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World Congress in Toronto

Registration is now open for the 9th World Congress in Probability and Statistics, to be hosted by the Fields Institute in Toronto, from July 11–15, 2016. IMS members benefit from reduced registration rates, and if you register before the early-bird deadline, June 1, you'll save $100. We recommend that you **book your accommodation early** too, as there are a number of big meetings in Toronto at that time and hotel rooms are selling quickly.

Highlights of the program include the following special lectures: Wald Lectures Sara van de Geer; Rietz Lecture Bin Yu; Doob Lecture Scott Sheffield; Schramm Lecture Ofer Zeitouni; Laplace Lecture Byeong Park; Bernoulli Lecture Valerie Isham; Kolmogorov Lecture Ruth Williams; Lévy Lecture Servet Martinez; Tukey Lecture David Brillinger; Ethel Newbold Prize Lecture Judith Rousseau; Plenary Lecture Martin Hairer; and five IMS Medallion Lectures, from Frank den Hollander, Vanessa Didelez, Christina Goldschmidt, Arnaud Doucet and Pierre Del Moral. [*Editor's note: you can read previews of Frank den Hollander's and Pierre del Moral's Medallion lectures on pages 8 and 9, and more lecture previews in the next issue.*]

The invited sessions will be: SPDE's and the work of Martin Hairer; Integrable models in statistical physics; Random growth models; Spin Glasses; Random media; Random matrices; Random planar maps; Conformally invariant processes; Random walks on graphs; Interacting particle systems and their scaling limits; Limit Theorems and the Malliavin calculus; Stein's method; Rough paths; Scaling limits of stochastic networks; Statistics of random processes; Stochastic models of evolution; Stochastic models of cancer; Mathematical systems biology; BSDEs and their applications in finance; Biomedical applications; Random matrix theory and statistics; Graphical models and totally positive distributions; Compressed sensing; Computational versus statistical complexity in high-dimensional problems; Aggregation of estimators; Community detection in random graphs; Statistics and networks; Selective inference; Inference for high-dimensional covariance structures; Object Oriented Data Analysis: Persistent Homology Representations; High-dimensional econometrics; Model selection in nonstandard high dimensional models; Online algorithms in machine learning; Frequentist properties of Bayesian nonparametric or high dimensional models; Analysis of next generation sequencing data for biomedicine; Statistical computing and complex data; Privacy and Statistics; Models and inference for big data; A celebration of the work of Peter Hall. See www.fields.utoronto.ca/programs/scientific/16-17/WC2016/program.html

Please note that Canada has introduced **new visa requirements**. Visa-exempt foreign nationals are expected to have an Electronic Travel Authorization (eTA) to fly to or transit through Canada. Exceptions include US citizens, and travellers with a valid Canadian visa. Check whether you need one: http://www.cic.gc.ca/english/visit/business.asp

IMS Members' News

US National Academy of Sciences elects Members, Foreign Associates

The US National Academy of Sciences (NAS) has announced the 2016 election of 84 new members and 21 foreign associates from 14 countries in recognition of their distinguished and continuing achievements in original research. Among them are five IMS Fellows. We congratulate:

- Steven N. Evans, professor of statistics and mathematics at the University of California, Berkeley
- Susan A. Murphy, Herbert E. Robbins Distinguished University Professor of Statistics in the Department of Statistics, and research professor in the Institute for Social Research, at the University of Michigan, Ann Arbor
- Larry A. Wasserman, professor in the department of statistics at Carnegie Mellon University, Pittsburgh
- Yuval Peres, principal researcher in theory group, Microsoft Research (citizenship: Israel)
- Nancy M. Reid, Canada Research Chair and University Professor in the department of statistics at the University of Toronto (citizenship: Canada)

(Yuval and Nancy were elected to the National Academy of Sciences as Foreign Associates.)

The full list of those elected is on the NAS website at http://www.nasonline.org/news-and-multimedia/news/may-3-2016-NAS-Election.html

Steve Evans

Susan Murphy

Larry Wasserman

Yuval Peres

Nancy Reid

Krzysztof Burdzy receives 2016 IMS Carver medal

Krzysztof (Chris) Burdzy, Professor of Mathematics and Adjunct Professor of Statistics at the University of Washington, USA, has been named the 2016 IMS Carver Medalist. Chris receives the award for leadership in the development and curation of electronic publications for the IMS probability community, especially for co-founding the *Electronic Journal of Probability* and *Electronic Communications in Probability*, and the Probability Abstract Service, as well as for sustained vigilance and dedication to ensuring the stability and open access for these publications and for serving as an informed resource for IMS on electronic issues.

Krzysztof (Chris) Burdzy

Chris said he was "deeply honored" to be chosen. He will receive his award at the Presidential Address and Awards Ceremony, at the World Congress in Toronto in July.

The Carver Medal was created in 2002 in honor of Harry C. Carver, Founding Editor of the *Annals of Mathematical Statistics* and one of the founders of the IMS. The medal is for exceptional service specifically to the IMS and is open to any member of the IMS who has not previously been elected President.

IMS Members' News

Paul Joyce: 1958–2016

We are deeply saddened to announce that IMS member Paul Joyce, professor of mathematics and Dean of the College of Science at the University of Idaho, was killed in a car accident on April 22, near Orofino, Idaho. He was only 57.

An obituary on the University of Idaho (UI) website noted that Paul was "a committed member of our university leadership team, a dedicated scientist and researcher, and a valuable teacher and mentor." Paul had just been awarded the honor of University Distinguished Professor, which he would have received at a ceremony a few days after his untimely death.

Paul Joyce

Paul had worked at UI since 1991; he was appointed Dean of the College of Science in 2013. His PhD in mathematics was from the University of Utah, and his MSc and BS, also in mathematics, were from Montana State University. He received several UI honors, including three Alumni Excellence Awards, the College of Science Distinguished Faculty Award and the Donald Crawford Graduate Faculty Mentoring Award. As dean, Paul led efforts to increase federal funding for research and education and address salary equity issues.

The UI obituary noted that in nomination documents for the Distinguished Professor award, "colleagues recognized Paul's dedication to his field and his interdisciplinary efforts. He will also be remembered for his humor, charisma and devotion to math jokes."

Paul is survived by his wife, Jana, and their son, Andrew.

The University of Idaho is setting up an endowment to support students in the graduate program that Paul helped to create. Read more at http://www.uidaho.edu/news/news-articles/faculty-staff-news/2016-april/042516-pauljoyce.

A full obituary will appear in the *Bulletin* in due course.

Statistics on the radio

IMS Fellow Robert Kass featured in a radio interview with radio station WRSI, *Where Statistics and Big Data and Your Brain Meet.* In the interview, Rob Kass of Carnegie Mellon University, talked about the importance of statistics in brain function and human behavior while explaining the role statistics played in debunking a once-popular phenomenon known as the Bible Code. In addition to instructing students within the Department of Statistics, Kass also works in CMU's Machine Learning Department and is the interim co-chair of the Center for the Neural Basis of Cognition. You can listen to the interview on the WRSI website at http://wrsi.com/monte/where-statistics-big-data-your-brain-meet/

> ### *Current Index to Statistics* wants your input
>
> Are you a user of the *Current Index to Statistics*? Interested in helping shape its future? We are looking for a few members of the Current Index to Statistics Management Committee. The workload is very light, but impact can be great. If you are interested, please email IMS Executive Director, Elyse Gustafson at erg@imstat.org.

Obituary: Ingram Olkin

1924–2016

Ingram Olkin, professor emeritus of statistics and education at Stanford University, died at home in Palo Alto on April 28 at the age of 91.

Ingram Olkin was an eminent scholar, teacher and stalwart contributor to many civil rights causes. He is best known for developing statistical analyses for evaluating policies, particularly in education. Throughout his career, Olkin conducted highly significant research concerning new and innovative statistical models and methods for the behavioral medical, and social sciences, often simultaneously. Particularly outstanding is his research into combining, statistically, the scientific results from independent studies.

"He was a man of remarkable intelligence and affability. His nearly boundless energy was generously used for the welfare of others," said Richard Cottle, a professor emeritus of management science and engineering and a close friend of Olkin. "It is hard to capture in words the goodness that Ingram showed in his everyday life."

Born in Waterbury, Conn., on July 23, 1924, he was the only child of Julius and Karola (née Bander) Olkin, both immigrants from Eastern Europe. At the age of 10, Ingram and his parents moved to New York City, and he later attended DeWitt Clinton High School in the Bronx from which he graduated in 1941. He enrolled at City College of New York (CCNY), but his studies were interrupted in 1943 when he volunteered and served in the US Army Air Force as a meteorologist until 1946.

Returning to CCNY, he completed his degree in mathematics and went on to obtain a master's degree in mathematical statistics at Columbia University followed by a PhD in mathematical statistics at the University of North Carolina at Chapel Hill, conferred in 1951.

For his first academic position, Ingram joined the Mathematics Department faculty at Michigan State University as an assistant professor and rose through the ranks to become a full professor. During the nine years he spent at Michigan State, he enjoyed productive sabbatical leaves at the University of Chicago (1955) and Stanford (1958). In 1960 he joined the faculty of the University of Minnesota to chair the formation of a new Statistics Department. One year later, he moved permanently to Stanford University, where he held a joint appointment with the Department of Statistics and the Graduate School of Education.

Olkin's research, teaching and other professional activities have had far-reaching influence in mathematical and educational statistics and their applications.

His scientific legacies lie in several fields, most notably multivariate statistical analysis, inequalities (especially majorization), linear algebra, and a subject called meta-analysis in which he was particularly active in his later years.

The latter subject enables researchers to combine separate studies in a manner that makes them more meaningful. Among the many books Ingram Olkin has co-authored and co-edited are *Inequalities: Theory of Majorization and its Applications* (with Albert Marshall) and *Statistical Methods for Meta-Analysis* (with Larry V. Hedges).

Ingram's dedication to his profession was outstanding. He belonged to the editorial boards of numerous journals on statistics and other fields. While serving as its editor, Ingram successfully advocated splitting the prestigious journal *Annals of Mathematical Statistics* into two journals: *Annals of Statistics* and *Annals of Probability*. He was instrumental in the formation of the *Journal of Educational Statistics* (now called

Ingram Olkin (Photo by Ed Souza)

the *Journal of Educational and Behavioral Statistics*). He served as chair of the Statistics Department at Stanford (1973–76). He was president of the Institute of Mathematical Statistics and chair, co-chair, or member of countless committees and panels at the national level.

Olkin's outstanding record of accomplishment and service brought him international recognition and a long list of honors and awards. Among them are the Wilks Medal and Founders Award from the American Statistical Association, a Guggenheim Fellowship, an honorary doctor of science from De Montfort University, election to the National Academy of Education, and the Melvin Zelen Leadership Award from the Department of Biostatistics at Harvard University's School of Public Health.

Olkin also devoted considerable time and energy to increasing the number and status of women in graduate studies and in tenure-line academic positions at the university level. He was instrumental in convincing the National Science Foundation to support a successful program that brought untenured female professors of statistics to Stanford for the summer, where they could interact with some of the leading figures in the field. To the

Ingram Olkin, 1924–2016
Continued from **page 4**

end, Ingram continued to be an advocate for giving women and minorities opportunities and fair treatment in all respects. In recognition of his support for women in statistics, he became the first (and only) male recipient of the Elizabeth L. Scott Award from the Committee of Presidents of Statistical Societies.

"Ingram Olkin was a gentleman in the best sense of the word," said Myra H. Strober, a professor emerita at the Graduate School of Business and at the Graduate School of Education. "He always supported talented women, students as well as faculty, and listened carefully to our difficulties and strategized with us on how to overcome them. He was brilliant, but he was gentle,

never belittling others and always open to hearing new ideas. We will miss him greatly."

Ingram was a member of the Stanford Emeriti Council, a group that plans quarterly talks by distinguished retirees for emeritus faculty and staff and their spouses. He was also a member of a group that planned a series of presentations on successful aging for such an audience.

Ingram was an active participant in monthly faculty lunches at Stanford's Hillel. He loved theater, art, classical music and especially opera, much of which he attended in San Francisco or elsewhere in his worldwide travels.

Ingram is survived by his wife Anita, with whom he was about to celebrate their 71st

wedding anniversary; his daughter Vivian, her husband Sim Sitkin, their children Leah and Jared; his daughter Rhoda and children Noah and Sophia; and his daughter Julia and children Rachel and Jeremy.

