEM Jobs, and Glassdoor in 2018, which had six analytics and data science jobs included in its 50 best jobs in America for 2018. We asked leaders in industry to answer the following set of questions to help students and statistics departments better prepare for jobs in the technology industry. We also hope the Q&A's will help companies attract the statistical talent they desire.

TALKSPACE

Bonnie Ray currently leads data science efforts at Talkspace. Talkspace is a NYC-based startup that enables behavioral health care for all through providing a secure, affordable platform for messaging-based psychotherapy.

Number of employees: Talkspace currently has about 60 full-time employees, five of whom make up the data science team—part of the larger technology team that also includes software engineers and product managers.

Distribution of highest degrees: The backgrounds of the data science team members vary, with some transitioning into data science after having worked for several years in another technical discipline and others having just completed master's or PhD degrees that included extensive data science training.

Growth (or lack thereof) in number of data scientists over last several years? The data science team was only created in 2017, but may grow by another one or two individuals over the course of 2018.

I completed a PhD in statistics from Columbia University and began my career as an academic, first as a postdoctoral fellow at the Naval Postgraduate School in Monterey, California, and then as an assistant/associate professor at the New Jersey Institute of Technology. During my time as a faculty member, I was consistently drawn to interdisciplinary work that had clear and tangible impact. I also came to realize standing in front of a class of undergraduate or master's students to teach introductory statistics classes was somewhat nerve-racking for me, rather than fulfilling.

I decided to leave academia to take a position that allowed me to continue doing research while also providing opportunities for direct business impact. I took a position as a research staff member in the statistical forecasting group at IBM Research. As a research staff member, my responsibilities involved working directly with other IBM divisions to apply and/or develop new statistical methods to solve immediate business problems, while also filing patent disclosures and publishing applied research papers.

Over time, I took on responsibility for managing a small team of researchers and ultimately serving as director for an organization within research focused on development and application of AI algorithms to business challenges facing IBM and IBM's clients. Moving into a management role required me to refine my business communication skills, as I was expected to present the work of my team to both internal and external clients on a regular basis, grow my strategic thinking skills to develop a solid research and funding roadmap for my team, and develop my people management skills to effectively motivate and provide feedback to my team. I also had to learn how to think more broadly, without necessarily understanding all the details of a research area.

More recently, as I've transitioned to the tech start-up world where I build and lead small teams of data scientists, I've needed to become comfortable with engineering concepts and agile development skills, while also continuing to hone my ability to translate business problems into defensible statistical approaches and skill at communicating statistical findings across different parts of the business.

What do you like about working in the start-up space? What are the challenges?

Working for an early-stage start-up allows me the opportunity to learn about all parts of the business, working directly with product managers to determine how data science can contribute to new product features, with the marketing team to understand the impact of advertising on customer acquisition and retention, with the clinical team to develop quantitative approaches to measure the quality of the service provided by therapists on the Talkspace platform, and with the commercial team to understand analysis and reporting needs of our commercial clients.

One challenge for me, personally, is the need to have a deeper understanding of the existing and potential computing infrastructure available to the data science team to ensure our data and computing needs are met. I've had to come up to speed on the various tool sets and platforms available for doing data science (e.g., Hadoop, Spark, Jupyter, GPUs, etc.) to successfully lobby for the needs of the team. Additionally, the team is sometimes asked to rapidly pivot from one priority to another, which can sometimes affect team morale—something I need to make sure I effectively motivate and manage.

How is the demand for statisticians in the technology industry? What are the main degrees you consider when looking for candidates with statistical expertise?

The demand for statisticians/data scientists in the start-up industry is currently huge, with newly minted graduates often starting at salaries 1.2x–1.5x that of new assistant professors.

While I do not look specifically for candidates with a degree in statistics when filling a data science role, I do look for evidence of basic statistical thinking and an understanding of fundamental statistical modeling approaches, such as linear modeling, survival analysis, and Bayesian techniques. Most of the candidates I look for at the bachelor's and master's levels have degrees in either statistics/data science or computer science (with a focus on machine learning and/or natural language processing). I also am open to candidates with degrees in electrical engineering, physics, computational biology, econometrics, and the quantitative social sciences—assuming they show a solid understanding of statistics fundamentals and appropriate coding skills.

What do you see as the most important statistical skills in the tech industry? What are the other important skills necessary for a successful career in this sector?

It is important that an individual have not only a firm grasp of core statistical modeling approaches such as covered in a strong master's program, but also be competent enough to identify and understand appropriate statistical techniques s/he may not initially be familiar with to appropriately address the problem at hand. Solid programming skills are also necessary, with the specific language or tool set and the depth of technical knowledge dependent on the particular role. The most important skill needed for a successful career, however, is the ability to communicate effectively with colleagues across the business, both to understand the business needs for which data science expertise is needed and to communicate the results of analyses back to the business with minimal jargon.

What advice do you have for students interested in working in the technology industry? Any advice for students in general?

I would advise students to make sure their coding skills are more than competent, as working with any of the data sets typically collected will require effective and efficient data wrangling skills—and sometimes knowledge of multiprocessor, distributed, or GPU-based computing techniques.

I would also advise students to become comfortable with delivering the 80% solution (i.e., a solution for which an initial version can be developed quickly, but that may not address the complexity of the problem in its entirety).

Additionally, joining local data science–oriented meet-ups is really useful for establishing a network of colleagues from which one can learn and grow, as well as finding potential new career opportunities. Many individuals in the tech industry also maintain personal blogs or social media accounts focused on data science topics, which gives them exposure in the tech community.

What advice do you have for statistics and biostatistics departments (e.g., coursework, nontraditional training suggestions, research experience)?

I would encourage statistics and biostatistics departments to incorporate coursework on text analysis techniques, given the huge amount of information gathered in free text format today. I would also encourage exposure to additional computer science concepts, particularly those having to do with algorithmic complexity, as well as an overview of state-of-the art optimization approaches. Also, internships or work in the university statistical consulting center should be a required part of the curriculum to allow students to practice their problem definition, data wrangling, and communication skills.

What opportunities for advancement and professional growth exist for data scientists and statisticians in industry, and what advice for young professionals would you have to take advantage of those opportunities?

Advancement in the tech industry can be quite rapid, with individuals moving from individual contributors to team leads to chief data scientist roles in the course of only a few years, depending on the size of the company. I would suggest an individual think deeply about where he wants to take his career before taking on a management role, as often a move to management takes one away from further development of one's core technical skills. However, working in the tech industry, particularly at a smaller company, often enables an individual to move into

If you would like a representative of your company—whatever the sector—to respond to these questions for a future issue, please email Steve Pierson at *pierson@amstat.org* or Megan Murphy at *megan@amstat.org*.

a role he may not have previously considered, such as a product management or business strategy role.

For career advancement in general, I would advise a young professional to be proactive in presenting his results to the business to gain exposure for his work, take advantage of opportunities to give talks at local data science community meet-ups, and/or participate in hackathons. These experiences provide broader exposure and networking opportunities that can lead to career advancement.

LINKEDIN

Deepak Agarwal is a vice president of engineering at LinkedIn, where he is responsible for all machine learning and statistical modeling efforts across the company. LinkedIn is the largest professional networking site available today. The site provides a way to connect with other professionals and helps you stay in contact with millions of users.

Number of employees: LinkedIn has more than 11,500 full-time employees, including more than 400 data scientists and more than 30 statisticians.

Distribution of highest degrees: ~350 PhDs, with many more employees who hold other graduate/postgraduate degrees

How many hires per year? More than 1,000 new hires per year

Growth (or lack thereof) in number of data scientists over last several years? 25% growth in data scientists last year

I earned a PhD in statistics from the University of Connecticut in 2001, with Alan Gelfand as my thesis adviser. My thesis involved fitting spatial models to large data obtained from disparate sources like satellite imagery, GIS, and census.

I got very interested in doing statistics for large data and joined the statistics department at AT&T Research Labs. After five fruitful years at AT&T, I decided to move to Yahoo! Research, where I became the chief statistician for the company. This was the best part of my technical career. I had the opportunity to create new statistical methodologies for large-scale problems that arise in consumer internet space. My work in this area had a significant impact on the business and resulted in several publications (including a book by Cambridge University Press).

After spending six years at Yahoo!, I decided to join LinkedIn in a management role. The last six years at LinkedIn have been the most fulfilling so far in terms of impact and job satisfaction. I lead a team of roughly 300 engineers and scientists who are responsible for all machine learning and statistical modeling at LinkedIn. The ability to use data and statistics to help connect talent with opportunity at scale is inspiring.

What do you like about working in the technology industry? What are the challenges?

I really like the broad impact one can have on the society and the agility with which one can accomplish things in the technology industry. The cycle from ideation to deployment is weeks, not months or years. Improving products through data-based algorithms is an integral part of the work. Statistical thinking and mindset is critical to success in this area. The volume and heterogeneity of data available to solve problems provide unparalleled opportunities to do novel methodological research. For instance, we changed the job recommendation algorithm last year to use random effects models. This improved the job application rates on the site by roughly 30%. The innovation was not so much the statistical model, but more scaling the estimation to billions of parameters and running such a large model to recommend jobs on the site. In addition to the technical innovation, that such work can create job opportunities for so many professionals on the planet is fulfilling.

While statisticians can have significant impact, the nature of the work is highly interdisciplinary. One has to collaborate closely with product management, engineering, security and privacy, legal, and others. Formulating the problem is often more of an issue and very challenging. Even when things get formulated, it can change quickly if there is a change in strategy or some new evidence emerges. Being adaptive in such a fast-paced environment can sometimes be challenging.

How is the demand for statisticians in the technology industry? What are the main degrees you consider when looking for candidates with statistical expertise?

Statisticians play a key role in many areas, and the demand for statistical expertise is growing at a rapid pace. Given the dearth of statisticians currently working in this industry, many in computer science and machine learning filled the gaps.

Success in areas like experimental design, causal analysis, and fraud prevention that is essential for almost every technology company today requires deep statistical expertise. In addition, large-scale statistical modeling is the core of all search and recommendation systems. We are interested in statisticians with both master's and PhD degrees in statistics and a genuine interest in learning computational techniques that can help them apply statistics to large data.

What do you see as the most important statistical skills in the technology industry? What are the other important skills necessary for a successful career in this sector?

The most important statistical skill is, of course, a deep knowledge of statistical methods and the ability to solve practical problems. In addition, it is important to have a strong background in statistical computing and a genuine interest in learning new computational techniques such as distributed computing to apply statistical techniques to massive data.

It is also important to not just like, but enjoy, working in an interdisciplinary environment. Often, the most successful folks in the technology sector are those who gain a deep understanding of the entire end-to-end process over the years. Given how many opportunities exist to innovate using data-based algorithms, such individuals often end up becoming successful leaders and entrepreneurs.

The advent of cloud computing has made managing and computing with large data more of a commodity; the next big quest is to "commoditize" the extraction of intelligence (aka statistical inference) from data. There was never a better time for statisticians to join the technology sector than now.

What advice do you have for students interested in working in the technology industry? Any advice for students in general?

I have seen students with classical statistics training being a bit skeptical about joining the technology sector. They are not sure about the impact relative to others with background in computer science and machine learning. I would advise them to seriously consider a career in the technology sector. There is significant opportunity to make an impact and a high demand for their skills. Things that they may want consider are a) do they like technology in general; b) do they like doing applied work and enjoy working in an interdisciplinary environment; and c) do they enjoy learning new computational techniques to work with massive data. If the answer to all three is yes, they must consider a statistics career in the technology sector seriously. There is no better time to do so than now.

What advice do you have for statistics and biostatistics departments?

I would encourage statistics departments across the country to emphasize areas such as experimental design a lot more from both a theoretical and practical perspective. A bit more emphasis on modern computational paradigms like distributed computing with Hadoop/Spark would be useful. When teaching classical statistics, emphasizing what methodologies work well in different data scenarios (small data, large data) and a balanced portfolio of statistical inference techniques without over-emphasizing one particular area (e.g., only frequentist, only Bayesian) would be good. It is more important for students to develop strong statistical intuition and understand the pros and cons of different approaches. This would help them enormously in their day-to-day job when working in the technology sector.

