

## samsi spotlight: H el ene Massam



**S**abbatical at SAMSI? **H el ene Massam** had many choices and places to go for her sabbatical.

After attending workshops at SAMSI in 2003 and again in 2005, H el ene was so intrigued by the concentration of experts and the quality of the workshops that she chose to join the SAMSI Program on High Dimensional Inference and Random Matrices this past fall.

“SAMSI mixes theory with applications which made this Sabbatical choice very attractive!”

H el ene is currently a faculty member at York University (Toronto, Canada) where she is a professor in the Department of Mathematics and Statistics. Her background is in graphical models and multivariate analysis. She received her PhD at McGill University in 1977, and did her dissertation on “Mathematical Programming with Cones.”

During her time as a program core participant in the Random Matrices program, she conducted the Bayes Focus Week workshop

in October and was instrumental in the Large Graphical Models workshop in November. H el ene was involved with 3-4 working groups on a weekly basis.

“The SAMSI working groups were constructive and focused... they provided a unique forum for interaction and discussion. I was able to make new contacts in the large random matrices community which will create research variations integrating concepts from the regularization and graphical models literature. There are so many interesting opportunities at SAMSI that it is hard to pick and choose...you can stay as busy as you want to at SAMSI”

A couple of papers will follow from cooperation started at SAMSI. Other papers were started before H el ene came to SAMSI, but were moved forward due to her experience with the High Dimensional Inference and Random Matrices program. Her main collaborators at SAMSI were Bala Rajaratnam, SAMSI and Cornell University; and Debashis Paul, University of California, Davis. “I am fortunate to work with some of the best young researchers in this field.”

The second half of H el ene’s sabbatical will be in Italy, Great Britain, France and the US. She is planning to return to SAMSI in the spring to finish her work in the Random Matrices program and prepare for the transition workshop at AIM in California in April 2007.

“If you want to have an impact you need to be involved in the activities.”

**samsi alumni:** Do you have news you want to share? E-mail us at: [alumni-news@samsi.info](mailto:alumni-news@samsi.info)

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## Fall 2006 Program on High-Dimensional Inference and Random Matrices



photo by Thomas Lehman

Random Matrices Opening Workshop Distinguished Lecturer David Donoho (Stanford University, Anne T. and Robert M. Bass Professor of Humanities and Sciences and Professor of Statistics) “The Breakdown Point Of Model Selection When There Are More Variables Than Observations”

**M**ore than three hundred international scientists participated in the Fall 2006 portion of SAMSI’s year-long program on “High-Dimensional Inference and Random Matrices.”

The kickoff workshop was held in September, and reflected the worldwide interest in random matrices and high-dimensional data analysis in many scientific fields.

The program leaders were: Iain Johnstone (Stanford University), Peter Bickel (University of California, Berkeley), David Donoho (Stanford University), H el ene Massam (York University), Douglas Nychka (National Center for Atmospheric Research (NCAR)), and Craig Tracy (University of California, Davis).

The program continued throughout the fall with eight working groups devoted to: Climate and Weather, Wireless Communications, Universality, Regularization, Geometric Methods, Multivariate Distributions, Graphical Models, and High-Dimensional Functional Estimation. Jack Silverstein (North Carolina State University) also organized a semester-

long graduate course on random matrices.

In November, a week was devoted to Bayesian methods, organized by H el ene Massam (York University), and another to graphical models, organized by Nanny Wermuth (Chalmers University.) A joint SAMSI/NCAR workshop focusing on climate modeling was organized by Derek Bingham (Simon Fraser University) and Montserrat Fuentes (North Carolina State University.)

Additionally, Eitan Greenshtein (Purdue University and SAMSI) and Donald Richards (Pennsylvania State University) organized an undergraduate workshop in which students were introduced to applications in medical imaging, lightwave systems, time series, pattern recognition, and tax collection methods by the Internal Revenue Service.

All members of the eight working groups were at SAMSI for the initial Kickoff Workshop. Weekly Internet teleconferences enabled remotely-based researchers to continue to participate in the working groups throughout the year. Each working group maintains a web page on which lectures, discussions, and reading materials are disseminated.

The workshops and working groups collectively provided a comprehensive treatment of the theory and applications of random matrices and high-dimensional inference to researchers from a wide variety of scientific fields.

A primary motivation for the SAMSI organization is the ability to cluster researchers from disparate fields to work on problems that intersect many disciplines. An example of this phenomenon arose in the working group on Geometric Methods in which ideas from the pure mathematics fields of harmonic analysis and representation theory were seen to have emerging but important implications for diffusion tensor imaging.

The program continues through the Spring 2007 semester, and will close with a Transition Workshop in April 2007, at the American Institute of Mathematics in Palo Alto, California.

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## From the director...

First, we are delighted that Sue McDonald has taken over as editor of samsi.info, and we look forward to an informative and stimulating newsletter under her editorship! We also welcome Jim Damon from the University of North Carolina, Chapel Hill to the SAMSII directorate; Jim is standing in for Chris Jones who is on sabbatical.

A quick update on the SAMSII renewal: this year is SAMSII's fifth (time flies when you're having fun), which means we are ending our first funding cycle from the National Science Foundation, and we are up for renewal for another five years. The renewal process culminated last fall in a three-day site visit by an eminent team of twelve examiners. The visit went very well, and we are expecting news from NSF any day now. The next issue of samsi.info will contain the many exciting details and plans for our next five years.

My topic for today is "SAMSII working groups." Except for opening program workshops, the research and activities at SAMSII are organized through working groups associated with each program. These working groups form the heart of any SAMSII program. They are the main forum in which collaborations are created and through which the research agendas are implemented.