Ingram made arrangements to donate his body to Stanford Hospital for science research; his wish was carried out. No memorial service has yet been announced.

Donations in memory of Ingram Olkin can be made to Stanford Hillel or to West Bay Opera.

Written by Richard Cottle and Julia Olkin; reprinted with permission from Stanford News *online, May 4, 2016.*

Calls for Nominations

IMS Special Lectures

The IMS Committee on Special Lectures is accepting nominations for IMS Named and Medallion Lectures. The following lectures are available for nomination in 2016.

- 2018 Wald Lecturer
- 2018 Neyman Lecturer
- 2018 Rietz Lecturer
- 2019 Medallion Lecturers

The deadline for nominations is October 1, 2016. To nominate someone, you will need a nomination letter (half a page, including your name, the nominee's name and the name of the IMS lecture for which the nominee is nominated), and a list of five of their most relevant publications, with a URL where these publications are accessible.

For more information visit: http://imstat.org/awards/lectures/nominations.htm

First International Prize in Statistics

Nominations are open for the first International Prize in Statistics, to be awarded at the ISI World Statistics Congress in Marrakech in July, 2017. The purpose of the Prize is to call public attention to the important role that statistics, data analysis, probability, and understanding of uncertainty have played and are playing in the advancement of society, science, technology and human welfare. The Prize was created by the American Statistical Association, International Biometric Society, International Statistical Institute, IMS and the Royal Statistical Society.

Nominations are open through August 15, 2016. When nominating, bear these points in mind: The prize will be awarded for a single work or body of work, rather than for more diffuse reasons such as "lifetime achievement." Not only should powerful and original ideas be recognized by the prize, but also contributions that lead to breakthroughs in other disciplines or works with important practical effects on the world. Generally, the prize will be awarded to individuals, but in some cases, groups of individuals working on similar ideas—or even teams of individuals or organizations—could be recognized. The recipient(s) must be living at the time of selection for the award. There is no age restriction.

To nominate, please see the information at http://statprize.org/nominations.cfm. The first International Prize in Statistics recipient will be announced in October 2016, and will be honored during a special ceremony in Marrakech in 2017. The Prize will carry with it a cash award of at least $75,000.

Obituary: Paul Herzberg

1936–2015

Professor Paul A. Herzberg, a long-time faculty member in the Psychology Department at York University in Toronto, died on December 2, 2015 at age 79. Paul joined York University in 1966 and retired from the Department of Psychology in 2002. He was named a senior scholar at the University. Paul's papers are housed in the Archives at the Scott Library at York University.

Paul was born on September 23rd, 1936 the son of Luise and Gerhard Herzberg, both of whom were refugees from Nazi Germany. His parents were distinguished scientists. His father, Gerhard Herzberg, a physicist, was awarded the Nobel Prize for Chemistry in 1971, for his contributions to the field of atomic and molecular spectroscopy. His mother, Luise, was an astrophysicist whose work gained considerable recognition in the 1960's. His parents were forever grateful to Canada for welcoming them in 1935 and to the University of Saskatchewan for offering Gerhard a permanent professorship in 1936. Gerhard went on to positions at the University of Chicago and then became the Director of the Division of Pure Physics, at the National Research Council of Canada.

Paul was a Fellow of the Institute of Mathematical Statistics and was a celebrated teacher of statistics, receiving several significant teaching awards for his teaching innovations. Paul developed and employed novel instructional methods for statistics and authored a statistics textbook, Principles of Statistics (Herzberg, 1983), which reflected his pedagogical philosophy. For twenty-five years, he taught statistics to undergraduate psychology majors at York University and developed an intensive program of individualized instruction. He taught over 3,000 students using his approach. Each year in his courses, he employed a select group of upper-level undergraduates as teaching assistants, over 300 in total. Many of these students went on to successful careers in psychology as academics in Canada and the United States. At a memorial held for Paul in February 2016, many spoke movingly about Paul's impact on them and their careers.

After his retirement from teaching at York, Paul remained physically and intellectually active. He continued his life-long commitment to fitness and swimming and took course to learn German. In one of his most important achievements, Paul wrote and published in 2010 a biography of his mother titled, Luise Herzberg Astrophysicist: A Memoir, in which he detailed her many scientific accomplishments and the challenges she faced as a woman in science and as the wife of a famous scientist. While his father's achievements had been detailed by others, Paul believed that his mother's many scientific achievements had been understated and that it was up to him to tell her story. After coming to Canada and spending years devoting herself to her children and her husband's career, Luise obtained a permanent position at the Dominion Observatory in Ottawa, Canada, and went on to work on data obtained from Canada's first satellite, the Alouette. She also worked at the Radio Physics Laboratory in Ottawa. One reviewer noted that Paul's biography "provides a unique look at a Jewish immigrant woman scientist, very much in the shadow of her famous husband, struggling to break loose from oppression of one kind or another" (Broughton, 2010). In 2007 Paul mounted a celebration of her life at the Preservation House Gallery in Toronto.

During his retirement, Paul also assembled a book of his wife Louise's poetry and botanical drawings, published in 2015. His wife Louise predeceased him by just a few months. At the time of his death, Paul had just completed a biography of C. J. Mackenzie, a significant figure in the development of science in Canada and a former President of the National Research Council of Canada. It will be published posthumously.

Paul is survived by his stepmother, Monika Herzberg, and by his sister, Agnes Herzberg, a statistician who spent her early career in the Department of Mathematics at the Imperial College of Science and Technology, London, and more recently in the Department of Mathematics and Statistics at Queen's University in Kingston Ontario, where she is currently Professor Emeritus.

Written by Doug McCann, Department of Psychology, York University, and Agnes Herzberg, Department of Mathematics and Statistics, Queen's University, Kingston, ON.

Medallion lecture preview: Frank den Hollander

Frank den Hollander is professor of mathematics at Leiden University in The Netherlands. His research focuses on probability theory, ergodic theory, statistical physics, population dynamics and complex networks. Frank has supervised 13 PhD students and 33 postdocs, has published 150 papers, and is the author of three monographs. He has served on strategic advisory boards across Europe, and is Fellow of the American Mathematical Society and of the Institute of Mathematical Statistics. Frank is member of the Royal Dutch Academy of Sciences. He has been awarded 25 national and international research grants, including an ERC Advanced Grant and a ten-year consortium grant by the Dutch Ministry of Education, Culture and Science called NETWORKS.

Metastability for the Widom–Rowlinson Model

Metastability is the phenomenon where a physical system, under the influence of a *stochastic dynamics*, moves between different subregions of its state space on different time scales. Metastability is encountered in a wide variety of physical systems. The challenge is to devise realistic models and to explain the experimentally observed *universality* displayed in metastable behaviour, both qualitatively and quantitatively. For an overview, see the monograph by Bovier and den Hollander[1].

In *statistical physics*, metastability is the dynamical manifestation of a first-order phase transition. An example is condensation. When water vapour is cooled down slightly below 100 degrees Celsius, it persists for a very long time in a *metastable vapour state* before transiting to a *stable liquid state* under the influence of random fluctuations. The crossover occurs after the system manages to create a *critical droplet* of liquid inside the vapour, which once present grows and invades the system. While in the metastable vapour state, the system makes many unsuccessful attempts to form a critical droplet, because this requires the system to climb an 'energetic hill'. [See graph above right]

In the *static* Widom–Rowlinson model[5], particles are viewed as points carrying disks, and the *energy* of a particle configuration equals minus the total overlap of the disks (consequently, the interaction between the particles is attractive). It was shown by Ruelle[4] and by Chayes, Chayes and Kotecký[2] that, on the *infinite Euclidean space*, this
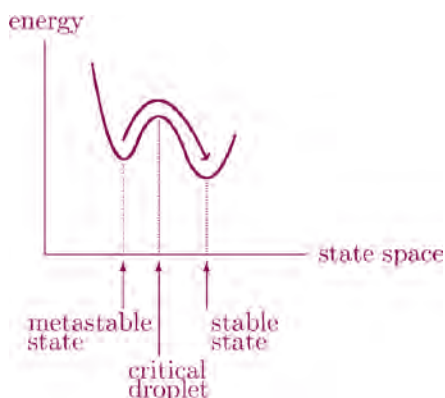
Above: Paradigm picture of metastability

model has a first-order phase transition between a vapour state and a liquid state. The phase transition occurs as the *chemical potential*, controlling the density of the particles, changes from a subcritical value to a supercritical value. The model is therefore a natural candidate to display metastable behaviour.

The *dynamic* Widom–Rowlinson model
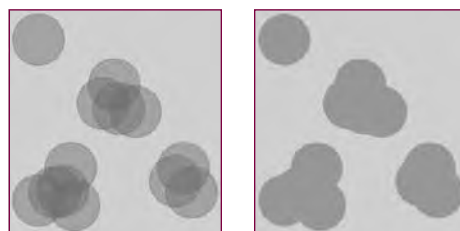
Above: Particles interacting via overlap of their disks

on a *two-dimensional torus* is considered in den Hollander, Jansen, Kotecký and Pulvirenti[3]. Particles are randomly created and annihilated as if the outside of the torus were an *infinite reservoir* with a given chemical potential. The system evolves according to a Metropolis dynamics associated with the Hamiltonian H of the model, i.e., a move

from an old to a new configuration is accepted at rate $\exp[-\beta(\Delta H)_+]$, with $\beta \in (0,\infty)$ the *inverse temperature* and $(\Delta H)_+$ the positive part of the change in the Hamiltonian caused by the move (H depends both on the energy and on the chemical potential).

We are interested in the metastable behaviour at low temperature when the chemical potential is supercritical. In particular, we start with the *empty torus* (which represents the vapour state) and are interested in the first time when we reach the *full torus*, i.e., the torus is fully covered by disks (which represents the liquid state). In order to achieve the transition from empty to full, the system needs to create a sufficiently large droplet of overlapping disks, which plays the role of the critical droplet that triggers the crossover. In the limit as $\beta \to \infty$ (low-temperature limit), we compute the asymptotic scaling of the average crossover time, show that the crossover time divided by its average is exponentially distributed, and identify the size and the shape of the critical droplet.

The critical droplet turns out to be close to a disk of radius

$$R_c(\kappa) = \frac{2\kappa}{\kappa - 1},$$

where $\kappa \in (1,\infty)$ is a parameter controlling the degree of supercriticality of the chemical potential. The average crossover time scales like

$$\exp[\beta \mathcal{U}(R_c(\kappa)) - \beta^{1/3}\mathcal{S}(R_c(\kappa)) + o(\beta^{1/3})], \quad \beta \to \infty.$$

The leading term corresponds to the classical *Arrhenius law*, with $\mathcal{U}(R_c(\kappa))$ the *energy* of the critical droplet. The correction term, which is large, represents a substantial

deviation from this law, with $\mathcal{S}(R_c(\kappa))$ the *entropy* of the critical droplet. This correction term comes from the fact that the boundary of the critical droplet is 'bumpy', with many particles sticking out just a little. It turns out that there ar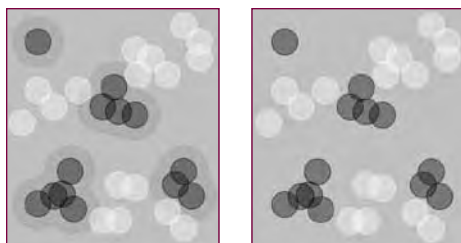e $\asymp\beta$ particles inside the critical droplet, $\asymp\beta^{1/3}$ particles touching the boundary, while the boundary itself fluctuates on scale $\beta^{-1/2}$.

The Widom–Rowlinson model can be viewed as the projection of a two-species model with hard-core repulsion in which one of the species is not observed. It therefore also serves as a model for *phase separation*.

Above: The one-species model as the projection of the two-species model.

References:

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2 J.T. Chayes, L. Chayes, and R. Kotecký, The analysis of the Widom–Rowlinson model by stochastic geometric methods, *Commun. Math. Phys.* **172**, 551–569 (1995).

3 F. den Hollander, S. Jansen, R. Kotecký, and E. Pulvirenti, Metastability for the Widom–Rowlinson model, work in progress. [supported by ERC Advanced Grant 267356-VARIS]

4 D. Ruelle, Existence of a phase transition in a continuous classical system, *Phys. Rev. Lett.* **27**, 1040–1041 (1971).

5 B. Widom and J.S. Rowlinson, New model for the study of liquid–vapor phase transitions, *J. Chem. Phys.* **52**, 1670–1684 (1970).