WELLIO

Sivan Aldor-Noiman

Wellio is a start-up of about a dozen people whose mission is to make it more convenient for people to eat healthier and better food, which they accomplish through the personalization of variety, healthiness, and cost, taking into account factors such as cooking ability, taste preference, health needs, and shopping preferences.

Emphasizing the importance of statistics and modeling, four members of the Wellio team are data scientists, with two having PhDs in statistics (including Aldor-Noiman), one a PhD in applied math, and another with a bachelor's and master's in computer science. There are also four software engineers.

Those interested in learning about Wellio's internship opportunities should contact Aldor-Noiman at *sivan@getwellio.com*.

I was drawn to statistics as an undergrad at The Technion – Israel Institute of Technology, where statistics is housed in the industrial engineering department. After earning a master's in statistics there, I did my PhD in statistics at the University of Pennsylvania Wharton School with Larry Brown and Bob Stine. I loved teaching, but knew I was not destined for academics and applied for jobs with technology companies.

I received several offers—including from well-known companies—but opted for the Climate Corporation, which was then a smaller, but growing, start-up working in the ag-tech sector. I chose them because of the wide-ranging statistical challenges I would have as one of their first statisticians doing modeling, including with spatial statistics and spatio-temporal dynamics. I also was really impressed with the impact and importance data science had in the product itself; it was clear this company wanted to use data science to its full extent. It was also quite clear to me that if I were to go to one of the more established companies with many other statisticians, the statistical challenges would have been narrower and professional advancement would have been much slower.

I spent five years with the Climate Corporation, an exciting period when it grew from 120 employees to more than 500 and was purchased by Monsanto. Early in my career there, I led a group doing weather modeling and risk insurance, which addressed many challenging and interesting problems statistically speaking (e.g., how weather impacts yields). I later started a remote sensing team (e.g., satellites, drones), which helped develop products that monitor crop development throughout the growing season. Both of these groups were extremely diverse and included statisticians, mathematicians, physicists, and remote sensing experts with mostly master's and doctoral degrees.

I subsequently started two more teams. The first focused on fields experiments and observational studies, which unlike the small experiments Fisher conducted, were massive experiments across many soil and weather environments, agriculture practices, and crops. The second team focused on developing best practices for data science across the company. The challenges in this team quickly became more focused around culture development for helping data science grow.

Today, I lead the team of data scientists at Wellio. I really like both the mission we set for ourselves and the team. We are building food recommendation systems using advanced statistical and deep learning models to solve NLP and computer vision problems. This team pushes me to develop and improve my statistical, engineering, and leadership skills.

What do you like about working in the technology industry? What are the challenges?

I like the many hats I wear working in the technology industry, including statistician, data engineer, leader, and communicator of our findings. The latter presents a challenge in that one must also present the strengths, weaknesses, and limits of the results to clients and customers who want certainty. It's hard for people to accept uncertainty; it's a difficult concept. A data scientist must also understand what's at stake for the customers. For example, when I was in the agriculture industry, a farmer's livelihood was directly affected by our products.

The expectation of providing certainty has only increased with the recent emergence of artificial intelligence, which is perceived as almost having an air of magic. There is a great responsibility for data scientists to understand the limits of their models and yet produce and communicate something useful. One has to strike a balance between use and limitations, being careful that communication of the limits does not scare off the clients.

The other great satisfaction of working in industry is that I get to see the impact of my work with the consumer using the product. Getting feedback and improving the models and products brings endless technical challenges, which I really like.

How is the demand for people with statistics degrees in the technology industry? What are the main degrees you consider when looking for candidates with statistical expertise?

There is a big demand for statisticians across degree levels (bachelor's, master's, doctoral). The Bay Area in particular is a crazy bubble for statisticians. There is such huge demand here that statisticians are being pinged almost weekly by recruiters. Most of the data scientist positions are filled by people with degrees in statistics, applied math, computer science, economics, physics, or disciplines that use more applied statistics like remote sensing. Analyst positions are generally geared toward those with undergraduate degrees, though. As I discuss below, one has to be careful about job titles; they are often quite misleading.

What do you see as the most important statistical skills in the technology industry? What are the other important skills necessary for a successful career in this sector?

What differentiates those with statistics degrees from others is the ability to reason through an argument, the data, and the model and then communicate it. All these are fundamental skills of statisticians. We learn it in our first EDA class. You just can't explain a model without these skills. When I haven't hired someone, not having these skills is the main reason.

So many people don't know where to start with a problem. When I am interviewing candidates, I ask them to look at the data and tell me what they see. I also assess their ability to build a model and assess its limitations, implicit in which are the questions: What is a model? What are the assumptions?

I also see an increased desire for candidates with causal inference expertise, with the technology industry starting to recognize anew that correlation is not causation. I know it sounds like old news for statisticians, but you would be surprised how people really look at results based on correlation and tell themselves the right story to fit their goals instead of developing the hypothesis in advance … like we are being taught in Stat101.

What advice do you have for students interested in working in the technology industry? Any advice for students in general?

I always provide the same advice: Go to a company looking for people to learn from, instead of a company where you would be the first data scientist

and would have to teach statistics to everyone. In such a situation, you won't learn as much about models and the many skills—technical and non-technical—that will help advance your career over the long run.

It's also important to ask what you are going to do and what the job looks like on a day-to-day basis. It might be they hire statisticians to produce dashboards and summary statistics, which may not be very challenging and therefore not helpful in the long term.

What advice do you have for statistics and biostatistics departments (e.g., coursework, nontraditional training suggestions, research experience)?

My beef is that some of them haven't acknowledged that applied statistics is very important, just as is the need to understand theory. One must have balance between the two. Someone trained for industry needs to understand the theory and must be able to analyze data. Students must be exposed to real problems.

Taking classes in computer science and programming is also a very good thing. I had to learn programming on the side, and it's harder for sure to do it this way. Furthermore, industry requirements for modeling and programming are very different than for statistical academia, which emphasizes statistical accuracy. Accuracy may not be sufficient in industry. Industry conditions can be much harsher. Sophisticated models may not be the first ones to try. A model that performs better from an engineering standpoint is likely the preferred one.

What opportunities for advancement and professional growth exist for data scientists and statisticians in industry, and what advice for young professionals would you have to take advantage of those opportunities?

Industry is still trying to figure out what data science is and what its career path is. Data analyst is often a junior position, but there is lots of variance. So, a senior analyst could be a PhD statistician. Don't be tempted by titles, which can be almost meaningless. As I advised above, ask lots of questions about what the position will entail.

Those questions should also be about career path, but one shouldn't be surprised if they struggle to answer the questions about career path. Two possible career paths are modeler-to-manager and statistician-to-principle data scientist. For the former, there is a big shortage generally of technical leaders who are good managers of people. More specifically for this audience, there is a big shortage of statisticians in the technology industry, but a much bigger shortage of statisticians who can manage. ■

STATCOM: Revitalization of Statistical Community Service at Universities

Evan Reynolds and Timothy NeCamp

Universities provide valuable resources for providing pro-bono statistical services, including community connections and many statistically inclined students eager to apply their skills. STATCOM at the University of Michigan is leveraging these resources to increase its benefit to both the community and the university. While several universities with graduate statistics and biostatistics programs founded STATCOM chapters in the 2000s, much of their activity has declined since then. In contrast, STATCOM is larger and more active than ever at the University of Michigan.

Statistics in the Community (STATCOM) is a university-based, student-run organization that provides pro-bono statistical consulting services to nonprofit and government organizations. STATCOM began in 2001 in the department of statistics at Purdue University. Following grant support from the American Statistical Association, STATCOM programs were initiated in universities across the country.

The STATCOM chapter at the University of Michigan (*https://goo.gl/2VpfoC*) was founded in December 2006 under the supervision of Michael Elliott. It is a community outreach program led by graduate students that provides free statistical consulting to organizations in Southeast Michigan. Currently, the group is led by co-presidents Evan Reynolds and Timothy NeCamp and supervised by Elliott and Cathie Spino. STATCOM is project based; as new projects arise, teams of 3–5 are assembled to help the requesting organization.

All project tasks are completed by student volunteers, including project obtainment, client communication, consultation, and analysis. Faculty members serve as project advisers. Project tasks include developing surveys and data-collection practices, defining questions that can be answered with available data, providing numerical and graphical summaries of the organization's data, and building statistical models and performing analyses to help answer the organization's key questions. By participating in projects, students learn consulting skills that are difficult to teach in a classroom setting.

In the past few years, the University of Michigan's STATCOM chapter has seen tremendous growth. In 2014, it had 45 student members with five projects. In 2017, it grew to 147 student members with 10 projects. The chapter has developed new collaborations and organizational features that have helped the chapter both expand and cope with the expansion.

STATCOM is made up of a multidisciplinary group of graduate students. Though most members are majoring in biostatistics and statistics, STATCOM also has students majoring in survey methodology, social work, epidemiology, information, and industrial and operations engineering. The enrollment in many of these programs, especially biostatistics and statistics, has increased substantially in the past few years. As these programs grow, more students are looking for ways to practice statistical consulting in real-world settings, especially in ways that can lead to positive impact. STATCOM has helped provide those experiences.

Finding pro-bono statistical projects with local nonprofit and government organizations can be difficult. Though statisticians know and believe in the benefits of data, community partners may be less aware of data's power. Starting a project with a potential partner requires raising awareness of how STATCOM can help, establishing trust in the benefits of statistical consulting, and ensuring that working with STATCOM will not be a burden. This is a not a trivial task.

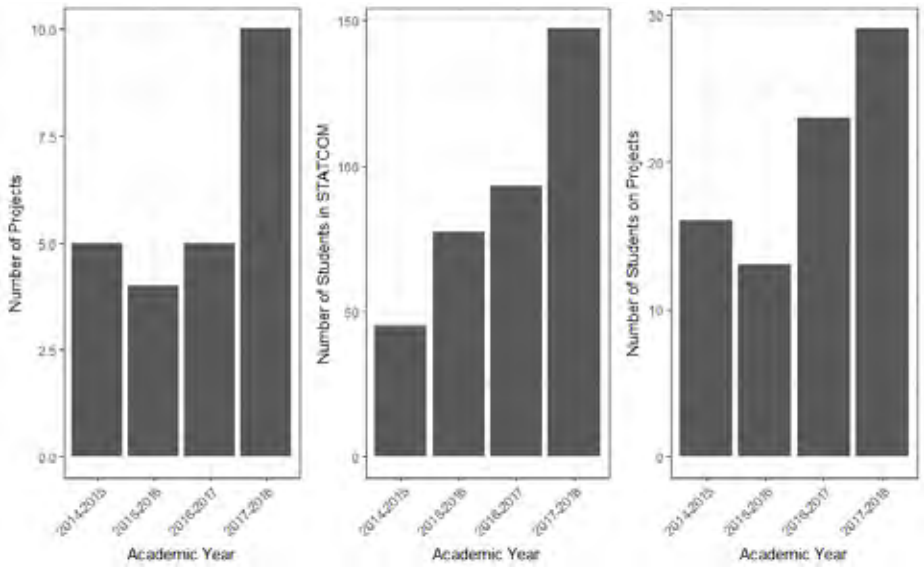
Two years ago, STATCOM started a collaboration with the Community Technical Assistance Collaborative (CTAC, *https://goo.gl/NDw2EN*), a group at the University of Michigan consisting of mostly social work students directed through the Edward Ginsberg Center. As the primary office for community engagement at the University of Michigan for the past 20 years, the Ginsberg Center has a large established network of community organizations. By collaborating with the Ginsberg Center, STATCOM was able to break down this initial barrier to community entry and acquire many more community partners. The collaboration also provided benefits such as workshops teaching STATCOM members practices for thoughtfully engaging with communities and the ability to work on projects that required both social work and evaluation skills (i.e., CTAC) and statistical expertise (i.e., STATCOM).

The rise of data science initiatives at the University of Michigan has fostered other beneficial partnerships. Through collaboration with the Michigan Institute for Data Science (MIDAS), STATCOM has worked with

students from other data science disciplines to broaden its impact. Also, STATCOM is teaming up this spring with CTAC and the Ann Arbor Data Dive for an inaugural showcase of all the pro-bono quantitative work going on across the university.