Working groups vary in their nature and format. Some are highly focused, at least initially, on knowledge acquisition and sharing. Others focus on specific problem formulation and agenda-setting, while still others devolve quickly into a set of research projects. The exact nature of a working group depends on the interests and goals of the participants, as well as, the extent of their shared backgrounds. Common among

all working groups is always the aim of developing a research agenda and attendant collaborations that derive energy from combining statistical and mathematical ideas in a cross-disciplinary context.

New and exciting this year is technology that allows individuals who cannot be resident at SAMSII to still participate in the working groups. One part of this technology is videoconferencing, allowing groups at remote sites to interact with groups at SAMSII. (An article about the operation of the "Berkeley node seminar" involving two SAMSII working groups can be found on the opposite page.)

For individuals, we also have a web-based system that allows for their participation in working group meetings and activities; all one needs is a computer and a telephone. The working group meeting takes place through a linked website – allowing presentations, writing, or just brainstorming. Remote participation in working groups is open to anyone who signs up for the working group at the program's opening workshop, or who later visits and joins.

Of course, there is no substitute for being physically present in the working groups, so we do hope to see you at SAMSII in a non-virtual sense!



James O. Berger

James O. Berger  
Director

## Berkeley node seminar

During the Fall 2006 SAMSII program on "High Dimensional Inference and Random Matrices", a special seminar series was organized jointly by SAMSII and the Department of Statistics, University of California, Berkeley.

A number of leading experts in the field of random matrices and statistical inference reside in the Bay area of California, and were not able to be resident at SAMSII throughout the program. The Berkeley Node seminar allowed these researchers to connect with the Program on a weekly basis and interact with the many researchers who were resident at SAMSII. The new videoconferencing facility at SAMSII provided the infrastructural support necessary for this activity.

This seminar series presented a host of speakers, many of whom were either researchers participating in the random matrix program at SAMSII or faculty members and students from University of California, Berkeley, University of

California, Davis and Stanford University. The talks were very stimulating and covered a wide range of topics including eigenvalue distribution for large random matrices, problems in mathematical physics, statistical regularization methods for high dimensional problems, asymptotic analysis of symmetric functions of random variables, and mathematical finance.

The discussions after the talks were likewise wide-ranging and thought-provoking, with attendees exploring new avenues of research and pointing to the advantages and limitations of the various analyses presented by the speakers. The fact that the attendance was very high on both coasts throughout the series points to the popularity of this mechanism for connecting to SAMSII.

Noureddine El Karoui, from the Statistics Department at the University of California, Berkeley, did a great job of marshalling



Noureddine El Karoui, Statistics Department  
University of California, Berkeley

resources and running the seminar from the west coast. The videoconferencing facility at SAMSII, with its easy-to-use apparatus, and a new "smart-board" are valuable additions that will surely play an important role in engaging more researchers from distant places in the exciting scientific research programs being conducted at SAMSII.

## SAMSII's fall undergraduate workshop

In November 2006, SAMSII hosted a two-day Undergraduate Workshop centered around topics from the High Dimensional Inference and Random Matrices Program. Held bi-annually at SAMSII, these undergraduate workshops expose students from around the country to topics and research directions associated with concurrent SAMSII programs. The goal is to broaden students' perspectives regarding graduate school, career, and research opportunities in both mathematics and statistics.

During the November workshop, 22 students from 17 universities heard lectures, participated in tutorials, and engaged in career discussions with SAMSII fellows, visitors, postdocs and graduate students. The lectures covered topics ranging from random matrix theory to applications including "Statistical Models for Climate Change" (Serge Guillas, Georgia Tech) and "Rare Events in Nonlinear Lightwave Systems" (Elaine Spiller, SAMSII



postdoc).

To gain hands-on experience, the students spent part of the first afternoon working through MATLAB tutorials led by Raj Rao from MIT. In the first tutorial, the students investigated seemingly unrelated problems involving permutations of subsequences and the spectral properties of random matrices. Through numerical experiments, the students were able to discern and postulate a correlation between the problems. Rao then pointed out that their result was related to the 2006 Fields Medal theory of Okounkov and had applications

in airplane boarding. Later in the tutorial, numerical experiments led the students to hypothesize results related to Anderson's localization in crystals for which Anderson won a Nobel Prize in 1977.

Don Richards from Pennsylvania State University started the final session by asking the students if they knew what organization is the largest user of random matrices. To answer the question, he accessed public IRS websites and demonstrated that tax data

at municipal levels produces immense random matrices that require various analysis techniques. This motivated the remainder of his lecture "Random Matrices in Multivariate Statistical Analysis."

SAMSII's next two-day Undergraduate Workshop will be held March 2-3, 2007, and will focus on topics from the SAMSII Program on Development, Assessment and Utilization of Complex Computer Models. Details can be found at: <http://www.samsi.info/>.

## program workshops

**Development, Assessment and Utilization of Complex Computer Models**  
Biosystems Modeling Workshop  
March 5-7, 2007  
(at Radisson RTP)

**Development, Assessment and Utilization of Complex Computer Models**  
Engineering and Methodology Subprograms Workshop  
April 2-3, 2007 (at SAMSII)

**High Dimensional Inference and Random Matrices**  
Transition Workshop  
April 10-13, 2007  
(at AIM, Palo Alto, California)

**Development, Assessment and Utilization of Complex Computer Models**  
Transition Workshop  
May 14-16, 2007  
(at Radisson RTP)

## summer programs

**Challenges in Dynamic Treatment Regimes and Multistage Decision-Making**  
June 18-29, 2007  
(at SAMSII and Radisson)

**Geometry and Statistics of Shape Spaces**  
July 7-13, 2007  
(SAMSII and Radisson)

For more information about SAMSII programs and workshops, visit SAMSII's Web site at <http://www.samsi.info> or call 919-685-9350.