Medallion lecture preview: Pierre Del Moral

Pierre Del Moral is Research Director at INRIA in France since 2007. He has previously worked at the University of New South Wales (Sydney, Australia); Polytechnique School in Palaiseau, Paris; Laboratoire J. A. Dieudonne of the University of Nice and Sophia-Antipolis; CNRS research fellow at University Paul Sabatier in Toulouse; Ecole Nationale Superieure de l'Aeronautique et de l'Espace in Toulouse; and for the company Steria-Digilog, working on particle filters in tracking problems arising in radar and sonar signal processing problems. He obtained his PhD in 1994 in signal processing with one of the first rigorous study on stochastic particle methods in nonlinear filtering and optimal control problems. His main research interests include branching processes and particle methods, Feynman–Kac formulae, nonlinear filtering, rare event analysis, stochastic algorithms and Markov chain Monte Carlo methodologies. He serves as associate editor for several journals, and has authored several books, including two research monographs, *Mean field simulation for Monte Carlo integration* and *Feynman-Kac formulae: Genealogical and interacting particle approximations*, and co-authored *Stochastic processes, from applications to theory* (with S. Penev).

An introduction to mean field particle methods

In the last three decades, there has been a dramatic increase in the use of Feynman–Kac type particle methods as a powerful tool in real-world applications of Monte Carlo simulation in computational physics, population biology, computer sciences, and statistical machine learning. The particle simulation techniques they suggest are also called resampled and diffusion Monte Carlo methods in quantum physics, genetic and evolutionary type algorithms in computer sciences, as well as Sequential Monte Carlo methods in Bayesian statistics, and particle filters in advanced signal processing. These mean field type particle methodologies are used to approximate a flow of probability measures with an increasing level of complexity. This class of probabilistic models includes conditional distributions of signals with respect to noisy and partial observations, non-absorption probabilities in Feynman–Kac–Schrödinger type models, Boltzmann–Gibbs measures, as well as conditional distributions of stochastic processes in critical regimes, including quasi-invariant measures and ground state computations.

This lecture presents an introduction to the stochastic modeling and theoretical analysis of these sophisticated probabilistic models. We shall discuss the origins and mathematical foundations of these particle stochastic methods, and applications in rare event analysis, signal processing, mathematical finance and Bayesian statistical inference. We illustrate these methods through several applications: random walk confinements, particle absorption models, nonlinear filtering, stochastic optimization, combinatorial counting and directed polymer models.

t and χ²: Revisiting the classical tests for the 21st century classroom

Contributing Editor Dimitris Politis writes:

Consider the standard setup where $X_1, \ldots, X_n$ are i.i.d. from distribution F with mean $\mu = EX_i$, variance $\sigma^2 = E(X_i - \mu)^2 > 0$, skewness $\gamma = E(X_i - \mu)^3 / \sigma^3$, and kurtosis $\kappa = E(X_i - \mu)^4 / \sigma^4$ assumed finite. As usual, define the sample mean $\bar{X} = \frac{1}{n} \Sigma_{i=1}^n X_i$, the sample variance $\hat{\sigma}^2 = \frac{1}{n-1} \Sigma_{i=1}^n (X_i - \bar{X})^2$, and the *t*-statistic $T = \sqrt{n}(\bar{X} - \mu)/\hat{\sigma}$.

At the beginning of the twentieth century, the classical theory for the *t* and χ^2 tests was developed by the statistical pioneers W.S. Gosset ("Student"), R.A. Fisher, etc. These were undoubtedly major breakthroughs at the time but are intimately tied to the assumption that F is Gaussian, which is often hard to justify. Indeed, the true sampling distribution of T and $(n-1)\hat{\sigma}^2$ can be quite different from the textbook t_{n-1} and $\sigma^2 \chi^2_{n-1}$ distributions respectively even under moderate non-normality.

Skewness and the t-statistic

Now that samples are typically large, practitioners may be reluctant to start out with such a restrictive assumption as normality, relying instead on a Central Limit Theorem (CLT). It is well known that the accuracy of the CLT for $\bar{X}$ depends on the skewness of the data. Under regularity conditions, an Edgeworth expansion yields:

$$P(\sqrt{n}(\bar{X} - \mu)/\sigma \le x) = \Phi(x) + b(x)\gamma/\sqrt{n} + O(1/n) \qquad (1)$$

for all x, where $\Phi(\cdot)$ is the standard normal distribution, and $b(\cdot)$ a bounded function. Eq. (1) indicates that the distribution of $\bar{X}$ has a skewness equal to $\gamma/\sqrt{n}$ that is not captured in the symmetric shape of a normal and/or *t*-distribution.

What is perhaps less well known is that skewness induces a strong dependence between the numerator and denominator of the *t*-statistic thereby shedding doubt on the accuracy of the *t*-tables; Hesterberg[5] brings out this point. Figure 1 depicts a scatterplot of $\bar{X}$ vs. $\hat{\sigma}$ based on 250 simulated samples each of size $n = 30$ from $F = \frac{1}{2}\chi^2_2$, i.e., exponential; the correlation between $\bar{X}$ and $\hat{\sigma}$ is unmistakeable.

One might think that this is a phenomenon particular to the exponential distribution where $\bar{X}$ and $\hat{\sigma}$ estimate the same parameter. In fact, the phenomenon holds true for any skewed distribution

Figure 1: Scatterplot of $\bar{X}$ vs. $\hat{\sigma}$ based on 250 exponential samples each of size n=30.
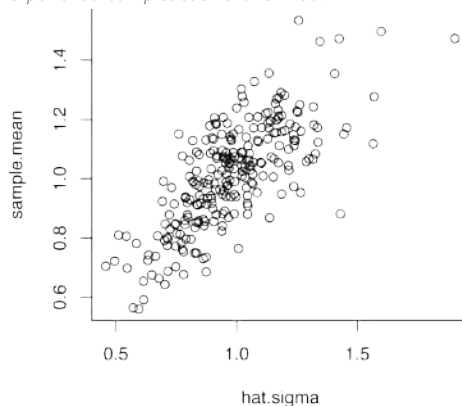
F, and the correlation persists regardless of sample size. To elaborate, the δ-method implies $\text{Corr}(\bar{X}, \hat{\sigma}) \approx \text{Corr}(\bar{X}, \hat{\sigma}^2) \to \gamma/\sqrt{\kappa - 1}$ as $n \to \infty$. When F is exponential, $\gamma = 2$, $\kappa = 9$, and $\text{Corr}(\bar{X}, \hat{\sigma}) \approx 0.7$. Incidentally, this large-sample correlation calculation shows as a by-product the nontrivial general inequality $\gamma^2 \le \kappa - 1$ which is sharper than what is implied by Littlewood's inequality; see p. 643 of DasGupta[2] with $r = 4$, $s = 3$ and $t = 2$. Interestingly, when F is Bernoulli(p), the identity $\gamma^2 = \kappa - 1$ holds for any $p \in (0, 1)$.
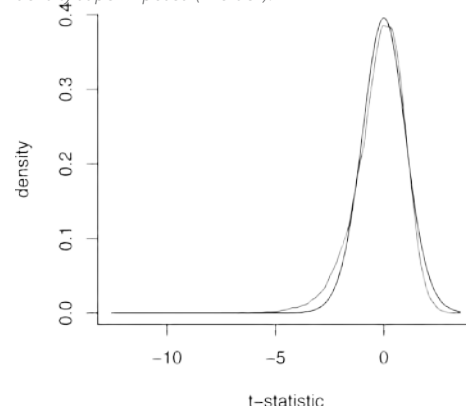
An Edgeworth expansion for the *t*-statistic yields:

$$P(\sqrt{n}(\bar{X} - \mu)/\hat{\sigma} \le x) = \Phi(x) + c(x)\gamma/\sqrt{n} + O(1/n) \qquad (2)$$

where $c(\cdot)$ is another bounded function. Figure 2 shows the true density of T obtained via Monte Carlo simulation from an exponential sample of size $n=30$ with the t_{29} density superimposed. The true density is skewed left although visually this might not appear particularly striking. However, the true 2.5% and 5% quantiles of T are -2.84 and -2.28 respectively that are poorly approximated by the corresponding t_{29} quantiles -2.04 and -1.70. Luckily, Efron's[3] bootstrap can be applied to the studentized sample mean, i.e., the statistic T, yielding a better approximation. As expounded upon by Hall[4], the studentized bootstrap captures the skewness, i.e.,

$$P^*(\sqrt{n}(\bar{X}^* - \bar{X})/\hat{\sigma}^* \le x) = \Phi(x) + c(x)\gamma/\sqrt{n} + O_P(1/n) \qquad (3)$$

Figure 2: True density of the t-statistic calculated from an exponential sample of size n=30 (in gray) with the t_{29} density superimposed (in black).

where $\bar{X}^* = \frac{1}{n}\Sigma_{i=1}^n X_i^*$, $\hat{\sigma}^* = \sqrt{\frac{1}{n-1}\Sigma_{i=1}^n (X_i^* - \bar{X}^*)^2}$, and the re-sample $X_1^*, \ldots, X_n^*$ is obtained by i.i.d. sampling from the empirical distribution of $X_1, \ldots, X_n$. Let $q^*(\alpha)$ denote the α-quantile of the LHS of eq. (3) which serves as an estimator of $q(\alpha)$, the α-quantile of the LHS of eq. (2). In the exponential example with $n = 30$, the expected values of $q^*(0.025)$ and $q^*(0.050)$ are, approximately, -2.90 and -2.31, i.e., very close to the true ones.

Kurtosis and asymptotic failure of the χ² test

The saving point for Student's *t* approximation is that $\hat{\sigma} \to \sigma$ almost surely as $n \to \infty$. Since a constant is independent to all random

variables, $\hat{\sigma}$ will gradually, i.e., asymptotically, become independent to $\sqrt{n}\,(\bar{X} - \mu)$, and the t distribution will become standard normal. Hence, Student's t approximation to the distribution of T is asymptotically valid for non-Gaussian data (with finite variance).

The χ^2 test does not even have this excuse: it is asymptotically *invalid* when $\kappa \neq 3$. This might appear suprising since the χ^2_m distribution is asymptotically normal when m is large; however, it has the wrong asymptotic variance. To see why, let $Y_i = (X_i - \mu)^2$ and $\bar{Y} = \frac{1}{n}\Sigma^n_{i=1} Y_i$. Then, a CLT on the i.i.d. variables $Y_1, \ldots, Y_n$ yields:

$$P(\sqrt{n}\,(\bar{Y} - \sigma^2) \leq x) \to \Phi(x/\tau) \text{ as } n \to \infty \qquad (4)$$

where $\tau^2 = (\kappa - 1)\sigma^4$. But $\Sigma^n_{i=1}(X_i - \bar{X})^2 = \Sigma^n_{i=1}(X_i - \mu)^2 + V_n$ with $V_n = O_p(1)$, i.e., bounded in probability. Hence, eq. (4) implies:

$$P(\sqrt{n}\,(\hat{\sigma}^2 - \sigma^2) \leq x) \to \Phi(x/\tau) \text{ as } n \to \infty. \qquad (5)$$

Recall that a χ^2_m variable has mean m and variance $2m$. Hence, the χ^2_{n-1} approximation to the distribution of $(n-1)\hat{\sigma}^2/\sigma^2$ is associated with a large sample approximation analogous to eq. (5) with τ^2 replaced by $2\sigma^4$; but this is only admissible when the kurtosis κ equals 3 as it does in the Gaussian case. If $\kappa > 3$, the χ^2 approximation underestimates the variance of $\hat{\sigma}^2$ leading to confidence intervals with smaller level than nominal. In the exponential case, the χ^2 approximation effectively estimates the variance of $\hat{\sigma}^2$ to only be ¼ of what it truly is.

Eq. (5) is valid in general but to be practically useful for tests and confidence intervals it needs a consistent estimate of τ^2 to be plugged in, e.g., letting $\hat{\tau}^2 = (\hat{\kappa} - 1)\,\hat{\sigma}^4$ where $\hat{\kappa}$ is the sample kurtosis. Furthermore, finite-sample accuracy can be improved via a skewness-reducing transformation such as the logarithmic; eq. (5) together with the δ-method yields:

$$P(\sqrt{n}\,(\log \hat{\sigma}^2 - \log \sigma^2) \leq x) \to \Phi(x/v) \text{ as } n \to \infty \qquad (6)$$

with $v^2 = \tau^2/\sigma^4 = \kappa - 1$. In addition, eq. (5) and (6) imply that the distribution of $\hat{\sigma}^2$ and/or $\log \hat{\sigma}^2$ can be bootstrapped. Focusing on eq. (6), one may readily approximate the quantiles of distribution $P(\sqrt{n}\,(\log \hat{\sigma}^2 - \log \sigma^2) \leq x)$ by the respective quantiles of the bootstrap distribution $P^*(\sqrt{n}\,(\log \hat{\sigma}^{*2} - \log \hat{\sigma}^2) \leq x)$. Studentized versions of eq. (5) and (6) can also be derived whose bootstrap approximations may give higher order refinements.