A recent project provides an excellent example of STATCOM's work and the benefits of these new collaborations. The Ann Arbor Area Community Foundation (AAACF) received $13 million to improve services for the senior population of Washtenaw County and sought to assess which subpopulations of the county were most in need. Working together, STATCOM and CTAC developed a survey to assess quality of life of seniors within Washtenaw County. Quality of life was measured through the Older People's Quality of Life questionnaire developed by Ann Bowling. CTAC members implemented the survey and received more than 600 survey responses. Once the data was compiled, STATCOM provided analysis with methods ranging from graphical summaries to regression trees. The analyses indicated geographic location—specifically within two ZIP codes of Washtenaw County—and financial vulnerability were most associated with lower quality of life. Surprisingly, living alone—which was previously hypothesized to negatively affect quality of life—was not a significant predictor.

This year, STATCOM is continuing to work on a spectrum of projects with a variety of community partners. STATCOM is collaborating with the Catholic Social Services of Washtenaw County to analyze therapy appointment data to optimize scheduling. A STATCOM team has assisted the Ozone House of Ann Arbor to build a predictive time-series model to schedule staff volunteers to best handle crisis calls from youth in the surrounding area. Additionally,



The University of Michigan's STATCOM had 45 student members with five projects in 2014. In 2017, it grew to 147 student members with 10 projects.

STATCOM has partnered with the Detroit College Access Network to evaluate how their counseling program has affected college application and enrollment for Detroit high-school students.

STATCOM recently expanded its student leadership team to distribute some of the increasing amount of administrative work required with the influx of new projects. New leadership positions include a communications chair who helps communicate with collaborators and community partners, a president-elect who will become president in the upcoming year and who receives training to ensure a smooth transition, and a project obtainment chair who actively seeks projects with new and old community partners.

As exciting as STATCOM's growth and accomplishments have been over the past several years, STATCOM is still nowhere close to its project capacity. Whenever a call for volunteers is sent out, there are always more interested volunteers than needed. With the help of new student leaders, STATCOM is hoping to increase its capacity and impact in 2018 and beyond. In 2018, there is a goal of 12 projects.

Many factors leading to STATCOM's success at the University of Michigan are present at other universities. The rise of student enrollment in statistics, biostatistics, and data science graduate programs is well documented. The influx of students wishing to get real-world analytical practice is at an all-time high. Additionally, working on projects within the local community guarantees a low overhead cost and easy access to projects. These types of collaborations can be replicated at other universities where, with high probability, established university-based community engagement organizations already exist.

Readers hoping to establish similar organizations at their universities should not be afraid to get started. The collection of student volunteers and potential projects can be slow, especially at first. Keep in mind, there are always organizations doing impactful work for the community, many of which can enhance the scope of their effect with the help of statistically inclined students. Also, while STATCOM at the University of Michigan has established wonderful university-wide collaborations, these are by no means a requirement for starting a new chapter. All it takes is a few students interested in applying their statistical skills to improve their community. In the end, the work will be an invaluable experience for students and provide a major benefit to the community, especially in an increasingly data-driven world. ■

MATH & STATISTICS AWARENESS MONTH

DATA Is My JOB

Four ASA members share career insights

Career opportunities are limitless with a degree in statistics or data science. To celebrate Mathematics and Statistics Awareness Month (#mathaware), we highlight four ASA members who have used their statistics skills and imaginations to snag sweet jobs.

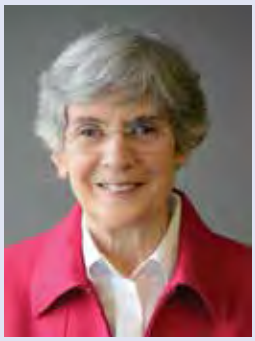
What do you during a typical day at work?

McDougall: Like most professionals/managers, there is not really a typical day, but there are tasks you regularly perform. I balance managing the company with keeping up as a statistician and working with clients.

- **Email.** Updates on ongoing projects (sometimes resolving issues); answering clients' questions; reaching out to potential clients or collaborators; setting up meetings; keeping up on industry changes, regulations, and statistics by being on mailing lists and reviewing the content
- **Meetings.** Both internal—project management, product development, finance, HR, marketing—and external—going to meet with clients offsite or having teleconferences with them
- **Research.** New statistical methods, therapeutic areas, regulations—usually as part of a project or a work-up for bidding on the project
- **Training.** Finding, organizing, and attending webinars in statistics, data management, etc.; also having statistical discussions with staff about design and analysis issues

The one big omission is programming. I don't

Who Are These People?



Janet McDougall is the founder and president of McDougall Scientific consulting firm.

Rob Santos is the chief methodologist and director of the Statistical Methods Group at the Urban Institute.

Yihui Xie is a data scientist and software engineer at RStudio, Inc.

Nancy Potok is the chief statistician of the United States.

meet our standards for a programmer—because of all the other distractions—and I do miss that part of the job.

Santos: On any given day, I will be overseeing policy research projects in diverse topics like housing discrimination, refugee resettlement, urban community attachment, food insecurity, driving travel behavior, client feedback loops, and firefighter safety and risk assessment, as well as attending to internal administrative projects like IRB reviews, advancing diversity/inclusion and community engagement research methods, and chairing institutional awards committee deliberations (this is but a portion of my current portfolio).

Xie: I answer software questions from various channels (StackOverflow, GitHub, emails, etc.) and write code, documentation, and books. I have been trying to publish one book a year since 2015, and—this year—I'm working on my fourth book.

Potok: There is no typical day—every day is different. A lot of my job involves external relationships with stakeholders, data users, and the US statistical agencies. As a result, I may be out of my office for the greater part of the day meeting with people, speaking at conferences or other events, attending workshops, or strategizing with the statistical agency heads on our priority work areas. On other days, I am mostly in my office meeting with my small staff and guiding their activities. Some days, I brief the policy officials at the Office of Management and Budget on high-priority decisions that need to be made or documents that need to be cleared. If I am really lucky, I get to catch up on things I should be reading once in a while.

> . . . [P]ursue your passions, keep your options open, have fun, and always challenge yourself beyond your self-perceived limitations. Life's all about the journey, not the destination.

How did you end up in your current position?

McDougall: By chance. I started freelance work in the pharmaceutical industry after working at one company for about four years. Through contacts in the industry, the workload grew and I brought others

onboard, then had to move the business out of my home and into a leased office. Taking on leases, it seemed appropriate to incorporate—so I did and, as the owner, became the de facto president.

For the next couple of years, I kept my title as statistician, as that was what I was proud to be. When a future client asked if this was my father's business, I recognized I had to take the business—and my image—more seriously and adopted the title of president. I kept the title and have grown into the position, learning to be more of a strategic thinker and planner, making important and tough decisions, mentoring, delegating—even my beloved programming—to the growing staff, dealing with all the financial administrative tasks.

I was lucky to find good business coaches along the way who not only guided me, but also two other staff members (also statisticians) to form a management team. My role as senior statistician, where I keep abreast of the developing statistical trends and advise on design and analysis, is still what gives me the greatest pleasure.

Santos: Through a journey-pursuing opportunity. I spent much of my career in leadership positions trying to promote the most rigorous research in university-based survey research centers at Temple University, University of Michigan, and The University of Chicago. I finally realized I wanted to be closer to the action of putting research results to use for the betterment of society and landed at the Urban Institute, a public policy research think tank.

I then was lured back to my home state of Texas (Austin) to co-own a social science research firm, but we sold the firm after six years of amazing growth and interesting projects.

And then I returned to Urban Institute to resume my passion for conducting research for the public good. And this is where I have been the past 11 years.

I enjoy most the ability to play in everyone's tent, be it justice policy, immigration, housing, hunger issues, health, education, infrastructure, program evaluation, you name it. The past decade has been the most rewarding and fulfilling period career-wise in my life.

Xie: I wrote an R package named "knitr" in late 2011, which caught the attention of our current CEO. I met him in 2012 for the first time and collaborated on a few talks, including a keynote at the useR! conference in 2012. We had a brief phone call in 2013, when I was about to look for a job. He basically said "Yes," and that's it.

I'm a statistician by training, but I love programming more than statistics. Sorry! I probably should not have said that here. Anyway, I write software

SHARE WITH US!

We want to see you sharing your cool data jobs with future statisticians and data scientists. Snap a selfie with our #CelebrateStatistics or #CelebrateDataScience printable posters and tag @AmstatNews.

primarily for statisticians and data analysts.

Potok: The short, technically correct answer is that I applied for it on *USAJobs.com* and was selected through the federal government's merit selection process. Of course, that was after a long and varied career that spanned two tours at the US Census Bureau (first as the principal associate director and CFO and the second as the deputy director and COO); working in the private sector doing social science research and consulting; and—at various times—holding other federal positions, including deputy undersecretary for economic affairs at the Department of Commerce. I discovered I had a real passion for strategically managing data and the people who create and disseminate data to inform major policy questions and provide high-quality information that could change peoples' lives for the better.

What did you want to be when you were 12?

McDougall: A scientist. I got my first chemistry set when I was around eight or nine years old and loved the sense of wonder and discovery.

Santos: I totally wanted to be a math professor. I loved everything there was about mathematics and majored in math for my BA. But when it came time to think about graduate school, my counseling professor insisted I consider a more applied area—statistics—so I could always have a great job. Time has shown he certainly steered me well.

Xie: I just wanted to study super hard and obtain the highest possible educational degree, which was a "postdoc" according to what people in my village told me when I was a boy. I probably also wanted to be a scientist. Now some people call me "data scientist," which is not what I intended to be when I was 12; I had no clue about statistics until I went to college. To a child, a scientist who plays with colorful chemicals looks like more fun. Playing with data is also fun, although it is a little more abstract.

Potok: My career goal at age 12 was to be a librarian. I loved reading, doing research, and uncovering new and interesting information. One of my favorite activities at that age was to pick up a Funk & Wagnalls encyclopedia, open it to a random page, and just start reading. Of course, at age 13, I discovered boys and my career ambition shifted quickly to wanting to be a go-go dancer for a rock band. It's been an interesting ride since then.

What career advice would you give your 20-year-old self?

McDougall: Keep learning—and not just in your narrow discipline. I still over-prepare for meetings and discussions about protocol development and analyses—therapeutic areas, publications for the disease or the design—also just general trends in our society. By reading widely, the doors to serendipity open more frequently and you get wonderful insights into a problem or an opportunity that you might miss otherwise. You 'see' things other people miss, because your mind has been opened to different possibilities.

Santos: I'd say pursue your passions, keep your options open, have fun, and always challenge yourself beyond your self-perceived limitations. Life's all about the journey, not the destination. A great career and a good, fulfilling life can be had by heeding those few words.

Xie: Try more often to do things you don't like but are important at the same time. It is easy to do things you like, but in the real world, there is no guarantee you will like all tasks assigned to you. Don't be afraid of the pain from challenges. If you don't feel the pain in tackling a challenge, it basically means you are losing the chance to learn more things and grow up.

Potok: Conquer your fear of taking big risks to follow your dreams—at 20 years old, there is plenty of time to learn from your mistakes and discover both what you are great at and what makes you happy. ■

Master's and Doctoral Programs in Data Science and Analytics

Steve Pierson, ASA Director of Science Policy

More and more universities are starting master's and doctoral programs in data science and analytics—of which statistics is foundational—due to the increasing interest from students and employers. *Amstat News* reached out to those in the statistical community who are involved in such programs to find out more about them. Given their interdisciplinary nature, we identified programs involving faculty with expertise in different disciplines to jointly reply to our questions. We have profiled many universities in our April, June, and December 2017 issues and January 2018 issue; here are several more.

University of Central Florida

Liqiang Ni is associate professor of statistics in the department of statistics at the University of Central Florida. His research interests include dimension reduction, multivariate analysis, actuarial science, and business intelligence. He has served as the graduate coordinator since August 2017.

Shunpu Zhang is a professor of statistics and chair of the department of statistics at the University of Central Florida. His research interests include bioinformatics, functional estimation, health informatics, large-scale hypothesis testing, and big data analytics.

MS in Statistical Computing—Data Mining Track

Website: *https://goo.gl/ndCqwg*

Year in which first students graduated/are expected to graduate: 2002

Number of students currently enrolled: 60

Program format: In-person, 36 credits, comprehensive exam required, either thesis or project-based, full time and part time, graduate assistantship offer on competitive basis

There are largely two components for required courses in the curriculum. The first tilts to traditional statistics, including a two-semester course for theoretical statistics and one-semester course for regression analysis and logistic regression/GLM, respectively. The second component tilts to applications: two-semester course for data processing and preparation, including coding, and two-semester course for data mining. There is a variety of elective courses students can choose from.

What was your primary motivation(s) for developing a master's (or doctoral) data science/analytics program? What's been the reaction from students so far?

In the late 1990s, the statistics community began to realize the great potential in data mining and data science. UCF created one of the earliest data mining programs, in part inspired by SAS Company and with support from Disney, Florida Hospital, Blue Cross Blue Shield of Florida, Universal Studios, and many local business partners.

The students responded with a good deal of enthusiasm. We have seen a growing need for an educated and talented workforce at the MS level and beyond that can contribute to industry, government, and academia through innovative applications of data analysis methodologies.

How do you view the relationship between statistics and data science/analytics?

We believe statistical science is an integral part of data science/analytics. A good data scientist/data analyst must have adequate training in statistics.

What types of jobs are you preparing your graduates for?

We are preparing MS graduates largely for industries. Every year, a few graduates continue their studies in PhD programs.

What advice do you have for students considering a data science/analytics degree?

We suggest students have a solid foundation in computer programming, mathematics, and statistics to be a good data analyst. They also should have a keen interest in the new developments in data science.

Describe the employer demand for your graduates/students.

Demand for our graduates has always exceeded the supply, especially in recent years.

Do you have any advice for institutions considering the establishment of such a degree?

We believe a data analytics/data science graduate program resides best in a statistics department with concentrations in computer programming and software development. Open-mindedness is the key to a successful interdisciplinary program.

University of Michigan

Michael Elliott is a professor of biostatistics and research professor of survey methodology. His research interests include survey methods, causal inference, missing data, and longitudinal data analysis with applications to social epidemiology, cancer trials, women's health, pediatrics, and injury.

H. V. Jagadish is Bernard A. Galler Collegiate Professor of Electrical Engineering and Computer Science. His research has spanned many aspects of big data, including data usability when they come from multiple heterogeneous sources, and has undergone many manipulations.

XuanLong Nguyen is associate professor and director of master's programs in statistics. His research interests include Bayesian nonparametrics, hierarchical models, and machine learning.

Elizabeth Yakel is associate dean for academic affairs and professor in the school of information. Her research focuses on data reuse, teaching with primary sources, and the development of standardized metrics to enhance repository processes and the user experience.

Ji Zhu is a professor and director of the data science master's program in statistics. His research interests include statistical learning; network analysis; and statistical modeling in finance, marketing, and biosciences.

Data Science Master's Program

Website: *https://goo.gl/NxAbnN*

Year in which first students graduated/are expected to graduate: 2019–2020

Partnering departments: Biostatistics, Electrical Engineering and Computer Science, School of Information, Statistics (administrative unit)

Program format: Full time, on campus; requires at least 25 credit hours in core areas including databases, data and web applications, regression, and statistical learning

The program requires the students to have demonstrated competence in a basic computing sequence and a basic statistics sequence. By taking graduate-level courses, the students need to demonstrate expertise in data management and manipulations, as well as statistical techniques relevant to data science. The students need to take at least one advanced elective from each of the following buckets: principle of data science; data analysis; and data science computation. The students will also have an integrative capstone experience through an approved project.

Students with an undergraduate degree in data science would already have obtained a reasonable level of training toward the core skills and may finish the master's degree in one year. Students with an undergraduate degree in mathematics or physics, statistics or biostatistics, computer science, and other quantitative disciplines should be able to complete all requirements within two years.

What was your primary motivation(s) for developing a master's (or doctoral) data science/analytics program? What's been the reaction from students so far?

The data science explosion is fueled organically by new data generated from diverse sources, devices, web services, mobile communication, scientific studies, and social media. Data scientists require a versatile and unique set of skills to manage, process, and extract data from these complex information streams, and then interrogate, analyze, visualize, and interpret the information. Nationally, there is a pressing need for data scientists, and, in fact, for people with every level of data science training. The successful launch of our data science major, which has attracted almost 200 students across campus in its first two years, made it clear that our students want to be part of data science. The collaborative approach we take across departments and colleges enables us to pool resources and offer the best our university has for a truly cross-cutting program.

How do you view the relationship between statistics and data science/analytics?

Statistics is undoubtedly a major part of data science. The advancement of statistics has always been driven by new data that arise in science or society, whether they are from agriculture measurements or the industrial revolution or the internet. While data science requires tools from multiple disciplines (e.g., mathematics, computer science) and must

work with specific domains of applications (e.g., business or health care analytics), statistics and data science are inseparable. From design of experiments to probabilistic modeling, from data exploration to confirmatory testing, and from estimation to prediction, statistics has been the core to data analysis. Statistics without data science will not thrive, and data science without statistics is certainly unsound.

What types of jobs are you preparing your graduates for?

This is a new program, but we provide the training the students need to work as data scientists in a wide range of industries, from financial services to health care, from marketing to social networking. We invite companies to our career fair for the students, and we encourage students to take internships to help them understand what they need to prepare for in school.

What advice do you have for students considering a data science/analytics degree?

We offer two master's degrees, one in applied statistics and the other in data science. At the present time, the applied statistics degree focuses more on modeling and inference, and the data science degree focuses more on data handling and data mining. Some of the students from the applied statistics degree pursue a doctoral degree in statistics, biostatistics, economics, and other quantitative fields. We expect the data science students to be versed in data management and programming. However, there is an increasing overlap between the two programs, as we offer more computing courses to applied statistics students and more statistics courses to data science students.

Describe the employer demand for your graduates/students.

We do not have data on our graduates from the data science program, but the vast majority of our graduates from the applied statistics program was employed or went to PhD programs within six months of their graduation.

Do you have any advice for institutions considering the establishment of such a degree?

Data science programs by nature cross traditional boundaries, but the department of statistics is a natural and ideal home for such programs. To make such programs successful, the statistics departments must be willing to modernize their existing curriculum to embrace data science and reach out to work with the faculty from other programs. At Michigan, different programs offer complementary courses in data science and, together, we believe we can attract and accommodate students from diverse backgrounds.

The Johns Hopkins University

James Spall has four appointments at The Johns Hopkins University: principal professional staff at JHU/APL; chair of the applied and computational math program; co-chair of the data science program; and research professor in the department of applied math and statistics. Spall has published extensively in the fields of control systems and statistics.

Master of Science in Data Science and Post-Master's Certificate (PMC) in Data Science

Website: *https://goo.gl/RGZfVN*

Year in which first students graduated/are expected to graduate: Late 2018

Number of students currently enrolled: More than 120 fully matriculated students in the MS degree and 0 students in the PMC program. There are additional students who have been given a provisional admission status (additional evaluation and/or coursework required) for both the MS and PMC.

Partnering departments: Applied and computational mathematics and computer science

Student type: Nontraditional/part time/continuing education, although there are a few students pursuing the degree full time

Program format: Online/in-person/combination; 30 credit hours required in five years for the MS; 18 credit hours required in three years for the PMC.

The program is a combination of selected offerings in two existing rigorous graduate degree programs in applied and computational mathematics (ACM) and computer science (CS). On the ACM side, students will take a foundational course in statistical methods and data analysis, followed by required courses in optimization, statistical models and regression, and computational statistics. On the CS side, students will take a foundational course in algorithms, followed by required courses in databases, visualization, and data science. All students are also required to take one upper-level ACM elective (e.g., data mining, queuing theory, or stochastic optimization) and one upper-level CS elective (e.g., machine learning or big data processing using Hadoop). Qualified students will need to have taken three semesters of calculus (through multivariate), discrete mathematics, Java, and data structures.

What was your primary motivation(s) for developing a master's (or doctoral) data science/analytics program? What's been the reaction from students so far?

The motivation for starting the program is clear to anybody even slightly paying attention to broad

trends in society toward greater quantitative analysis in decision-making and the need for processing and interpreting massive data sets in many diverse fields. JHU had a well-received non-credit sequence in data science through Coursera and the school of public health for several years, and the need for a graduate credit program was fairly clear. In response, the JHU Whiting School of Engineering, through its engineering for professionals division, took on the challenge of creating a rigorous, credit data science program based in both applied math and computer science. Relative to the number of applicants, the data science program has had an overwhelming response since the program was rolled out in fall 2016. The cumulative number of applications grew from 0 to more than 2,000 in less than two years.

How do you view the relationship between statistics and data science/analytics?

While there is a wide variety of data science programs, all seem to have a substantial basis in statistics. That connection is not surprising when you consider statistics is defined as the field devoted to "the practice or science of collecting and analyzing data"!

While we will not proclaim to know "the" relationship between statistics and data science, the JHU program in data science is deeply connected to advanced methods in mathematical statistics, modeling, and computational statistics. As such, the prerequisites for the data science program involve mathematics through multivariate calculus (Calculus III), as well as a course in discrete mathematics and exposure to linear algebra and matrix theory.

What advice do you have for students considering a data science/analytics degree?

A prospective student needs to be strong in math and adept at programming. Someone considering the program who has not taken mathematics or programming courses in several years prior to starting the program might consider taking a refresher to "hit the ground running." Also, for the key demographic of students who are working full time or near full time, it is recommended that students initially take only one course at a time. This allows a person to re-acclimate to academic life.

The range of jobs associated with data science, broadly defined, is almost limitless. It seems many large and small employers have people doing data science in some capacity, but without having that label in the job title.

What types of jobs are you preparing your graduates for? Describe the employer demand for your graduates/students.

The range of jobs associated with data science, broadly defined, is almost limitless. It seems many large and small employers have people doing data science in some capacity, but without having that label in the job title. Given that most of our students are part time and are partially or fully employer funded, the students are expected to continue with their current employer. For the minority of students not employer funded, we currently have little data regarding employer demand because the program is a new offering. That being said, given the strong demand for the program, there is little doubt that those students in the job market will be able to find relevant positions.

BASS XXV Scheduled for Fall

The 25th Biopharmaceutical Applied Statistics Symposium (BASS XXV) will be held October 15–19 at the Hotel Indigo Savannah Historic District in Savannah, Georgia. One-hour tutorials on diverse topics pertinent to the research, clinical development, and regulation of pharmaceuticals will be presented by speakers from academia, the pharmaceutical industry, and the US Food and Drug Administration. Two parallel, two-day short courses will be presented October 17–19. BASS will also offer a poster session.

BASS is a nonprofit entity established to support graduate studies in biostatistics. For further information, contact the BASS registrar at *Rewhitworth@gmail.com* or BASS chair, Tony Segreti, at *segretia@bellsouth.net*. Visit the BASS website at *www.bassconference.org*.

University of Vermont

James P. Bagrow is an assistant professor in mathematics and statistics at the University of Vermont and a member of the Vermont Complex Systems Center. He has degrees in liberal arts (AS) and physics (BS, MS, and PhD).

Jeffrey S. Buzas is professor and chair of mathematics and statistics and director of the statistics program. He has degrees in mathematics (BS) and statistics (MS and PhD).

Margaret J. Eppstein is professor and chair of computer science at the University of Vermont and the founding director of the Vermont Complex Systems Center. She has a BS in zoology, MS in computer science, and PhD in environmental engineering.

Peter Sheridan Dodds is a professor in mathematics and statistics at the University of Vermont, where he is also the director of the Vermont Complex Systems Center and co-director of the Computational Story Lab.

PhD in Complex Systems and Data Science

Website: *http://vermontcomplexsystems.org/education/phd*

Year in which first students graduated/are expected to graduate: 2021

Partnering departments: Vermont Complex Systems Center (lead), Mathematics and Statistics, Computer Science

Program format: In-person (online being developed), thesis/project or coursework, 30 credit hours, traditional/non-traditional/full-time/part-time/continuing education

We provide students with broad training in computational and theoretical techniques for describing and understanding complex natural and socio-technical systems, enabling them to then—as possible—predict, control, manage, and create such systems.