Classroom strategies

It is important to convey to the students that there is nothing wrong with the T and $\hat{\sigma}^2$ statistics *per se*; the issue is how to accurately approximate their sampling distributions without relying on the often unjustifiable assumption of Gaussianity. Luckily, simulation and resampling have been slowly finding their way into the undergraduate classroom (see, for example, the textbooks [1], [6] and [7] in the references below). However, in their first course on Mathematical Statistics,

students may find the notion of resampling from the empirical distribution difficult.

The following steps may be useful in easing undergraduates into the matter.

1. Introduce Monte Carlo simulation from the start as an alternative, computer-intensive methodology to approximate probabilities and expectations, and create quantile tables.
2. Employ *parametric bootstrap*—which is easy to motivate—in order to wean students off reliance on textbook tables.
3. Finally, depose of the parametric framework altogether, and show students how to generate quantiles for the T and $\hat{\sigma}^2$ statistics by resampling from a *histogram* of the $X_1, \ldots, X_n$ data as an approximation to the underlying true density (or mass) function.

If F is (absolutely) continuous, resampling from the histogram is closely related to the smoothed bootstrap; however, it still works when F is discrete as long as the bins are small enough. To elaborate, suppose the histogram of $X_1, \ldots, X_n$ is based on m bins centered at midpoints $v_1, \ldots, v_m$ that are collected in vector `V` with their respective counts collected in vector `Vcounts`. Basic resampling can then be performed in R letting `Xstar = sample(V, size=n, replace = TRUE, prob = Vcounts/sum(Vcounts))`; note that both the midpoints `V` and the counts `Vcounts` are part of the list output of the R function `hist()`. If F is continuous, one can then add to each of the coordinates of `Xstar` a uniform "jitter"; i.e., the final bootstrap sample (from which T and $\hat{\sigma}^2$ are to be re-computed) would be given by `Xstar + Ujit` where `Ujit = runif(n, min=-b/2, max=b/2)` and $b = v_{j+1} - v_j$ is the bin width.

References

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3 Efron, B. (1979). Bootstrap methods: another look at the jackknife, Ann. Statist., 7, pp. 1-26.

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5 Hesterberg, T.C. (2015). What teachers should know about the bootstrap: resampling in the undergraduate statistics curriculum, American Statistician, vol. 69, no. 4., pp. 371-386.

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Recent papers

Annales de l'Institut Henri Poincaré (B), Probabilités et Statistiques Volume 52, Number 2, May 2016

The Probability and Statistics section of the *Annales de l'Institut Henri Poincaré* is an international journal that publishes high quality research papers. The journal, which is supported by the IMS, deals with all aspects of modern probability theory and mathematical statistics, as well as with their applications. The editors are Thierry Bodineau and Lorenzo Zambotti.
Access papers at https://projecteuclid.org/aihp

Call For Nominations: Parzen Prize

The Department of Statistics at Texas A&M University invites nominations for the Emanuel and Carol Parzen Prize for Statistical Innovation

To promote the dissemination of statistical innovation, the Emanuel and Carol Parzen Prize for Statistical Innovation is awarded in even numbered years to a North American statistician whose outstanding research contributions include innovations that have had impact on practice and whose Ph.D. degree is at least 25 years old.

The Parzen Prize is awarded by the Department of Statistics at Texas A&M University and is selected by the members of the Parzen Prize Committee (three internal faculty members and two external faculty members). The prize consists of an honorarium of $1000 and travel to College Station, TX, to present a lecture at the Prize Ceremony.

Nominations for the 2016 Parzen Prize should include a letter describing the nominee's outstanding contributions to high impact innovative research in statistics, a current curriculum vita, and two supporting letters. Nominations should be submitted by August 15, 2016 to the Chair of the 2016 Parzen Prize Committee:

Professor Thomas Wehrly, Department of Statistics, Texas A&M University: TAMU 3143, College Station Texas 77843-3143.

For a list of previous Parzen Prize winners and more information, please visit our website at

http://www.stat.tamu.edu/about/awards-and-prizes/parzenprize.

XL-Files: Lectures (Marriages?) That Last

Xiao-Li Meng writes: Other than zero, I have a hard time coming up with an estimate for the number of readers of my *XL-Files* of July 2013 who still recall the Harvard Horizons program, which trains students to present a five-minute TED-style talk on their research. But the number is clearly not zero in terms of students who wanted me to experience what I had put them through, because there were enough of them who nominated me for the annual "Lectures That Last" (at Harvard's Memorial Church on February 6, 2016), where each faculty was given 5–7 minutes on the theme of *Crossroads*. After much agonizing, I settled on "Marriages That Last." I hope none of you need my unsolicited advice, but just in case you do, feel free to read a synopsis below or watch online (with enhanced laughter track) https://www.youtube.com/watch?v=UpFBA3yvppg, while holding a glass, or someone's hand, or both.

Many of you must be wondering what a statistician can say about marriages, other than that the success rate of remarriages is statistically significantly lower than that of the first marriages. Indeed, I never thought about the connections between statistics and marriages until about five years ago, when I was approached by a young scholar during a statistical conference. He got my attention with a line that few academics can resist: *"I really enjoyed your writing."* But his next line was truly unexpected: *"Your article saved my marriage."* Wow! I didn't know my writing could be this powerful! Naturally, I asked which article. "Remember the parking problem you wrote about?" he reminded me. Now I was even more curious…

To keep the suspense just a little bit longer, let me take a detour—continuing the theme of crossroads—on something else I did as a statistician that ultimately led to a happy wedding in this very church. About a decade ago, I started to offer a course later known as my 'happy course': *Real-Life Statistics: Your Chance for Happiness (or Misery)*. It is a course intended to showcase how statistical insights work in real life, and hence I used many real-life stories, including my own.

There are actually very few fundamental statistical insights, and one of them is the *bias-variance tradeoff*, also known as the *robustness-efficiency tradeoff*. Basically it says that if you want a method to work really well for a particular case—that is, to be efficient—then it would not be very applicable in general. Conversely, if you want a method to be applicable in general—robust—then it is unlikely to do very well for a particular case. There is no free lunch, you must make a choice.

When I started to use the seven-storey Broadway garage just down the road, which has seven floors, I naturally parked in the first parking spot available when I arrived in the morning. This was an efficient strategy in terms of minimizing the walking distance on the stairs, but its efficiency depends on a crucial assumption: that I would remember on which floor I parked when I returned in the evening. After walking up and down the stairs many times late at night, I laughed at myself for forgetting the robustness-efficiency trade-off! There is a much more robust strategy: always park on the seventh floor, which is never full in the morning.

Apparently, the young fellow who approached me, and his wife, were frustrated by a similar parking problem for their shared car. They had some childcare issues that required them to return to it often several times a day, depending on who happened to have some squeezable moments. But then they often couldn't locate quickly where the car was parked by the other, and it became almost a daily ritual for them to blame each other for the wasted time. As the frustration escalated from parking lot to bedroom, my young fan was delighted to discover the simple solution offered in my article. And they have lived happily ever after—or so, at least, I hope!

Of course as a statistician, I would not make any scientific claim without having at least two cases. Recall that my happy course ultimately led to a happy wedding [*in Harvard's Memorial Church—described in XL-Files in the December 2013 issue*]. Yes, that took place on October 5, 2013, and if you check the Memorial Church's log book, you might be surprised to find out who officiated the wedding. Yes, the truly statistically yours.

The happy couple were two members of my happy team, a group of graduate students in statistics who helped me to design and teach the happy course. I took both of them to Shanghai as my TFs for a summer school version of the happy course, and they fell in love with each other during that trip. Probably wanting to thank me for being an accidental matchmaker, three years later they asked me to officiate their wedding. I of course wouldn't waste any opportunity to preach about statistical insights, and this time it is the universal law of *regression towards the mean*, which in simple terms is that when something is high, it has the tendency to go down, and vice versa. [*Editor's note: to hear more on this, you'll have to watch Xiao-Li in the Youtube clip cite a part of his preaching from that ceremony, especially if you might be in need of it now!*]

And I hope you all would accept what I am trying to convey: that inspirations and solutions in life often come from unexpected sources. I also hope I have given you a helpful line for your marriage or relationship: "Honey, it's not me—it's the regression towards the mean." Joking aside, as a statistician, I'd be delighted if your memories of the two fundamental statistical insights I mentioned would be as lasting as your longest marriage or relationship.
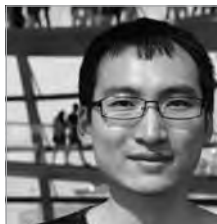
IMS Travel Awards announced

This year's 15 recipients of the IMS Travel Awards

The IMS Travel Awards provide funding for travel to present a paper or a poster at an IMS sponsored or co-sponsored meeting, for New Researchers who would not otherwise be able to attend. See http://www.imstat.org/awards/travel.html

Abhishek Chakrabortty
Harvard University, USA

Shih-Kang Chao
Purdue University, USA

Emilie Devijver
KU Leuven, Belgium

Ethan X. Fang
Penn State University, USA

Fengnan Gao
Leiden University, The Netherlands

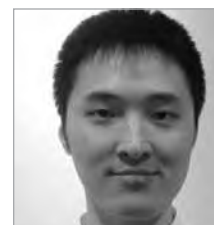**Edward Kennedy**
University of Pennsylvania, USA

Sebastian Kurtek
The Ohio State University, USA

Andrew J. Landgraf
Battelle Memorial Institute, USA

Matey Neykov
Princeton University, USA

Yang Ning
Princeton University, USA

Gunwoong Park
University of Wisconsin-Madison, USA

Kolyan Ray
Leiden University, The Netherlands

Srijan Sengupta
University of Illinois at Urbana-Champaign, USA

Botond Szabó
Leiden Univ and Budapest University of Technology & Economics

Weichen Wang
Princeton University, USA

Where are these New Researchers going with their awards?

Edward Kennedy will be traveling to Avignon, France, for the **Third Conference of the International Society for Non-Parametric Statistics** (ISNPS), June 11–16, 2016 **w** http://www.isnpstat.org/.

Shih-Kang Chao will use his travel award for the **IMS Asia Pacific Rim meeting** that takes place June 27–30, 2016, hosted by The Chinese University of Hong Kong **w** https://ims-aprm2016.sta.cuhk.edu.hk/.

The **9th World Congress in Probability and Statistics**, hosted by the Fields Institute, Toronto from July 11–15, 2016, is also

the location of the IMS Annual Meeting. Attending the World Congress will be Fengnan Gao, Gunwoong Park, Kolyan Ray and Botond Szabó. Meeting details at **w** www.fields.utoronto.ca/programs/scientific/16-17/WC2016/

The remaining recipients—Abhishek Chakrabortty, Emilie Devijver, Ethan X. Fang, Sebastian Kurtek, Andrew J. Landgraf, Matey Neykov, Yang Ning, Srijan Sengupta and Weichen Wang—will be attending **JSM 2016 in Chicago**, July 30–August 4: **w** https://www.amstat.org/meetings/jsm/2016/

If you are attending any of these meetings yourself, do go and introduce yourselves and, if you can, listen to their talks or look at their posters.

Want to apply for next year?

If you are a new researcher interested in attending an IMS sponsored or co-sponsored meeting (other than the New Researchers Conference, which is funded separately), check out the information on how to apply at http://www.imstat.org/awards/travel.html
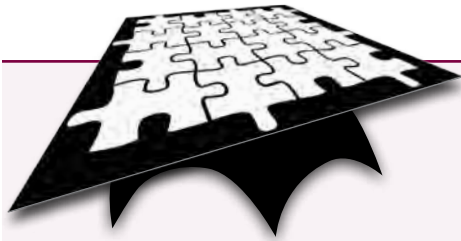
Student Puzzle Corner 14

It is the turn of a statistics problem this time, and we are going to look at a Bayesian answer to a historically celebrated problem. Give or take half a billion years, the estimated age of our Sun is 4.5 billion years. We think that on each day during these 4.5 billion years, the Sun has risen. Can we talk about the probability that it will rise every day for the next 4.5 billion years? This is essentially what's known as *Laplace's Sunrise* problem.