Our PhD is a natural addition to our educational platform, which already consists of an MS in complex systems and data science and a five-course graduate certificate in complex systems. UVM also now has an undergraduate major in data science.

The major skill sets we aim to train include the following:

- Data wrangling: Methods of data acquisition, storage, manipulation, and curation
- Visualization techniques, with potential for building high-quality web-based applications
- Uncovering complex patterns and correlations in systems through data-fueled machine learning and genetic programming
- Powerful ways of identifying and extracting explanatory, mechanistic stories underlying complex systems—not just how to use black box techniques

Students must have prior coursework or be able to establish competency in the following:

- Calculus
- Coding (Python/R ideal, but not necessary)
- Data structures
- Linear algebra
- Probability and statistics

What was your primary motivation(s) for developing a master's (or doctoral) data science/analytics program? What's been the reaction from students so far?

The basic motivation was that we live in a renaissance time with so many fields moving from data-scarce to data-rich. Students need a suite of skills to be able to contend with the kinds of broad problem solving they will face in the real world, very likely as parts of teams. These students should not be cogs with narrow training. Student response has been extremely positive.

How do you view the relationship between statistics and data science/analytics?

Our PhD and master's incorporate training in computer science, statistics, mathematics, physics (mechanisms), and complex systems.

What types of jobs are you preparing your grads for? (If you have had graduates, please summarize the types of jobs they took and in what sector.)

Data science positions at corporations and in governments positions. Students with training that will be formally framed by our PhD have gone on to work for companies, as well as into careers in education.

What advice do you have for students considering a data science/analytics degree?

Students should look for data science programs that are truly interdisciplinary. They should be able to develop skills that enable them to explain patterns, and not just reproduce them or generate novel ones. While explanation is fundamental to science, it is also crucial in real-world venues to be able to understand and defend, for example, decisions proffered by algorithms for maintenance of ethical, legal, and assurance standards.

Describe the employer demand for your grads/students.

Very strong. We have increasingly received interest in PhD students with a deeper training.

Do you have any advice for institutions considering the establishment of such a degree?

Just do it. The world has changed, and it is our responsibility to adapt. We have to frame education so students will have a clear path to becoming data scientists. Many essential courses will already exist, but the development of hybrid core courses on data science will likely also be necessary. ■

Climate Science Day Participants See Change of Tone on Capitol Hill

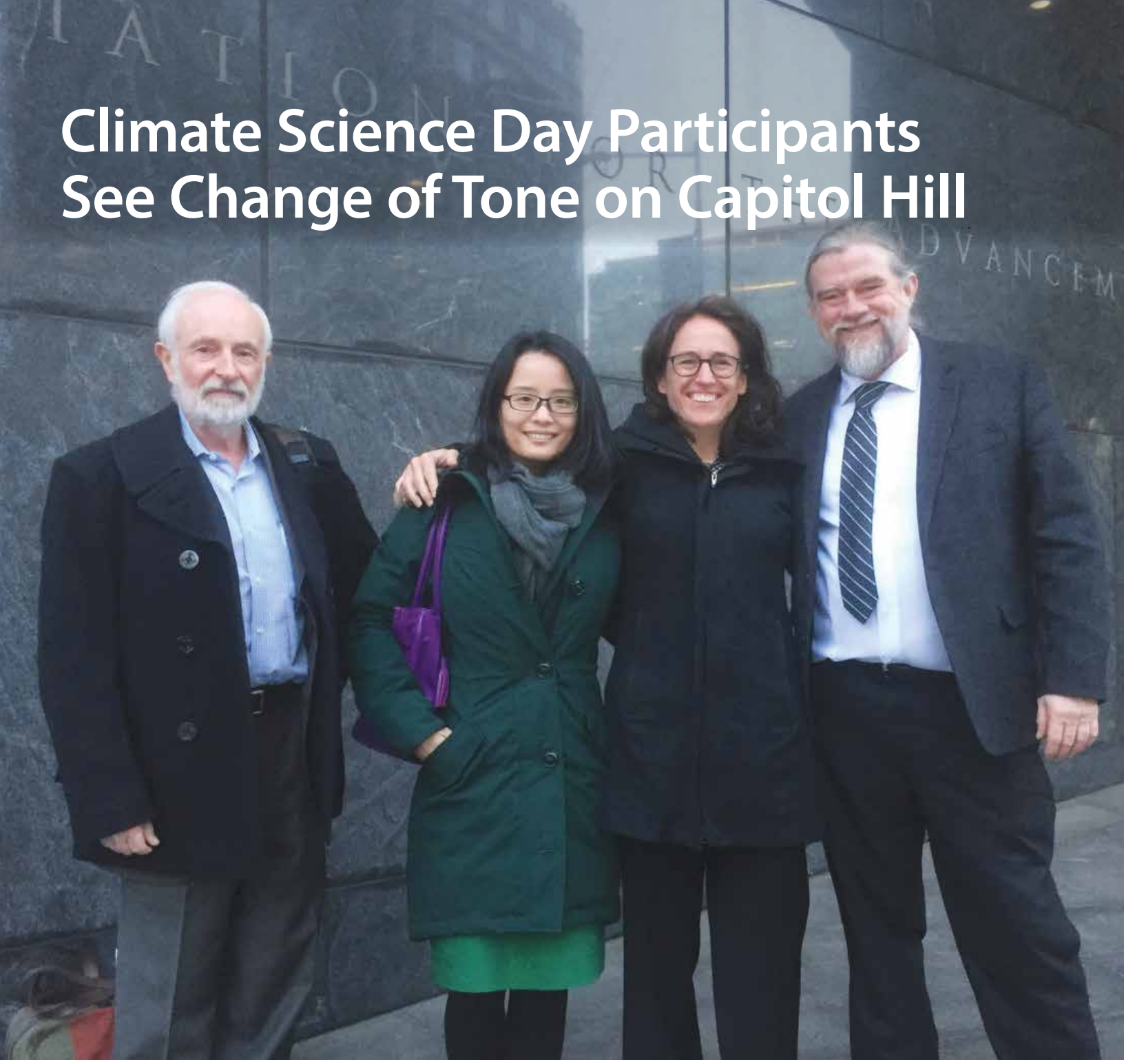


Photo by Steve Pierson/ASA

From left: The ASA's 2018 Climate Science Day participants—Peter Bloomfield, Bo Li, Dorit Hammerling, and Leonard Smith—gather in front of the American Association for the Advancement of Science building.

The ASA Advisory Committee on Climate Change Policy and the Section on Statistics and the Environment sent four statisticians to the eighth annual Climate Science Day (CSD) on Capitol Hill at the end of January. Peter Bloomfield, Dorit Hammerling, and Leonard Smith were return CSD participants, while Bo Li participated for the first time.

CSD's purpose is to connect scientists with congressional lawmakers and their staffs to discuss climate science, a purpose that is quite broad considering the wide range of views and interests across the 50 states and 435 congressional districts. The scientists attended a series of briefings earlier in the day to prepare them for this range. The briefings included a discussion with a panel

Photo courtesy of Carissa Bunge
Bo Li with teammate Rachel Kirpes outside the Capitol

of Hill staffers, tips for Hill visits, strategies for communicating about climate science, a keynote speaker, and time for each team—two scientists of different disciplines and a science society staff person—to prepare specifically for their meetings. This year's keynote speaker was Laura Helmuth, the health, science, and environment editor at *The Washington Post*.

With a goal for productive, engaging discussion, the request made to congressional offices in the past was to consult CSD participants or the sponsoring organizations when they had questions regarding climate science. This year, however, CSD participants were encouraged to focus on connecting the mainstream scientific view with current and potential future impacts of climate change in their districts for offices that have not yet acknowledged the scientific community's view of climate change

Photo courtesy of Julia Marsh
Dorit Hammerling and her teammate, Matthew Hurteau, outside the office of Sen. Tom Udall (D-NM)

Photo by Steve Pierson/ASA
Leonard Smith meets with his representative, John Rutherford (R-FL).

as, for example, was stated in the 2016 letter signed by 31 scientific organizations, including the ASA: *https://goo.gl/ycrG5d*.

For offices whose views were more congruent with the mainstream scientific view, the discussions were about being a resource and the risks specific to the district/state.

The 19 2018 CSD participants—sponsored by 10 science associations—collectively had 70 meetings. As reported last year (*https://goo.gl/BTcbCh),* participants again noted the changing tone of climate change discussions in many offices. Where once there was polite, but short and nonengaging discussions, there was more open discussion about the impacts of climate change in the district or state and even the political challenges.

Hammerling, who participated in her second CSD, also mentioned she enjoyed the interaction with other CSD scientists and the preparatory briefings. Li commented on the importance—as part of a scientist's responsibility to society—of regular communication with policymakers and providing updates from the research community about new discoveries and developments. ■

Committee on Privacy and Confidentiality Offers Resources

The ASA Committee on Privacy and Confidentiality supports Data Privacy Day each year—held this year on January 28—to create awareness of privacy issues and their importance to the public. As part of this effort, a webinar titled "What Is a Privacy-Loss Budget, and How Is It Used to Design Privacy Protection for a Confidential Database?" was presented February 1 by John Abowd, chief scientist and associate director for research and methodology at the US Census Bureau and professor of economics, statistics, and information science at Cornell University. Links to the recording and slides can be found at *https://goo.gl/nAhcm9*.

Additionally, the committee's website (*https://goo.gl/1iGsVo*) provides several resources for policymakers, statisticians, and the public, including an overview of methods to maintain data confidentiality; training modules; and discussions about various types of data, laws, and regulations. The latest postings are a draft of guidelines for developing a privacy policy (*https://goo.gl/HdHgWU*) and a committee history piece written by Margo Anderson (*https://goo.gl/Qw5u7m*).

Privacy and confidentiality problems and questions can be sent to committee chair, Aleksandra Slavkovic, at *sesa@stat.psu.edu*.

STAT*tr@k*

On Biostatistics, Alan Alda, and Being Mission Driven

EDITOR'S NOTE: This originally ran on the Flatiron blog in January 2018. (*https://goo.gl/8s92Qo*)

Sandy Griffith is a principal methodologist at Flatiron Health, a health care technology company based in New York City. Prior to this role, she was assistant professor of medicine in the department of quantitative health sciences at Cleveland Clinic and Case Western Reserve University School of Medicine. Griffith holds a PhD in biostatistics from the University of Pennsylvania and can be found on Twitter as @sgrifter.

Sometimes, things have a way of coming into your life at the moment you most need them.

Every year, our entire company of almost 500 gathers at a venue in New York City to hear updates from teams across the company, get additional insight into our strategy from our co-founders, and spend time with colleagues based in other offices and cities.

A biostatistician by training, I work on our quantitative sciences team analyzing oncology data collected in real-world settings. My job is to use statistics to learn from the experience of every patient with cancer—not just the small percentage enrolled in traditional clinical trials.

I was asked to present on my team's research during this "all-hands" meeting—an exciting honor when I agreed to it months earlier, but as the date approached, my excitement started to be eclipsed by nervousness. I give a lot of talks, but this one was different. The all-hands was going to have a larger audience than I had ever presented to, and it was going to be in front of my colleagues—people who I see every day and whose opinions I care deeply about. Also, I was used to presenting scientific results to scientists. What I was not used to was presenting scientific findings to my colleagues and peers, most of whom are not scientists.

I thought of the people who would be in the audience.

Rosie, the always-optimistic manager of our office team who helps make our New York City office warm and welcoming every single day.

Alan Alda, actor, *New York Times* bestselling author, and inspiration for the Alda Center for Communicating Science

Neal, the research oncologist from Cleveland who recently joined the company after 30 years in traditional academic medical center and university environments.

Ben, head of our provider sales team, who has spent years understanding the software challenges that community oncology practices face.

Lise, a certified public accountant who left a promising career in the financial services industry to join Flatiron when we were still a small start-up finding our way.

The week before our all-hands meeting, with the presentation still looming over me, I blocked it out of my mind because I had to focus on a more immediate task and talk at hand: presenting statistical details of validating oncology endpoints at the International Conference on Health Policy Statistics. Scientific findings to a scientific audience.

At the tail end of the last day of the conference, the suitcases in the meeting rooms and the limited attention spans signaled everyone's eagerness to get home.

I, too, was eager to head back to New York City, but the winter weather had other plans. I saw in the program there was an unusual workshop in the last slot of the day hosted by the Alan Alda Center for Communicating Science that claimed to use improv theater techniques to help scientists communicate to a variety of audiences. Stuck in Charleston with nothing to do, I showed up—skeptical yet intrigued. This was not the kind of thing that usually happened at a statistics conference. And what did all of this have to do with Alan Alda?

It turns out, Alan Alda hosted a television show on PBS called "Scientific American Frontiers" for many years, interviewing scientists about their research. Over time, he realized that his interview subjects tended to stay within their safe, technical bubbles, not venturing out to engage with the show's diverse audience. Scientists aren't trained in communications or presentation skills, but, through his center, he hoped to change this.

At the beginning of the workshop, the instructor handed out worksheets with Mad Libs–style exercises for us to ease into explaining our research in layman's terms. We filled in blanks:

- This is important because *people with cancer get sicker or get better, but no one learns from what worked or didn't work for most of them.*
- This is exciting because *I get to work with a big and amazing source of information and, if I do my job well, can improve and maybe save peoples' lives.*

We paired up and acted out scenes, explaining our research to our partner, who was instructed to react to our presentation as if they were an 11-year-old who wasn't familiar with technical scientific jargon. Equally as important as the language I used to describe the research, our instructor explained that the findings had to mean something to our partner in order to be understandable—we had to convey the "so what" of the work. So, instead of focusing on the novelty and complexity of the statistical methods of my research, I took a different approach: "You might have a family member who gets sick one day, and you'll want their doctors to know about what happened to other patients like them." This meant something no matter who was on the listening side.

Now I was ready to present to a room of 11-year-olds, but I was still struggling with my all-hands talk because of the diverse backgrounds and experiences of my colleagues who would be in the audience. Some knew a lot about the research I was planning to present. Kaplan-Meier curves, a staple of oncology research, show the percentage of population alive over a period of time, but can be complex to interpret. Was oversimplifying the results going to be difficult for Neal, our seasoned oncologist, to swallow? Would Lise, part of our finance team, get lost in the clinical details of the findings? And then, it hit me. I scribbled a single note on the back of my worksheet "What do they have in common?" Underneath, I wrote two words: "mission driven."

Despite all their differences, I realized everyone in the audience *would* have something in common. They were all driven toward a mission of improving the lives of people with cancer—family and friends they've known, or those they will know. For some, it might even be their past or future selves. The idea that those patients will get treatments, and might get sicker or better, but their experience likely won't ever help others. For all of these people, different in so many ways, that wasn't acceptable. That's what I'd speak to. I left Charleston with a worksheet, a hastily scribbled note, and newfound clarity.

The day of the presentation, I walked onto the stage filled with nervous energy. I saw Ben Reynolds, head of our provider sales team, sitting in the front row, but far removed from the day-to-day context of the work I was about to present. Then something magical happened over the course of the presentation. The more data I showed, the more Ben's face lit up. After I saw that, I began presenting directly to him, feeding off his engagement and reaction. I couldn't see the other 500 faces in the darkened auditorium, but I knew that if it meant something to Ben, it had meaning for everyone.

That night at our company party, I heard from Rosie, our office manager. "Every day my team works hard to make sure everyone has what they need, we are always so focused on that. One day a year we get to take a step back and hear about all the amazing work Flatiron is doing, how it all comes together." She told me that the presentation brought tears to her eyes, and if this is what can come from her keeping the lights on, she feels honored to get to be a part of our mission.

I spend my days surrounded by data and figures. As a biostatistician, of course I live for this stuff. What I didn't know was whether it meant as much to everyone else. But then a winter storm and Alan Alda showed up in my life at exactly the right moment and helped me see the link between my lines on a plot and the mission that connects us all. ■

PASTIMES OF STATISTICIANS

What Does Claire Kelling Like to Do When She Is Not Being a Statistician?

Claire Kelling's largest project thus far, a gift for her mother, contains 10,712 beads.

A tree of life Claire Kelling made for her father.

Claire Kelling completed her first major beading project when she was in about the fourth grade and entered it into the 4-H fair. It won fourth place.

Who are you, and what is your statistics position?

I am a dual PhD candidate in statistics and social data analytics at Penn State.

Tell us about what you like to do for fun when you are not being a statistician.

When I am not being a statistician, I like to weave! I mostly create beaded patterns for family members as Christmas and birthday gifts. My most recent patterns have used more than 10,000 beads per design!

What drew you to this hobby, and what keeps you interested?

I have been beading since I was quite young, starting when I was about 10 years old, I think. I never enjoyed or was particularly good at the typical artistic activities, like drawing or painting. I am a triplet, and my brother and sister were both quite talented artistically. Having hobbies was actively encouraged in my family, as we lived on 56 acres with little to no TV, internet, or games. Therefore, I took up this hobby as a way to express myself artistically. It started as weaving potholders and turned into weaving pretty elaborate designs on a bead loom!

My next big step for weaving will likely involve a large fabric loom (about 5 x 5 x 5 ft). I enjoy this hobby because, as a statistician perhaps, I am drawn to patterns, and beading involves patterns quite obviously in the designs, but also in the execution of the craft. It is very methodical and careful, much like statistics.

Claire Kelling began beading when she was 10 years old.

I also enjoy creating something tangible through my hobby. My beadworks are almost always gifts, and I think a handmade gift is an excellent way to show your appreciation for someone. I think the fact that I have put 10,000+ beads individually onto a needle to weave into a design shows a lot about how much I care about someone! ■

STATS4GOOD

Data for Good Researchers Fight Human Trafficking

Data for Good researchers often tackle problems reflecting the worst of society's ills. One such area is human trafficking, which has attracted considerable interest in recent years. The Walk Free Foundation is dedicated to ending modern slavery and human trafficking and works to raise awareness; partners with governments, businesses, and NGOs; and performs research. Collecting and analyzing data plays a critical role in this advocacy.

Collecting data on modern slavery and human trafficking faces many challenges. As these activities are illegal in many areas, secrecy is required for them to thrive. Victims can be reluctant to report their plight, and perpetrators strive to prevent detection.

Walk Free worked with Gallup Inc. to develop a world poll and has conducted 48 surveys since 2014. Tens of thousands of responses have been collected. Senior researcher Davina Durgana used these to develop the Global Slavery Index (*https://goo.gl/zXTaet*). Walk Free subsequently collaborated with the International Labour Organization (ILO) and International Organization for Migration (IOM) to produce the first global estimate of modern slavery. This research found that more than 40 million people around the world were held in slavery in 2016.

Another Data for Good organization active in human trafficking research is Peace-Work. This all-volunteer cooperative of statisticians, data scientists, and other researchers applies analytics to issues in poverty, education, and social justice. Peace-Work projects are often in academic and policy research, with volunteers as likely to be found working with government economic data to write a position paper as working with a social justice organization. Projects have included education performance metrics, root cause analysis of homelessness, descriptive statistics of privilege, and the impact of racial bias.

Peace-Work's efforts focus on human trafficking in the United States. State-level summary data published by Polaris was combined with demographic and socio-economic data and other sources. A mixed model was developed to identify economic, demographic, and other drivers of human trafficking in the United States. The number of victims reported by state was divided by population to yield per capita victim rates as the model outcome. These relative numbers are not able to estimate the number of people being trafficked; the goal of this project was to identify key drivers of human trafficking. Applying the model outcome to the statistics from smaller locations, such as metropolitan areas, can indicate where relatively high trafficking levels are expected.

Differences between individual states in legislation, administration, and the anti-trafficking efforts and organizations result in differences in reported levels unrelated to the amount of human trafficking present. The presence of these random factors in addition to variables driving the outcomes makes meta-analysis a good choice for the modeling method, identifying factors predicting a high level of human trafficking while accounting for variations between states. The fixed effects found by the state-level meta-analysis were then applied to data on large cities to yield potentially unidentified centers of human trafficking activity.

Peace-Work has begun to partner with local agencies to repeat meta-analysis of human trafficking at the level of metropolitan areas. Variations between states in the reported rate appear to be driven, in part, by differences in state laws. As a result, work has begun to advocate for legislative changes to implement best practices for finding traffickers and supporting victims across the country.

At the SAS Institute, a recent project used text analytics and machine learning to combat human trafficking. Starting with approximately 1,000 textual reports from the US State Department, SAS applied supervised and unsupervised machine learning to identify patterns in the text between source and destination countries, including types of trafficking and whether the countries involved were cooperating to help solve the problem. As described by Principal Solutions Architect Tom Sabo, the next step was to extract those patterns and present them in network data visualizations to share the insights gained with law enforcement and advocacy groups. Text clustering was also used to identify groups of words in the text that could be associated with trafficking children.

This study enables organizations fighting human trafficking to better leverage the intelligence to be gained from the State Department reports, in addition to finding key word clusters that can be used to examine other documents.

As much as the progress to date is encouraging, much more work is needed. The best efforts of statisticians and data scientists will continue to be needed in the fight against this terrible crime. ■

With a PhD in statistical astrophysics, **David Corliss** works in analytics architecture at Ford Motor Company while continuing astrophysics research on the side. He is the founder of Peace-Work, a volunteer cooperative of statisticians and data scientists providing analytic support for charitable groups and applying statistical methods to issue-driven advocacy in poverty, education, and social justice.

MORE ONLINE

You can learn more about the Walk Free Foundation and their fight against human trafficking at *www.walkfreefoundation.org*. Peace-Work's research, including the US human trafficking study, can be found at *https://goo.gl/j92WVz*.

MASTER'S NOTEBOOK

The Important Role of the Master's Statistician in Clinical Trials

Valerie Durkalski-Mauldin is a professor of biostatistics in the department of public health sciences at the Medical University of South Carolina and serves as the director of the Data Coordination Unit (DCU), a unit that specializes in the design, coordination, and analysis of multicenter clinical trials.

I can't live without my fellow master's (MS) statisticians! Their contributions to each project are invaluable. The Data Coordination Unit (DCU) serves as the data coordinating center for several NIH-funded multicenter clinical trials and clinical trial networks. We currently have seven PhD statisticians and six MS statisticians on our team at the DCU, in addition to several project and data managers and computer programmers.

Each of the clinical trials we coordinate involves a statistical team of at least one MS and one PhD statistician to work on the statistical aspects of the trial and collaborate with the study team on the coordination of the trial. Key tasks of the statistical team include study design and statistical analysis plan development, data cleaning, generation of the Data and Safety Monitoring Board (DSMB) reports, conduct of interim and final analyses (including program validation), and creation of public use data sets for submission to the NIH data repository. It is quite a workload for each project, and the contributions of the MS statisticians are invaluable to the team.

Our PhD and MS statisticians work closely with one another and enjoy a mutually beneficial relationship. The PhD statistician often acts as an informal mentor, and the MS statistician has a trusted source of advice and expertise when questions arise.

The DCU MS statisticians are involved before trial initiation, during trial execution, and after trial completion. As several of our trials are NIH-funded, the NIH grant submission process is an excellent opportunity for the statistical team to work together with their clinical colleagues to develop the appropriate trial design to address the important clinical questions of interest.

Our MS statisticians work on literature reviews to support the analysis plan and assist with sample size estimation and program simulation studies required for more complex trial designs when we need to better understand the trial's operating characteristics. This exposure to the trial-development and grant-writing process is the beginning of the team-building process. All our MS statisticians have enjoyed the exposure to this aspect of trial development, as they often do not receive any formal training while in school in clinical trials or NIH grant writing.

Once a trial is funded, the work scope turns toward daily trial-related tasks, including development of the statistical analysis plan, validation of analysis and report programs, working closely with data managers on case report form development and centralized data monitoring procedures, and report generation. Our MS statisticians are savvy programmers (in SAS and/or R), which is essential for many aspects of their job. For centralized data monitoring, the MS statistician and data manager work together to define the missing data and logic checks to be programmed for each data item. They also outline additional data checks and define which will be performed by the data manager and which will be performed by the statistician. Examples of items within a trial that our statistical team reviews include logic checks for sequences and dates, comparison of data distributions within and across sites, and trends and patterns of data.