A simple Bayes formulation that lets us do some calculations is as follows. Take the sequence of sunrises to be i.i.d. Bernoullis $X_1, X_2, \cdots$ with a success probability p, and give p a prior distribution G with a density g. Now calculate the Bayesian predictive probability $P(X_n+1 = X_n+2 = \cdots = X_{2n} = 1 \mid X_1 = X_2 = \cdots = X_n = 1)$, induced by the joint marginal distribution of $(X_1, X_2, \cdots, X_{2n})$ under the prior distribution G.

Here is the exact problem of this issue:.

For $n \geq 1$, define $\theta_n = P(X_{n+1} = X_{n+2} = \cdots = X_{2n} = 1 \mid X_1 = X_2 = \cdots = X_n = 1)$.

(a) Take the special case where $g(p)$ is a Beta(a, β) density and find in closed form $\lim_{n\to\infty} \theta_n$.

(b) Take a general prior density g and assume that g is infinitely differentiable from the left at $p = 1$. Find in closed form $\lim_{n\to\infty} \theta_n$.

Note: Part (b) is for extra credit and a personal letter from the Editor. The answer will depend on the first k for which $g^{(k)}(1-) \neq 0$.

Student members of the IMS are invited to submit solutions (to bulletin@imstat.org with subject "Student Puzzle Corner"). The deadline is **June 7, 2016**. The names and affiliations of (up to) the first 10 student members to submit correct solutions, and the answer to the problem, will be published in the next issue of the Bulletin. The Editor's decision is final.

Deadline June 7

Solution to Puzzle 13

Editor Anirban DasGupta writes:

The problem asked was the following: consider iid observations $X_1, X_2, \cdots$ distributed as $N(\mu, \sigma^2)$ and consider for each n, $X_{(n)} = \max\{X_1, \cdots, X_n\}$ and $\bar{X} = \bar{X}_n = (\Sigma_{i=1}^n X_i)/n$. Look at the conditional expectation of $X_{(n)}$ given $\bar{X}$, $\mu_n(\bar{X}) = E(X_{(n)} \mid \bar{X})$ and the conditional variance of $X_{(n)}$ given $\bar{X}$, $V_n(\bar{X}) = \text{Var}(X_{(n)} \mid \bar{X})$. Find closed form deterministic (i.e., non-random) sequences a_n, b_n, c_n, d_n such that $b_n [\mu_n(\bar{X}) - a_n]$ and $dn[V_n(\bar{X}) - c_n]$ converge almost surely to one.

The intuition is that sample extremes and sample means are asymptotically independent, and so, asymptotically, $\mu_n(\bar{X})$ should grow like the unconditional expectation of $X_{(n)}$ and $V_n(\bar{X})$ should decay like the unconditional variance of $X_{(n)}$. *However, no almost sure conclusions can be drawn from asymptotic independence or weak convergence. One must rigorously prove the result expected from informal intuition.*

It is enough to consider the standard normal case, namely, the case

$\mu = 0$, $\sigma = 1$. In the standard normal case, by using Basu's theorem,

$$\mu_n(\bar{X}) = E(X_{(n)} \mid \bar{X}) = \bar{X} + E(X_{(n)} - \bar{X} \mid \bar{X}) = \bar{X} + E(X_{(n)} - \bar{X}) = \bar{X} + E(X_{(n)}).$$

Using the fact that $\frac{E(X_{(n)})}{\sqrt{2\log n}} \to 1$, and the Kolmogorov strong law, $\frac{\mu_n(\bar{X})}{\sqrt{2\log n}}$ a.s. $\to 1$. Likewise, once again by using Basu's theorem, in the standard normal case,

$$V_n(\bar{X}) = \text{Var}(X_{(n)} \mid \bar{X}) = \text{Var}(X_{(n)} - \bar{X}) = \text{Var}(X_{(n)}) + \text{Var}(\bar{X}) - 2\text{Cov}(X_{(n)}, \bar{X})$$
$$= \text{Var}(X_{(n)}) + \text{Var}(\bar{X}) - 2\text{Var}(\bar{X}) = \text{Var}(X_{(n)}) - \frac{1}{n}.$$

Use now uniform integrability of the sequence $X_{(n)}$, centered and normalized as

$$\sqrt{2\log n} \left[X_{(n)} - \sqrt{2\log n} + \frac{\log\log n + \log 4\pi}{2\sqrt{2\log n}} \right],$$

and its weak convergence to the standard Gumbel law, which has a variance of $\frac{\pi^2}{6}$ to conclude that $\frac{\text{Var}(X_{(n)})}{\frac{\pi^2}{12\log n}} \to 1$.

Thus, $\frac{12\log n}{\pi^2} V_n(\bar{X}) \overset{a.s.}{\to} 1$.

JSM 2016: Workshops for Junior Researchers

Two free workshops at JSM are designed for new researchers to develop capabilities for research publication. The **Writing Workshop** continues the successful series of workshops where each participant receives individual mentoring by an experienced journal editor. New this year, the **Review & Edit Workshop** will be offered by a team of executive editors of leading journals to junior researchers as they take up new responsibilities for reviewing technical articles and for joining the ranks of associate editors. Both workshops will be held at JSM 2016 (subject to availability of funds). Thanks to NISS, ASA, IMS and ICSA (with other societies to be named) for partial support of both workshops.

2016 NISS/ASA/IMS/ENAR/ICSA Writing Workshop for Junior Researchers: Sunday 31 July & Wednesday 3 August at JSM

The goal of the Writing Workshop for New Researchers is to provide instruction for writing journal articles and grant proposals. Participants will be required to provide a recent sample of their writing, which will be reviewed by a senior mentor. The sample could be a current draft of an article to be submitted for publication or an early version of a grant proposal. Submission of the writing sample is required at registration, although an updated draft may be submitted in July to the mentor.

Mentors will be former journal editors and program officers, who will critique the submitted material and provide individual feedback. Participants will be expected to initiate a revision in response with additional feedback from their mentors.

On Sunday the morning session will be a tutorial on effective writing techniques for technical articles. The afternoon session will take up specific issues such as requirements of specific journals, ethics, and dealing with reviews and revisions. The Wednesday morning session will focus on specific issues for participants whose native language is not English with commentary by panels of experienced researchers who are non-native English speakers.

Participants are expected to prepare an agreed-upon revision of a (limited) critiqued portion of the draft manuscript to return to the mentor for further comment. The working lunch on Wednesday will focus on further discussion and feedback and will also allow time for follow-up discussions between participants and their mentors.

Attendance will be limited and will depend on the number of mentors available. To apply, go to http://www.amstat.org/meetings/wwjr/. Applications are due by June 1, 2016, and successful applicants will be notified by June 30. Applications received after June 1 will be considered if space is available. There is no fee for participation. Participants will receive lunch on Sunday, July 31, and Wednesday, August 3. **Participants must agree to attend the full Sunday session, the half-day Wednesday session, and the Wednesday lunch**. We have requested funding for partial travel support.

This workshop is designed for researchers with a recent PhD in either statistics or biostatistics. Top priority will go to those who have held the PhD for 0–3 years. Current PhD students who are completing their degree before the end of the summer will also be considered.

2016 Reviewing and Editing Workshop for Junior Researchers, also at JSM Chicago

Reviewing technical articles for publication and determining which of these are published in statistical journals is the lifeblood of statistical research. Quality in reviewing and in selection of manuscripts for publication depends upon skilled reviewers and editors. With many new journals both online and print, both reviewers and editors are taking on these responsibilities without a great deal of personal experience. The goal of this workshop is to assist new reviewers and editors by drawing on the experience of senior editors.

The workshop will be a half-day beginning with a working breakfast. The program will be in two sessions, the first on reviewing and the second on editing. A one-hour tutorial will be followed by separation into 3 or 4 roundtables, each led by one of the editor-mentors.

The first session tutorial will address such questions as: *What constitutes an "excellent" review? What does an Editor need to know from a Reviewer? What does the author need to know from the Reviewer? Which judgments should be made by Reviewers and which by Editors?*

The second session tutorial will focus on questions like: *What are the paradigms for operating a journal? What really is the job of an Associate Editor? How should judgments be made about finding Reviewers? How should reviews received be evaluated? What about complaints (legitimate or not)? How is the role of an (Executive) Editor different?* Roundtables will be small groups organized around their areas/types of research. They will discuss real examples, synthesized examples and reviews that participants have written or received. Participants will be asked to prepare some materials in advance.

Attendance will be limited. To apply, go to http://www.amstat.org/meetings/wwjr/. Applications are due by June 1, 2016. This workshop is designed for researchers with a PhD in either statistics or biostatistics. Top priority will go to those who have previously attended a Writing Workshop and who have held the PhD for 3–7 years. Top priority will go to those who have previously attended a Writing Workshop and who have held the PhD for 3–7 years.

Terence's Stuff: Representing statistical models

Terry Speed finds plate notation challenging. Is he alone in thinking that sometimes using 20 words is better than one picture?

Recently I attended a lecture about the use of statistical models to solve a problem in molecular biology. Some impressive results on sensitivity, specificity and accuracy were presented. But mostly I was struck by the fact that the Bayesian graphical models used in the analysis were entirely expressed in the *plate notation* (check Wikipedia): there wasn't a single equation in the presentation. Whether a variable was normal, Poisson, gamma or Dirichlet wasn't spelled out, though one could try and guess this from the variable name. Parameterizations had to be inferred as well. The role of subscripts was taken over by the nesting relationships in the plates. During the lecture I was unable to translate the diagram into something I fully understood, and I wondered whether anyone else in the audience could. I was reminded of the advice someone gave Stephen Hawking: that every equation he included in *A Brief History of Time* would halve the sales. Was my lecturer strictly following that advice? (Hawking did include one equation: $e=mc^2$.) What about every plate diagram? Some slides had two, and one had three of them. In another lecture I attended very soon afterwards, this experience was repeated. I had to wonder whether it's me, and not them. Can the modern user of Bayesian graphical models read plate diagrams as readily as I can read linear models in matrix form? Am I the only person who thinks that sometimes twenty words is worth more than a picture?

The need to represent statistical models is (necessarily) as old as the use of statistical models. Gauss in the early part, and Yule at the end of the 19th century, used equations without subscripts. Here is Yule's 1899 linear model for pauperism: *"change per cent. in pauperism = −27.07 per cent. + 0.299 (change per cent. in out-relief ratio), + 0.271 (change per cent. in proportion of old), + 0.064 (change per cent. in population),"* and so on.

I don't know the first use of subscripts in statistics, but they were certainly there in 1889 in the work of Thiele. He wrote a linear model for observation $o_{m,n}$ made using the mth parallel thread of the passage time of star n travelling at known velocity h_n, as $\lambda_1(o_{m,n}) = g_n + f_m/h_n$. Here λ_1 is Thiele's version of our modern expectation E. In their 1932 book on matrices, Turnbull and Aitken used an almost modern matrix notation for linear models, $Ax−h = \varepsilon$.

Multiple subscripts were still used in the early 1960s when I learned linear models. When I started teaching linear regression, I used $y = X\beta + \varepsilon$, and still do. At one point, I wanted to get away from the craziness of fixed, random and mixed, and wrote my linear models for the expectation and dispersion D of an array y as follows: $E(y)\in\mathcal{L}$, $D(y)\in\mathcal{V}$, where $\mathcal{L}$ is a linear subspace and $\mathcal{V}$ is a suitable class of covariance matrices. Much to my regret, this didn't catch on.

Of course we always need words as well; we can save a few by writing the standard linear model as $y|(X, \beta, \sigma^2) \sim N(X\beta, \sigma^2 I)$. Bayesians can then preface this by their priors, e.g. $\beta \sim N(\lambda, \Omega)$ and $\sigma^2 \sim IG(\varphi, \psi)$. Most of the models that I meet can be concisely described by a small collection of expressions like these, and independence statements, and that is my preference. I accept that this approach does not highlight the conditional independences within the model, but I think that much of the time (as in linear models) this is a side issue. Plate diagrams may still be preferred by people who haven't become familiar with the nesting and crossing of subscripts, though as someone who has dealt with many subscripts, I worry about multiply nested or crossed plates.