Our MS statisticians also have developed graphics for centralized monitoring tasks to facilitate the monitoring of site performance and data quality. After the trial is completed, MS statisticians assist with primary and secondary analyses, manuscript preparation, and the creation of public use data sets. The list goes on for the contributions our MS statisticians bring to each clinical trial study team, and our PhD team members are grateful for their contributions.

In addition to the daily trial-related work tasks, our statistical group (both MS and PhD members) meets bimonthly to discuss statistical topics and challenges they have encountered with various trials. This provides the opportunity for relaxed discussion within our group and is a great learning opportunity for everyone.

Based on the questions, we identify topics of interest that are then presented to the group during a monthly "lunch n' learn" session. Topics have covered a wide range, including programming graphics in R, review of FDA guidances, randomization techniques, handling of missing data, and

multiplicity. There is never a shortage of subjects, and it engages the group to stay in touch with the current methodology research.

We also encourage our MS statisticians to publish methodology research. Having the combined statistical team of PhD and MS members encourages this aspect, as several of our MS statisticians have significant authorship in peer-reviewed journals and present at national and clinical meetings.

All these activities encourage professional development, which is important for any profession. Some MS statisticians may later want to pursue their PhD, while others are already doing what they love. Regardless of the goal or setting, I strongly believe in the collaboration between PhD and MS statisticians.

So, what does it take to be a successful MS statistician working in clinical trials? Let's ask the experts. Here are a few suggestions from our team.

Lydia Foster earned her Master of Science degree in applied statistics from Kennesaw State University with an undergraduate degree in mathematics. She worked for the Centers for Disease Control and Prevention prior to joining the DCU in 2011. Foster believes strong statistical programming is key. In addition, being able to clean, manipulate, and present data is helpful. This isn't always the focus of a MS-level program, so a student should consider other resources such as SAS courses and certifications and R tutorials. Collaboration is another important skill. Study teams often consist of several people with different areas of expertise, and the project is most successful when each person can contribute in their area of strength.

Lydia Foster

Holly Tillman earned her master's degree in industrial statistics from the University of South Carolina with an undergraduate degree in statistics. She worked for the Office of Research and Statistics in South Carolina before joining the DCU in 2011. Tillman stresses the importance of having attention to detail and accuracy. "Once you graduate and find a position that suits you, continue to be exposed to new projects." The ability to understand the study protocol/design and relate it to the data analysis plan is a key skill set and best learned by exposure to real projects. Practice using different techniques to achieve the same outcome through programming and analyses so you are able to check yourself for errors. Finally, realize you never stop learning in both statistics and programming, so don't be afraid to take more courses, tutorials, and webinars whenever possible.

Holly Tillman

Jyoti Arora earned her master's degree in statistics from Rashtrasant Tukadoji Maharaj University in India with an undergraduate degree in statistics. She suggests you engage with real-world data as a student. Students should participate in data analysis competitions such as those on *DrivenData.org, Kaggle.com*, and *KDnuggets.com* and ask their professors for help if they have any questions. This will offer them an opportunity to work on the unstructured data and develop skills to identify patterns, trends, and relationships within data. Data visualization is a tremendously useful skill to learn and maintain. Students earning a degree in the field of statistics should also focus on developing a broad perspective and understanding of the world by exposing themselves to people, topics, and issues in disciplines such as biology, psychology, public policy, social science, or computer science. This will help in collaborating and communicating with people from other backgrounds.

Jyoti Arora

Angela Pauls earned her master's degree in statistics from Northern Illinois University with an undergraduate degree in computer science. She highlights the importance of strong programing skills, professional knowledge, and hands-on experience as significant criteria for leading a successful career. Continuous education and good collaboration with PhD-level statisticians can keep you on the top of your game, as well. Pay attention to the detail, as you will be the one who will work with the data and provide analysis results. If you don't pay attention to the detail and process carefully and patiently, it is easy to make a mistake, which not only reflects poorly on you, but potentially those you work with and, even worse, the trial. ■

Angela Pauls

The Value of CSP 2018

Photo by Sara Davidson/ASA

CSP 2018 attendees introduce themselves to one another at the ice-breaker during the keynote address on February 16.

Conference focuses on people and interactions, not just talks and presentations

Jean V. Adams, CSP 2018 Steering Committee Chair

The 7th annual Conference on Statistical Practice was held in Portland, Oregon, Feb 15–17. There were talks, short courses, posters, and blah, blah, blah. You've been to conferences. You know what they're about. Watching and listening to presentations. Right?

Wrong.

Consider the TED talks. They are all available online for free. Yet people spend thousands, even tens of thousands, of dollars to attend the TED conference in person. Why?

The people.

A conference is all about the ***people***. The word conference comes from the Latin word *conferre*, which means "to bring together." To bring people together, you need to have some enticement. The Conference on Statistical Practice does this by inviting abstracts from potential speakers and instructors and selecting only the best for inclusion in the program. But, putting people in the same place at the same time is just the first hurdle. What's the second?

Connecting them.

The value is in the ***interactions***. To encourage people to interact with each other, you need to create a safe space and remove barriers to communication. The Conference on Statistical Practice focuses on this second hurdle to ensure attendees get the most out of the conference. We limit attendance to keep the conference small. We keep the meeting rooms close to the shared space to encourage mixing. We include an ice-breaker at the keynote. We encourage folks to gather together for meals. We connect mentors and mentees.

Photo by Meg Ruyle/ASA
Theresa Henle, Brianna Heggeseth, and Christina Knudson get acquainted at the CSP 2018 Opening Mixer.

Photo by Sara Davidson/ASA
CSP 2018 attendees chat during a break from a short course February 15.

Photo by Sara Davidson/ASA
ASA President Lisa LaVange gives the keynote address at CSP 2018 February 16.

I was surprised by how much people are using this meeting to connect with each other, even beyond the scheduled events. A lot of small professional networks (formal and informal) were taking advantage of the opportunity.

Our focus on **people** and **interactions** was effective. Just listen to what attendees had to say about the 2018 Conference on Statistical Practice:

"I was surprised by how much people are using this meeting to connect with each other, even beyond the scheduled events. A lot of small professional networks (formal and informal) were taking advantage of the opportunity."

"I met a woman who started graduate school to get a degree in biostatistics. She was an opera singer before this! I think she wants to bring her creativity to statistics."

"It was really interesting to meet people with such diverse backgrounds and at different stages in their careers and studies."

Many thanks to ASA President Lisa LaVange, who kicked off the meeting with her keynote address, "Reflections on Career Opportunities and Leadership in Statistics." LaVange also led a panel session on her #LeadWithStatistics initiative to establish a leadership institute at the ASA.

Interact at next year's Conference on Statistical Practice in New Orleans, February 14–16. To learn more, visit *ww2.amstat.org/meetings/csp/2019*. ■

Symposium on Data Science and Statistics Promises Solid Program, Networking

Yasmin H. Said is the 2018 SDSS Program Chair. She holds a PhD in computational statistics. Based on her research on ecological alcohol systems, she was awarded patent 7,800,616, Policy Analysis and Action Decision Tool. She was a visiting fellow at the Isaac Newton Institute for Mathematical Sciences at the University of Cambridge in England. She was a founding co-editor-in-chief of *WIRES: Computational Statistics*, a Wiley journal. She is an elected member of both the Research Society on Alcoholism and International Statistical Institute.

The ASA Symposium on Data Science and Statistics (SDSS) is designed for data scientists, computer scientists, and statisticians who analyze and visualize complex data. The 2018 symposium returns to Reston, Virginia, the site of the original 1988 symposium held under the newly incorporated Interface Foundation of North America (IFNA). The SDSS series, beginning this May, is a joint collaboration of the ASA, assuming responsibility for administrative management, and the Interface Foundation, retaining responsibility for the direction and intellectual focus.

The SDSS program offers short courses, concurrent sessions, electronic poster sessions, exhibits, and many opportunities for networking. Emery N. Brown, a well-known scholar with a medical focus on anesthesiology and neuroscience, will give the keynote address: "Uncovering the Mechanisms of General Anesthesia: Where Neuroscience Meets Statistics."

The plenary talks will feature David Scott from Rice University, David Brillinger from the University of California at Berkeley, Jerome Friedman from Stanford University, and Adalbert Wilhelm from Jacobs University in Germany.

The invited program includes session tracks on data science, data visualization, machine learning, computational statistics, computing science, and applications and features well-known scholars such as Leland Wilkinson, Roy Welch, Wayne Oldford, Edward George, William Cleveland, David Banks, Michael Trosset, Menas Kafatos, Nozer Singpurwalla, Lynne Billard, Carey Priebe, Douglas Nychka, Kirk Borne, and Claudio Cioffi-Revilla. In addition, there will be a number of contributed and electronic poster sessions. In total, there will be approximately 300 presentations split nearly equally between invited and contributed talks, as well as poster sessions spanning an array of topics.

A key feature of SDSS is a collection of short courses. These short courses will focus on the latest software tools, technologies, and methodologies for data science—including the Hadoop, R, and Spark ecosystems—and give participants hands-on experience. A number of high-profile technology companies will present these short courses, as well as invited talks, including Cloudera, Databricks, Domino, H2O.ai, IBM, Microsoft, RStudio, and SAS.

SDSS
SYMPOSIUM ON
DATA SCIENCE & STATISTICS
BEYOND BIG DATA: LEADING THE WAY
RESTON, VIRGINIA • MAY 16–19, 2018

There will be many opportunities for networking and social interaction with ample breaks, continental breakfasts on Thursday through Saturday, an opening mixer on Wednesday, and a symposium banquet on Thursday. Barry Nussbaum, 2017 ASA president, will be the banquet speaker, giving a light-hearted talk titled, "I Never Met a Datum I Didn't Like."

For more information about SDSS, see *ww2.amstat.org/meetings/sdss/2018/index.cfm*.

The 2018 SDSS is being held in honor of Edward Wegman, the founder and a key person in IFNA, serving as treasurer for some 30 years. He was the founding chair of the statistics department at George Mason University and developed both the MS in statistical science and PhD in computational science and informatics there. He has been dissertation director for 44 doctoral students, with seven additional students in candidacy. After a 32-year career at George Mason, Wegman will retire at the end of May as professor emeritus. He earned his PhD in May 1968 from the University of Iowa. Several sessions in this first SDSS are dedicated to his contributions to the profession. ■

sectionnews

Biometrics

The Biometrics Section will sponsor seven continuing education (CE) courses at the 2018 Joint Statistical Meetings in Vancouver. Here, we highlight four of them:

Prediction in Event-Based Clinical Trials

Instructors: *Daniel Heitjan and Gui-Shuang Ying*

Did you ever wish you could use the accumulating data from your event-based clinical trial to reliably predict its future course? Well, now you can! Give these instructors a half day at JSM 2018 and they will teach you how using their Bayesian simulation methods coded in straightforward R.

Participants will learn about flexible parametric and nonparametric prediction models for simulating future enrollment and event histories. The instructors will describe applications to real trials, showing how you can predict the timing of future interim analyses, identify efficient enrollment strategies informed by current data, and give DSMBs the best possible information on the likelihood of trial success.

Bring your own computer and data and give their methods a try!

Health Care Analytics in the Presence of Big Data

Instructor: *Evan Carey*

The phrase "big data" has become widespread, but what does it mean for the practicing health care analyst? Come to this course to learn more!

In this course, participants will gain hands-on experience using cutting-edge software tools for the analysis of large administrative health care data sets, with a focus on Python and Apache Spark. Serial and parallel optimizations techniques using frequentist statistical frameworks and machine learning frameworks will be demonstrated.

This course will focus on methods and software, rather than the clinical context, but numerous real-world examples will be discussed that will offer a broad perspective. Students will be provided with a copy of a functioning "virtual machine" with all software and course materials pre-installed.

Regression Modeling Strategies

Instructor: *Frank Harrell*

When was the last time you had a "statistical modeling tune-up"? How do you keep up to date with methods for developing and validating predictive models, dealing with common analytical challenges, and graphically interpreting regression models? This course is the answer!

Here is an enlightening and extremely popular course (that's why we offer it nearly every year) that covers multivariable regression modeling strategies, relaxing linearity assumptions, interaction surfaces, differences with machine learning, classification vs. prediction, quantifying predictive accuracy, detailed case studies using R, and more.