I'm not the first and won't be the last person to find graphical models with plate diagrams a challenge to decode. There's plenty of discussion of these issues in papers and in blogs. We want our model descriptions to communicate and explain our models. Other requirements, which seem less central to me, include their being helpful for devising new models, and for programming to analyse data using the models. Whatever we present, there will be some assumed knowledge: a way of denoting the nesting of subscripts, a convention for what is observed and what is not, and so on; in short, we need to know how to read them. Here, familiarity is paramount.

From some time in the late 19th century until the mid-1930s, words for linear models were replaced by variables with subscripts, which were replaced by matrices. Plate diagrams were invented by David Spiegelhalter around 1994, but have only become widely used in the last few years. Perhaps I am complaining too soon…

Plate notation for the simple linear regression model
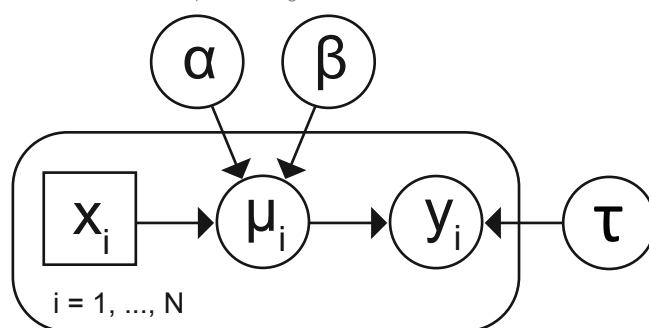
IMS meetings around the world

Joint Statistical Meetings: 2016–2020

IMS sponsored meeting
JSM 2016
July 30–August 4, 2016
Chicago, IL

UPDATED

w http://amstat.org/meetings/jsm/2016
The 2016 Joint Statistical Meetings will be held July 30 to August 4 at McCormick Place, 2301 South Lake Shore Drive, Chicago, IL 60616. The theme of JSM 2016 is "The Extraordinary Power of Statistics."

The IMS program chair for invited sessions is Jan Hannig, University of North Carolina **e** jan.hannig@unc.edu. The IMS contributed program chair is Alexander Aue, University of California, Davis **e** aaue@ucdavis.edu

Registration and housing reservations are now open, and the early-bird registration deadline is June 1. The 2015 JSM housing reservations went very quickly, so if you are planning to attend, be sure to book your accommodation via the JSM website as soon as possible.

Workshops for Junior Researchers: The successful series of writing workshops for junior researchers continues this year, and is complemented for the first time by a new Reviewing & Editing workshop. See the article on page 16 for details and apply before June 1 2016 at http://www.amstat.org/meetings/wwjr/

Advice for first-timers at JSM: Check out the JSM website for some helpful tips if it is your first time at JSM. It's a really big meeting, with thousands of people attending from all over the world, so it's very common to feel a bit overwhelmed, and to have the sense that you're missing out on sessions. See https://www.amstat.org/meetings/jsm/2016/firsttimeattendees.cfm

ASA President's Invited Speaker announced: The ASA President's Invited Speaker for JSM 2016 is Joe Palca, a science correspondent for National Public Radio (NPR). Since joining NPR in 1992, Palca has covered a range of science topics, but is currently focused on the eponymous series, Joe's Big Idea (http://www.npr.org/series/156490415/joes-big-idea), an NPR experiment exploring how ideas become innovations and inventions.

Professional Development at JSM: JSM 2016 will feature 46 Professional Development offerings: Continuing Education short courses, Computer Technology Workshops, and Personal Skills Development Workshops. Search the online program for CE, CTW and PSD: see http://www.amstat.org/meetings/jsm/2016/professionaldevelopment.cfm

IMS sponsored meeting
18th Meeting of New Researchers in Statistics and Probability
University of Wisconsin–Madison
July 28–30, 2016 (immediately before JSM)
w www.stat.wisc.edu/imsnrc18/about.html

IMS sponsored meetings: JSM dates for 2017–2021

IMS Annual Meeting @ JSM 2017:	JSM 2018	IMS Annual Meeting @ JSM 2019	JSM 2020	IMS Annual Meeting @ JSM 2021
July 29–August 3, 2017, Baltimore, MD	**July 28–August 2, 2018 Vancouver, Canada**	**July 27–August 1, 2019, Denver, CO**	**August 1–6, 2020 Philadelphia, PA**	**August 7–12, 2021, Seattle, WA**

At a glance:

forthcoming IMS Annual Meeting and JSM dates

2016

IMS Annual Meeting/ 9th World Congress: Toronto, Canada, **July 11–15, 2016**

JSM: Chicago, IL, **July 30 – August 4**

2017

IMS Annual Meeting @ JSM: Baltimore, MD, **July 29 – August 3, 2017**

2018

IMS Annual Meeting: Vilnius, Lithuania, **July 2–6, 2018**

JSM: Vancouver, Canada, **July 28– August 2, 2018**

2019

IMS Annual Meeting @ JSM: Denver, CO, **July 27–August 1, 2019**

2020

IMS Annual Meeting: TBD

JSM: Philadelphia, **August 1–6, 2020**

More IMS meetings around the world

Peter Hall Memorial Conference *NEW*
September 30–October 1, 2016
Conference Center, University of California, Davis

w http://www.stat.ucdavis.edu/hallmemorialconference/

Please join the UC Davis Department of Statistics for the Peter Hall Memorial Conference in honor of Distinguished Professor Peter Hall who sadly passed away in January 2016.

The confirmed speakers so far for the Peter Hall Memorial Conference are: Jeannie Hall, Melbourne, Australia; Rudy Beran, UC Davis; Peter Bickel, UC Berkeley; Tony Cai, University of Pennsylvania; Song Xi Chen, Iowa State University; Ming-Yen Cheng, National Taiwan University; Aurore Delaigle, University of Melbourne; Jianqing Fan, Princeton University; Frédéric Ferraty, University of Toulouse; Jiashun Jin, Carnegie Mellon University; Iain Johnstone, Stanford University; Runze Li, Pennsylvania State University; Steve Marron, University of North Carolina; Byeong Park, Seoul National University; Terry Speed, Melbourne and UC Berkeley; Matt Wand, University of Technology, Sydney; Alan Welsh, Australian National University; and Fang Yao, University of Toronto.

The full schedule of events and speaker abstracts will be posted soon. Registration is open now: http://www.stat.ucdavis.edu/hallmemorialconference/register.php

Peter Hall was the IMS Wald lecturer in 2006

If you would like to give a short contributed talk please complete the form on the website. Space for contributed talks is limited and so you may be asked to provide a poster instead. Talks could be as short as five minutes depending on the number of contributors.

ENAR 2017–2019 dates

IMS sponsored meetings
March 12–15, 2017: in Washington DC
March 25–28, 2018: in Atlanta, GA
March 24–27, 2019: in Philadelphia, PA
w http://www.enar.org/meetings/future.cfm

IMS co-sponsored meeting
WNAR Annual Meeting in conjunction with the XXVIII International Biometric Conference
July 10–15, 2016, Victoria, BC, Canada

w http://biometricconference.org/

The next WNAR Annual Meeting, in conjunction with the XXVIII International Biometric Conference (IBC2016), will be held July 10–15, 2016 at the Victoria Conference Centre in Victoria, British Columbia, Canada. A list of invited sessions is at http://biometricconference.org/invited-sessions/. There will also be four full day short courses. Registration is open.

IMS co-sponsored meeting
The 10th ICSA International Conference
December 19–22, 2016
Shanghai Jiao Tong University, China

w http://www.math.sjtu.edu.cn/conference/2016icsa/

The theme is *Global Growth of Modern Statistics in the 21st Century*. Plenary speakers are: Jim Berger, Tony Cai, Kai-Tai Fang, Zhiming Ma, Marc A. Suchard, Lee-Jen Wei and C.F. Jeff Wu.

IMS co-sponsored meeting
Stochastic Networks Conference 2016
June 20–24, 2016. San Diego, CA

w http://stochasticnetworks2016.ucsd.edu/

The aim of the conference is to bring together researchers who share an interest in stochastic network models, to survey recent developments, and to identify future research directions. As in the past, the 2016 meeting will be structured in a workshop format, with approximately 20 hour-long invited talks, allowing ample unscheduled time to maximize interactions between speakers and participants and to facilitate a fruitful exchange of ideas. In addition, there will be a poster session for contributed papers.

Stochastic networks is a multifaceted area of research dealing with the modeling, stability, control, performance, approximation, and design of stochastic networks. It gives rise to challenging and subtle mathematical problems, whose solution often requires a combination of ideas and techniques from several branches of mathematics, including probability theory, stochastic processes, analysis, optimization, algorithms, combinatorics, and graph theory. Research in this area is strongly motivated by applications in diverse domains, ranging from traditional areas of telecommunications and manufacturing to service operations, biological and social networks, revenue management, and health care.

Like its predecessors, the 2016 Stochastic Networks Conference will emphasize new model structures and new mathematical problems that are motivated by contemporary developments in various application domains, as well as new mathematical methods for stochastic network analysis.

IMS co-sponsored meeting
39th Conference on Stochastic Processes and their Applications (SPA)
July 24–28, 2017. Moscow, Russia
w TBC

IMS sponsored meeting

Joint 2018 IMS Annual Meeting and 12th International Vilnius Conference on Probability Theory & Mathematical Statistics
July 2–6, 2018
Vilnius, Lithuania

w TBC

We are please to announce that the 2018 IMS Annual Meeting will be held in beautiful Vilnius, the capital of Lithuania, in conjunction with the 12th Vilnius Conference on Probability Theory and Mathematical Statistics. The Program Co-chairs are Peter Bühlmann (IMS) and Vygantas Paulauskas (Vilnius). The Local Chair is Remigijus Leipus. Details to follow, but mark your calendars!

IMS co-sponsored meeting

Advances in Statistics, Probability and Mathematical Physics
June 10–11, 2016
University of Pavia, Italy

w http://www-dimat.unipv.it/eugenioconference/

The conference will honor Eugenio Regazzini on the occasion of his 70th birthday. The program will feature invited talks of authoritative speakers who have been working on topics related to the ones Eugenio has contributed to in Statistics, Probability and Mathematical Physics. Invited speakers: Jim Berger, Eric Carlen, Persi Diaconis, Ed George, Alexander Gnedin, Robert C. Griffiths, Ildar Ibragimov, Michael Jordan, Giovanni Peccati, R.V. Ramamoorthi, Chiara Sabatti.

IMS co-sponsored meeting

2017 IMS-China International Conference on Statistics and Probability
June 28–July 1, 2017. Nanning, Guangxi Province, China

w TBC

Local organizing committee chair: Zijia Peng, Guangxi University for Nationalities, China **e** pengzijia@126.com. Scientific program committee chair: Ming Yuan, University of Wisconsin–Madison, USA **e** myuan@stat.wisc.edu. The website is under construction, but please mark your calendars not for this conference.

IMS co-sponsored meeting

The 25th ICSA Applied Statistics Symposium 2016
June 12–15, 2016
Atlanta, Georgia, USA

w http://www.math.gsu.edu/~icsa/

Contact: Yichuan Zhao **e** yichuan@gsu.edu

Keynote speakers: Bin Yu, David Madigan and Paul Albert; Banquet speaker Michael Eriksen. Details of the scientific programs are on the symposium website. See the website for calls for the Student Paper Award applications and short course proposals.

IMS co-sponsored meeting

Fourth IMS Asia Pacific Rim Meeting
June 27–30, 2016, Hong Kong, China

w http://ims-aprm2016.sta.cuhk.edu.hk/

The IMS Asia Pacific Rim Meeting series promotes interaction and networking among statisticians and probabilists from Asia, the Pacific Rim, and other parts of the world. The previous three meetings were held in Seoul, Tsukuba, and Taipei. This fourth meeting will take place on the beautiful campus of The Chinese University of Hong Kong, during the period June 27–30, 2016. The program covers recent developments and the state-of-the-art in a variety of modern research topics in statistics and probability. Program chairs: Ming-Yen Cheng (cheng@math.ntu.edu.tw) and Xuming He (xmhe@umich.edu).

The plenary speakers are Persi Diaconis, on *Understanding Importance Sampling*, and Iain Johnstone, on *Low Rank Structure in Highly Multivariate Models*. See the website for details of distinguished lecturers, registration and the program schedule.

IMS co-sponsored meeting

9th World Congress on Probability and Statistics
July 11–15, 2016. Toronto, Canada

w http://www.fields.utoronto.ca/programs/scientific/16-17/WC2016/

This meeting is jointly sponsored by the Bernoulli Society and the IMS. The Scientific Programme Chair is Alison Etheridge. The Local Chair is Tom Salisbury. The 9th World Congress on Probability and Statistics will be hosted by the Fields Institute.

IMS co-sponsored meeting

Reproducibility of Research: Issues and Proposed Remedies
March 8–10, 2017
Washington DC, USA

w http://www.nasonline.org/programs/sackler-colloquia/upcoming-colloquia/

This meeting is one of the Arthur M. Sackler Colloquia, which address scientific topics of broad and current interest that cut across the boundaries of traditional disciplines.

IMS co-sponsored meeting

6th IMS-FIPS (Finance, Insurance, Probability & Statistics) Workshop
July 7–9, 2016. Edmonton, Alberta, Canada

w http://www.mathfinance2016.com

The primary purpose of the workshop is to bring together a global cast of leading academic experts, practitioners and junior researchers to share research that underscores the contributions of probability and statistics to the development of quantitative models, methods, techniques and technologies in the fields of finance and insurance.

Other meetings and events around the world

ASA Professional Development Webinars
Online, various dates

NEW

w http://www.amstat.org/education/weblectures/index.cfm

June 9, 2016: Enhancing the Value of Qualitative Research Using the Total Quality Framework (TQF)

June 16, 2016: Basket Design of Phase III Confirmatory Trials

July 7, 2016: Pushing the Frontier of TFL Automation and Dynamic Visualization with R/Shiny

July 14, 2016: Enabling Reproducibility in Statistical Analyses Using R Markdown

September 15, 2016: An Overview of Statistical Considerations in Clinical Validation of Companion Diagnostic Devices of Precision Medicine

October 6, 2016: Introduction to Stan - From Logistic Regression to PK/PD ODE Models

eRum 2016 (European R users meeting)
October 13–14, 2016
Poznan, Poland

NEW

w http://erum.ue.poznan.pl/

Contact Maciej Beręsewicz **e** erum@konf.ue.poznan.pl

European R users meeting (eRum) is an international conference that aims at integrating users of the R language. eRum 2016 will be a good chance to exchange experiences, broaden knowledge on R and collaborate. One can participate in eRum 2016:

(1) with a regular oral presentation,

(2) with a lightning talk,

(3) with a poster presentation, or

(4) attending without presentation or poster.

Due to space available at the conference venue the organizers have set a limit of participants at 250.

6th International Workshop on Climate Informatics (CI 2016)
September 22–23, 2016
National Center for Atmospheric Research (NCAR) in Boulder, CO, USA

NEW

w https://www2.cisl.ucar.edu/events/workshops/climate-informatics/2016/home

We have greatly increased the volume and diversity of climate data from satellites, environmental sensors and climate models in order to improve our understanding of the climate system. However, this very increase in volume and diversity can make the use of traditional analysis tools impractical and necessitate the need to carry out knowledge discovery from data. Machine learning has made significant impacts in fields ranging from web search to bioinformatics, and the impact of machine learning on climate science could be as profound. However, because the goal of machine learning in climate science is to improve our understanding of the climate system, it is necessary to employ techniques that go beyond simply taking advantage of co-occurence, and, instead, enable increased understanding.

The Climate Informatics workshop series seeks to build collaborative relationships between researchers from statistics, machine learning and data mining and researchers in climate science. Because climate models and observed datasets are increasing in complexity and volume, and because the nature of our changing climate is an urgent area of discovery, there are many opportunities for such partnerships.

Climate informatics broadly refers to any research combining climate science with approaches from statistics, machine learning and data mining. The Climate Informatics workshop series, now in its fifth year, seeks to bring together researchers from all of these areas. We aim to stimulate the discussion of new ideas, foster new collaborations, grow the climate informatics community, and thus accelerate discovery across disciplinary boundaries. The format of the workshop seeks to overcome cross-disciplinary language barriers and to emphasize communication between participants by featuring tutorials, invited talks, panel discussions, posters and break-out sessions. The programs of previous workshops can be found on the website. We invite all researchers interested in learning about critical issues and opportunities in the field of climate informatics to join us, whether established in the field or just starting out.

Workshop on Higher-Order Asymptotics and Post-Selection Inference (WHOA-PSI)
September 30–October 2, 2016
Washington University in St. Louis, St. Louis, MO, USA

NEW

w http://www.math.wustl.edu/~kuffner/WHOA-PSI.html

The Workshop on Higher-Order Asymptotics and Post-Selection Inference (WHOA-PSI) seeks to showcase the exciting new ideas coming out of the post-selection inference framework and investigate how tools from higher-order asymptotics can both elucidate important properties of post-selection inference procedures, as well as suggest new directions which may ultimately yield more accurate small-sample performance.

More details on potential topics, and a list of confirmed speakers, on the website.

Registration and details regarding accommodations will also be available soon.

Other meetings and events around the world

Platinum Jubilee International Conference on *NEW*
Applications of Statistics
December 21–23, 2016
Kolkata, India
w http://stat.caluniv.in/platinum/

Contact: Asis Chattopadhyaycustat75@gmail.com

The Department of Statistics of Calcutta University was established in 1941 with Prof. P.C. Mahalanobis as the Head. It is the oldest department in Asia that offers a postgraduate course in Statistics. It has nurtured and produced several eminent statisticians, who have received world-wide recognition. The department is regularly visited by illustrious scholars from India and abroad. Over the years, it has established itself as one of the prime departments in India for dissipating knowledge in Statistics and related disciplines.

The Department of Statistics, Calcutta University, in its Platinum Jubilee Celebration Year, is organising a three-day Conference on "Applications of Statistics". This International Conference will offer a common platform to statisticians engaged in research on applied aspects of Statistics, to interact and exchange ideas. This conference will mainly focus on the following six thrust areas.

(i)   Design of Experiments in Agriculture and Industry
(ii) Survey sampling and official statistics
(iii) Biostatistics
(iv) Applications of Statistics in Social Science
(v)   Applications of Statistics in Industry
(vi) Applications of Statistics in Physical Science

The "Applications of Statistics in Industry" Session will be organized as a special session in the memory of the late Professor Purnendu Kumar Bose.

Paper submission is open until August 15, 2016

Are you organizing a meeting? It's free, and easy, to get it listed here, and also at the online calendar, www.imstat.org/meetings. Submit the details at www.imstat.org/submit-meeting

The 10th International Conference on Multiple Comparison *NEW*
Procedures
June 20–23, 2017
Riverside, California, USA
w http://www.mcp-conference.org/hp/2017

Contact: Xinping Cui xinping.cui@ucr.edu

The tenth International Conference on Multiple Comparison Procedures (MCP) will be held during June 20–23, 2017, on the campus of the University of California, Riverside. Now in its twentieth year, the biennial MCP conference promotes fundamental research and application of MCP and provides a unique forum for interactions among industry practitioners, research scientists from subject matter areas and statisticians. This unique conference continues the dialogue among academia, industry and regulatory agencies to explore innovative solutions for statistical challenges and their applications in modern scientific investigations including those in clinical trials, drug discoveries and bioinformatics/genomics. Sessions will include theory and applications in closed testing, multiple endpoints, adaptive designs, group sequential designs, subgroup analysis, post selection inference and new multiple testing approaches to foster future advances in the field.

The Department of Biostatistics at the University of Washington, *NEW*
Seattle, is hosting four Summer Institutes in Statistics.
Summer Institute in Statistical Genetics (SISG): July 11–29, 2016
w http://www.biostat.washington.edu/suminst/sisg/
Summer Institute in Statistics and Modeling in Infectious Diseases (SISMID): July 11–27, 2016
w http://www.biostat.washington.edu/suminst/sismid/
Summer Institute in Statistics for Big Data (SISBID): July 11–27, 2016
w http://www.biostat.washington.edu/suminst/sisbid
Summer Institute in Statistics for Clinical Research (SISCR): July 25–29, 2016
w http://www.biostat.washington.edu/suminst/siscr

The Summer Institutes consist of a series of short workshops (modules) conducted by experts in the subject fields and designed to introduce participants to modern issues and challenges in biostatistics, genetics, infectious diseases, epidemiology and clinical trials. Prerequisites are minimal, and the modular nature of the Summer Institutes enables participants to design programs best suited to individual backgrounds and interests. Participants attending the Summer Institutes will receive certificates of module completion in recognition of their participation.

Employment Opportunities around the world

New Zealand: Wellington

Victoria University of Wellington

Professor in Actuarial Science

http://jobs.imstat.org/c/job.cfm?site_id=1847&jb=28102914

Switzerland: Lausanne

Ecole Polytechnique Federale de Lausanne

Instructorships in Mathematics

http://jobs.imstat.org/c/job.cfm?site_id=1847&jb=27571861

United States: Riverside, CA

University of California, Riverside

Multiple Ladder-Rank Faculty Positions in Business Analytics including Endowed Chairs (open rank)

http://jobs.imstat.org/c/job.cfm?site_id=1847&jb=27285841

United States: Orlando, FL

University of Central Florida College of Medicine

Assistant, Associate or Full Professor of Medicine (Biostatistician)

http://jobs.imstat.org/c/job.cfm?site_id=1847&jb=27071868
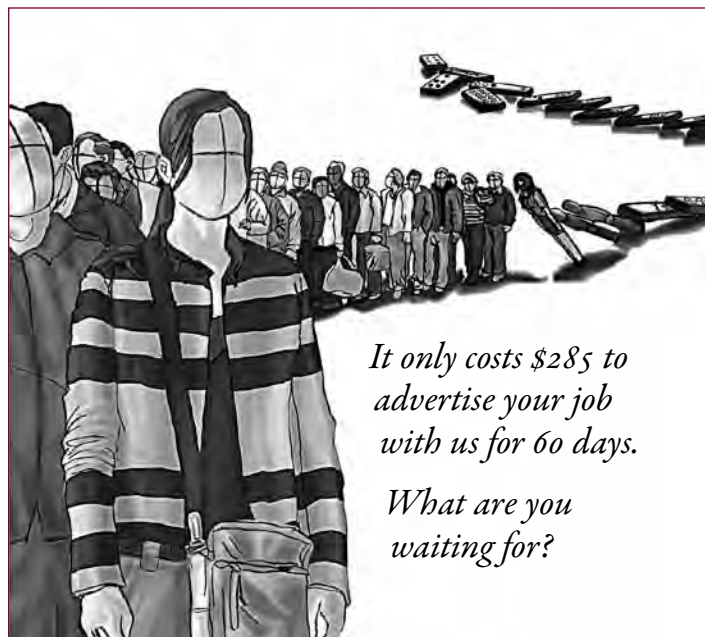
United States: Princeton, NJ

Princeton University

Lecturer Position in Operations Research and Financial Engineering

http://jobs.imstat.org/c/job.cfm?site_id=1847&jb=28118789

Germany: Göttingen

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

The Faculty of Mathematics and Computer Science at the Georg August University Göttingen, Germany invites applicants for a
Junior Professorship for Mathematical Statistics
(salary W1 NBesO)
to begin on October 1st, 2016 on a temporary basis, at the **Institute for Mathematical Stochastics**.

If the personal requirements are satisfied, the candidate will be recruited as a civil servant on time for an initial period of three years. The renewal of the position for another three years will depend on a positive interim evaluation.