Introduction to Bayesian Nonparametric Methods for Causal Inference

Instructors: *Jason Roy and Michael Daniels*

Have you ever thought about trying more innovative approaches to causal inference, but you didn't know how to begin? Bayesian nonparametric methods (BNP) could be exactly what you are looking for!

In this short course, expert instructors will review BNP methods and illustrate their use for causal inference in the setting of point treatments, dynamic (longitudinal) treatments, and mediation.

The BNP approach to causal inference has several possible advantages over popular semiparametric methods, including efficiency gains, the ease of causal inference on any functionals of the distribution of potential outcomes, the use of prior information, and capturing uncertainty about causal assumption via informative prior distributions. You'll learn even more from their wealth of examples, supported by detailed instructions for software implementation using R.

For more information, visit the Biometrics Section community site at *https://goo.gl/bgUKmV*. ■

Physical and Engineering Sciences

Joanne Wendelberger, Joint Research Conference Chair

Make your plans now to head to Santa Fe, New Mexico, for the 2018 Joint Research Conference (JRC) on Statistics in Industry and Technology, which will be hosted by the Los Alamos National Laboratory at the Drury Plaza Hotel June 11–14.

Further information about the conference is available at *jrc2018.lanl.gov* ■

North Carolina Chapter

David Banks of Duke University moderated a discussion this past December for the North Carolina Chapter of the ASA. The panel featured Jim Blum, Ashley Kesler, Kristen Foley, Kirsten Doehler, Joe Ibrahim, and Bob Rodriguez.

Nearly 75 statisticians braved the snowy weather to discuss topics such as how to get the most out of your ASA and North Carolina Chapter memberships, career directions, continued education, the mobility and flexibility of statisticians, and the future of statistics.

Questions focused on how to decide between industry and academia, how to best use tools and skills on the job, and what the panelists' favorite coding activities on a sunny afternoon are—to which the response was, "Never let a data set best a beautiful Saturday afternoon!"

Details about the panel can be found at *https://goo.gl/gcMTpq*.

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 Consortium for Data Analytics in Risk (CDAR) invites applications for a Swiss Re postdoctoral fellowship to begin as soon as possible. Priority will be given to applicants with expertise in data science, machine learning, and financial economics. Apply online at *http://jobs.amstat.org/jobs/10781779*. The review process will continue until the position is filled. EOE. ■

Indiana

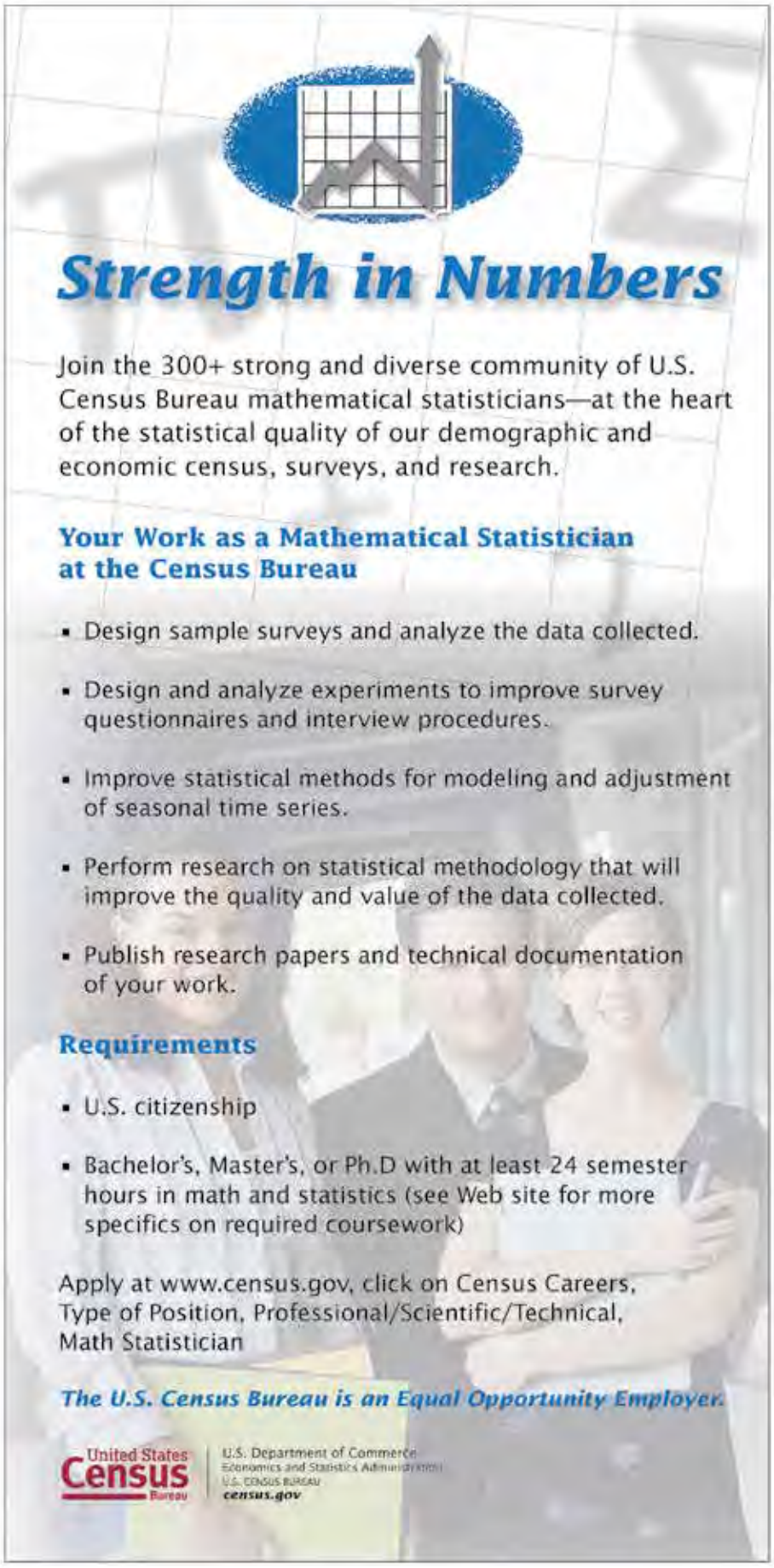
■ The Department of Statistics at Indiana University, Bloomington, anticipates two visiting assistant professor positions for 2018–2019. One year, with possible renewal for a second. Teaching load of 2 courses per semester. See *www.stat.indiana.edu* for department information. Apply electronically at PeopleAdmin *https://goo.gl/sPkacr.* Indiana University is an equal employment and affirmative action employer and a provider of ADA services. ■

TRAINING PROGRAM
at Texas A&M University for New and Established Investigators in Bioinformatics and Biostatistics

The Department of Statistics at Texas A&M University has openings for its NCI-funded T32 training program in Bioinformatics and Biostatistics with an emphasis on the Biology of Nutrition and Cancer (*http://stat.tamu.edu/B3NC*). Drs. Raymond Carroll in Statistics and Robert Chapkin in Nutrition direct the program. Program participants will receive training via a structured format in biology, genetics, gene expression analyses, genomic signal processing, and the biological mechanisms of cancer that may be activated by nutrition-related factors. No teaching duties are required. Each participant will be mentored by a multidisciplinary team of experienced researchers from Statistics, Electrical Engineering, Nutrition and Biochemistry and will be provided with excellent computing support. Applicants should have a Ph.D. in a quantitatively oriented discipline, such as statistics, electrical engineering and applied mathematics. Both recent and established investigators are invited to apply. Funding is restricted to U.S. citizens and permanent residents. The 2-year stipends are competitive with initial tenure-track positions in statistics. Interested applicants should send a vita and three letters of reference (for new or recent Ph.D.s) by May 1, 2018 to:

Dr. Raymond Carroll
Department of Statistics
Texas A&M University
College Station TX 77843-3143
carroll@stat.tamu.edu

AA/EOE



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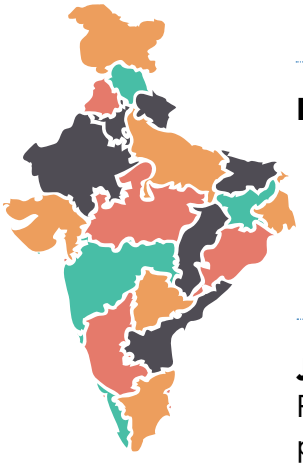

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NEXT MONTH: What do you like best about JSM? Sum it up in four or fewer words! #JSMin4words

JSM2018
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Statistics

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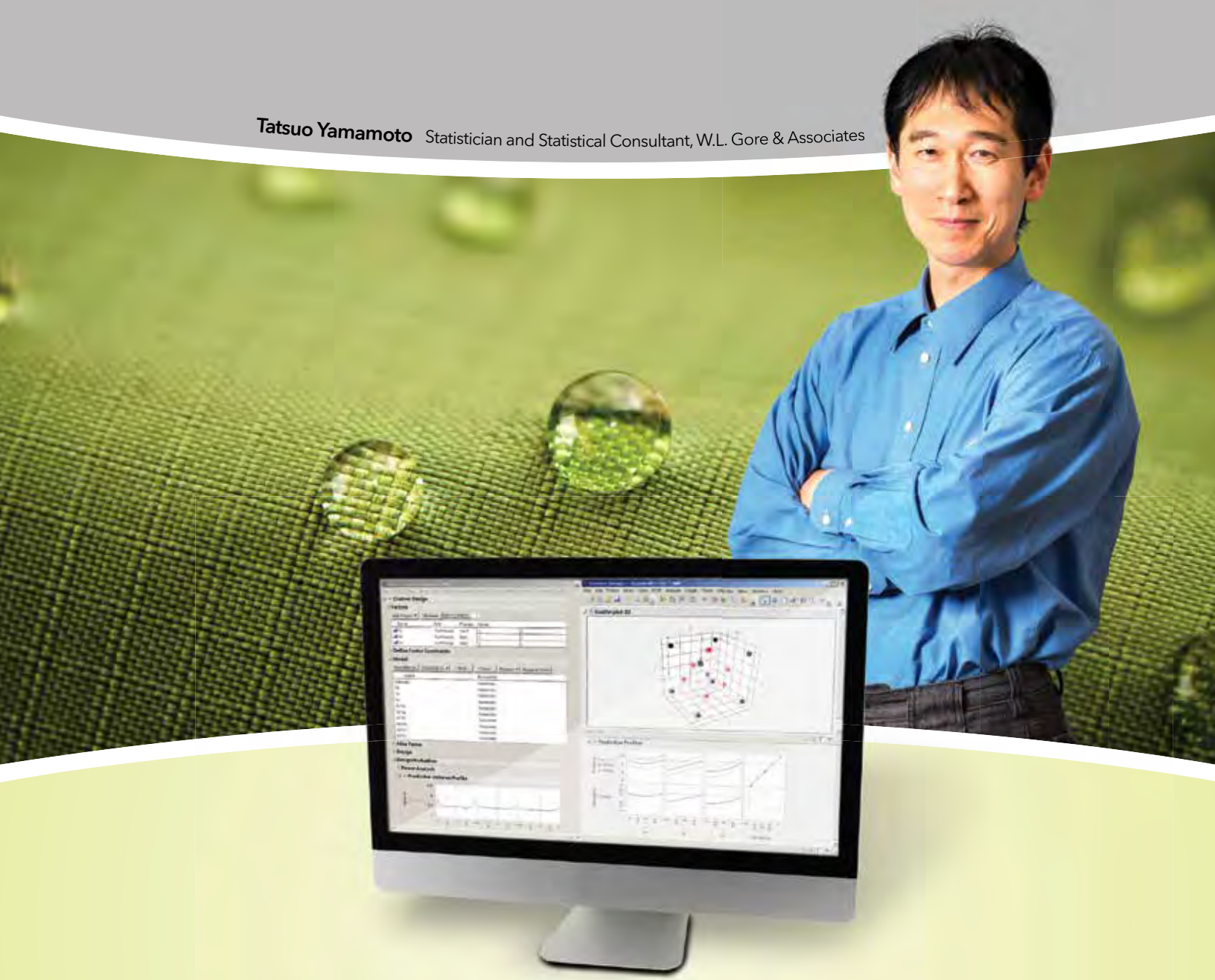

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