You can find the full text of the vacancy notice with further information at
http://www.stochastik.math.uni-goettingen.de/uploads/media/JP16.pdf

Contact: Prof. Dr. Axel Munk munk@math.uni-goettingen.de

International Calendar of Statistical Events

IMS meetings are highlighted in maroon with the [ims] logo, and new or updated entries have the [NEW] or [UPDATED] symbol. Please submit your meeting details and any corrections to Elyse Gustafson: erg@imstat.org

June 2016

June 1–4: Berlin, Germany. **5th Berlin Workshop on Mathematical Finance for Young Researchers w** http://www.math.hu-berlin.de/~mfy2016/

June 1–4: Malta. **4th Stochastic Modeling Techniques & Data Analysis Conference w** http://www.smtda.net/smtda2016.html

June 5–10: Sandbjerg Estate, Sønderborg, Denmark. **Stochastic Geometry, Stereology and their Applications w** http://csgb.dk/activities/2016/stochgeom/

June 6–10: Pittsburgh, PA, USA **Statistical Challenges in Modern Astronomy VI w** http://www.scma6.org

[ims] June 10–11: Pavia, Italy. **Advances in Statistics, Probability and Mathematical Physics w** http://www-dimat.unipv.it/eugenioconference/

June 11–16: Avignon, France. **3rd ISNPS Conference w** http://www.isnpstat.org

[ims] June 12–15: Atlanta, GA. **3rd ICSA Applied Statistics Symposium w** http://math.gsu.edu/~icsa/

June 12–18: Svetlogorsk, Russia. **XXXIII International Seminar on Stability Problems for Stochastic Models w** http://tvp.ru/conferen/2016_1218_06_1_Eng.htm

June 12–18: Snowbird, Utah, USA. **Mathematics Research Community on Algebraic Statistics w** http://www.ams.org/programs/research-communities/mrc

June 13–17: Sardinia, Italy. **ISBA 2016 World Meeting w** http://www.corsiecongressi.com/isba2016/

June 15–18: Cartagena, Colombia. **Second International Congress on Actuarial Science and Quantitative Finance w** http://icasqf.org

June 19–22: Santander, Spain. **36th International Symposium on Forecasting w** http://forecasters.org/isf/

June 20–22: Centre de Recerca Matemàtica, Spain. **Conference on Probability and Statistics in High Dimensions: A scientific tribute to Evarist Giné w** http://www.crm.cat/en/Activities/Curs_2015-2016/Pages/MEG.aspx

June 20–23: Geneva, Switzerland. **ICES-V, the 5th International Conference on Establishment Statistics w** TBC

[ims] June 20–24: San Diego, CA. **Stochastic Networks Conference**

2016 **w** http://stochasticnetworks2016.ucsd.edu/

June 21–24: UC Berkeley, USA. **Workshop on Algorithms for Modern Massive Data Sets (MMDS 2016) w** http://mmds-data.org/

June 22–24: Magdeburg, Germany. **Novel Statistical Methods in Neuroscience w** http://www.math.ovgu.de/neurostat.html

June 23–25: Xuzhou, China. **International Workshop on Mathematical Reliability and Safety (MRS 2016) w** http://mrs2016.jsnu.edu.cn/

June 25–July 6: Edmonton, Alberta, Canada. **PIMS Summer School 2016 in Mathematical Finance w** http://www.mathfinance2016.com

[ims] June 27–30: Hong Kong, China. **Fourth IMS Asia Pacific Rim Meeting w** http://ims-aprm2016.sta.cuhk.edu.hk/

June 27–30: Copenhagen, Denmark. **26th Nordic Conference in Mathematical Statistics (NORDSTAT 2016) w** www.nordstat2016.dk

June 27–July 1: Barcelona, Spain. **3rd Barcelona Summer School on Stochastic Analysis w** http://www.crm.cat/en/Activities/Curs_2015-2016/Pages/3rd-BCN-Summer-School-on-Stochastic-Analysis.aspx

July 2016

[ims] July 7–9: Edmonton, Alberta, Canada. **6th IMS-FIPS (Finance, Insurance, Probability & Statistics) Workshop w** http://www.mathfinance2016.com

July 10–13: Tinos, Greece. **Greek Stochastics Workshop on Big Data and Big Models w** http://www.stochastics.gr/meetings/theta/

[ims] July 10–15: Victoria, BC, Canada. **WNAR Annual Meeting in conjunction with the XXVIII International Biometric Conference w** http://biometricconference.org/conference-information/

[ims] July 11–15: Toronto, ON, Canada. **IMS Annual Meeting at 9th World Congress in Probability and Statistics w** http://www.fields.utoronto.ca/programs/scientific/16-17/WC2016/

[NEW] July 11–27: University of Washington, Seattle, USA. **Summer Institute in Statistics and Modeling in Infectious Diseases (SISMID) w** http://www.biostat.washington.edu/suminst/sismid/

[NEW] July 11–27: University of Washington, Seattle, USA. **Summer Institute in Statistics for Big Data (SISBID) w** http://www.biostat.washington.edu/suminst/sisbid

NEW July 11–29: University of Washington, Seattle, USA. **Summer Institute in Statistical Genetics (SISG) w** http://www.biostat.washington.edu/suminst/sisg/

July 25–27: NIMBioS, Knoxville, TN, USA. **Discrete and Algebraic Mathematical Biology: Research and Education w** http://www.nimbios.org/workshops/WS_mathbio

NEW July 25–29: University of Washington, Seattle, USA. **Summer Institute in Statistics for Clinical Research (SISCR) w** http://www.biostat.washington.edu/suminst/siscr

July 25–29: CRM Montreal, Canada. **Statistical Causal Inference and its Applications to Genetics w** http://www.crm.umontreal.ca/2016/Genetics16/index_e.php

ims July 28–30: University of Wisconsin–Madison. **18th Meeting of New Researchers in Statistics and Probability w** http://www.stat.wisc.edu/imsnrc18/about.html

ims July 30 – August 4: Chicago, USA. **JSM 2016 w** http://amstat.org/meetings/jsm/2016/

August 2016

August 1–3: Ilulissat, Greenland. **Applied Probability Symposium w** http://thiele.au.dk/events/conferences/2016/ilulissat/

August 7–10: Hamilton, ON, Canada. **Ordered Data and their Applications in Reliability and Survival Analysis: An International Conference in Honour of N. Balakrishnan for his 60th Birthday (ODRS 2016) w** http://mathandstats.mcmaster.ca/odreliabilityandsurvival/

August 8–12: University of Tennessee, Knoxville, USA. **NIMBioS Tutorial: Evolutionary Quantitative Genetics 2016 w** http://www.nimbios.org/tutorials/TT_eqg2016

August 14–19: Stanford, CA, USA. **MCQMC 2016: 12th International conference on Monte Carlo and quasi-Monte Carlo methods in scientific computing w** http://mcqmc2016.stanford.edu

August 15–19: Rønne, Bornholm, Denmark. **Workshop on Geometry and Stochastics of Nonlinear, Functional and Graph Data w** http://csgb.dk/activities/2016/geometry/

August 17–19: Maastricht, The Netherlands. **Small Area Estimation Conference 2016 w** http://www.sae2016.nl

August 18–21: Corvallis, Oregon, USA. **2016 IISA Conference on Statistics w** http://iisaconference.org/

August 21–24: Birmingham, UK. **International Society for Clinical Biostatistics 2016 Conference w** http://www.iscb2016.info/

August 24–26: Kerman, Iran. **13th Iranian Statistical Conference w** http://isc13.uk.ac.ir/index.php?slc_lang=en&sid=1

August 31–September 2: London, UK. **Population-based Time-to-event Analyses w** http://csg.lshtm.ac.uk/pta2016/

September 2016

September 5–8: Manchester, UK. **RSS 2016 International Conference w** www.rss.org.uk/conference2016

September 6–10: Minsk, Republic of Belarus. **Computer Data Analysis and Modeling: Theoretical and Applied Stochastics (CDAM 2016) w** http://www.cdam.bsu.by

September 7–10: Almaty, Kazakhstan. **Third International Conference on Analysis and Applied Mathematics w** http://www.icaam-online.org

September 15–16: Ghent, Belgium. **Flexible Statistical Modeling past, present and future w** http://www.fsm16.ugent.be/

NEW September 22–23: NCAR, Boulder, CO, USA. **6th International Workshop on Climate Informatics (CI 2016) w** https://www2.cisl.ucar.edu/events/workshops/climate-informatics/2016/home

September 28–30: Washington DC. **2016 ASA Biopharmaceutical Section Regulatory-Industry Statistics Workshop w** http://www.amstat.org/meetings/biopharmworkshop/2016/

NEW *ims* September 30–October 1: University of California, Davis, USA. **Peter Hall Memorial Conference w** http://www.stat.ucdavis.edu/hallmemorialconference/

NEW September 30–October 2: St Louis, MO, USA. **Workshop on Higher-Order Asymptotics and Post-Selection Inference (WHOA-PSI) w** http://www.math.wustl.edu/~kuffner/WHOA-PSI.html

October 2016

NEW October 13–14: Poznan, Poland. **eRum 2016 (European R users meeting) w** http://erum.ue.poznan.pl/

October 14–16: Niagara Falls, Canada. **International Conference on Statistical Distributions and Applications (ICOSDA 2016) w** http://people.cst.cmich.edu/lee1c/icosda2016/

October 20–22: Charlotte, NC, USA. **2016 Women in Statistics and Data Science Conference w** http://ww2.amstat.org/meetings/wsds/2016/index.cfm

International Calendar *continued*

November 2016

November 7–9: University of Tennessee, Knoxville, USA. **NIMBioS Workshop: Next Generation Genetic Monitoring w** http://www. nimbios.org/workshops/WS_nextgen

November 9–13: Miami, FL. **International Conference on Questionnaire Design, Development, Evaluation, and Testing w** http://www.amstat.org/meetings/qdet2/index.cfm

December 2016

December 4–9: Atlantic City, NJ, USA. **72nd Annual Deming Conference on Applied Statistics w** www.demingconference.com

December 5–9: Canberra, Australia. **Australian Statistical Conference, 14th Australasian Data Mining Conference, 9th Conference on Teaching Statistics w** www.asc2016.com.au

December 15–17: Taipei, Taiwan. **Conference on Experimental Designs and Analysis (CEDA) 2016 w** http://www3.stat.sinica.edu. tw/ceda2016/

December 19–22: Chennai, India. **Statistical Methods in Finance 2016 w** http://www.cmi.ac.in/~sourish/StatFin2016/

ims December 19–22: Shanghai, China. **10th ICSA International Conference w** http://www.math.sjtu.edu.cn/conference/2016icsa/

NEW December 21–23: Kolkata, India. **Platinum Jubilee International Conference on Applications of Statistics w** http://stat. caluniv.in/platinum/

March 2017

ims March 8–10: Washington DC, USA. **Reproducibility of Research: Issues and Proposed Remedies w** http://www.nasonline. org/programs/sackler-colloquia/upcoming-colloquia/

June 2017

NEW June 20–23: Riverside, CA, USA. **10th International Conference on Multiple Comparison Procedures w** http://www. mcp-conference.org/hp/2017

ims June 28–July 1: Nanning, Guangxi Province, China. **2017 IMS-China International Conference on Statistics and Probability w** TBC

July 2017

July 2–7: Groningen, The Netherlands. **IWSM 2017 w** http:// iwsm2017.webhosting.rug.nl/

July 9–13: Vigo, Spain. **38th Annual Conference of the International Society for Clinical Biostatistics w** TBC

July 16–21: Marrakech, Morocco. **61st ISI World Statistics Congress 2017 w** http://www.isi2017.org/

ims July 24–28: Moscow, Russia. **39th Conference on Stochastic Processes and their Applications (SPA) w** TBC

ims July 29 – August 3: Baltimore, USA. **IMS Annual Meeting at JSM 2017 w** http://amstat.org/meetings/jsm/

July 2018

ims July 2–6: Vilnius, Lithuania. **Joint 2018 IMS Annual Meeting and 12th International Vilnius Conference on Probability Theory & Mathematical Statistics w** TBC

July 9–13: Edinburgh, UK. **ISBA 2018 World Meeting w** TBC

ims July 28 – August 2: Vancouver, Canada. **JSM 2018 w** http://amstat.org/meetings/jsm/

July 2019

ims July 27–August 1: Denver, CO, USA. **IMS Annual Meeting at JSM 2019 w** http://amstat.org/meetings/jsm/

August 2020

ims August 1–6: Philadelphia, PA, USA. **JSM 2020 w** http://amstat.org/meetings/jsm/

August 2021

ims August 7–12: Seattle, WA, USA. **JSM 2021 w** http://amstat.org/meetings/jsm/

See the full list at **imstat.org/meetings**

Membership and Subscription Information

Journals

The scientific journals of the Institute of Mathematical Statistics are *The Annals of Statistics*, *The Annals of Probability*, *The Annals of Applied Statistics*, *The Annals of Applied Probability*, and *Statistical Science*. The *IMS Bulletin* is the news organ of the Institute.

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Issue		Deadline	Online by	Mailed
1:	January/February	December 1	December 15	January 1
2:	March	February 1	February 15	March 1
3:	April/May	March 15	April 1	April 15
4:	June/July	May 1	May 15	June 1
5:	August	June 15	July 15	August 1
6:	September	August 15	September 1	September 15
7:	Oct/Nov	September 15	October 1	October 15
8:	December	November 1	November 15	December 1

* Note that the August 2016 issue has an early deadline of June 15

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