

The Newsletter of the Statistical and Applied Mathematical Sciences Institute

Beyond Bioinformatics and Mathematics and Statistical Ecology Opening Workshops Kick Off a Great Year of Research

SAMSI recently hosted its two opening workshops to kick off another exciting year of research. This year's programs are focusing on ecology and bioinformatics. People from around the globe gathered to attend the two events held at the North Carolina Biotechnology Center, an easy walk from SAMSI's building in Research Triangle Park.

The Mathematical and Statistical Ecology opening workshop was held August 18-22. Over 100 participants attended the workshop. Presentations were made from leading applied mathematicians, statisticians, ecologists and others. Many of the presentations are available on the SAMSI website. Several of them were videotaped and will also be found on the website soon. Six working groups were formed and will be meeting weekly throughout the academic calendar year.

"A lot of research seemed to be on the cutting-edge of their disciplines which was particularly helpful to hear about as a non-expert for many of them," remarked one of the attendees.

Several people noted they would like to have the working groups form earlier. One person suggested we have people send a photo, a brief blurb of the person's research interests and what his/her background is to share with all participants beforehand so they can have a chance to look for a particular person at the workshop.

The Beyond Bioinformatics opening workshop, held September 8-12 may have broken an attendance record for SAMSI. There were 209 attendees at the workshop. In fact, not everyone



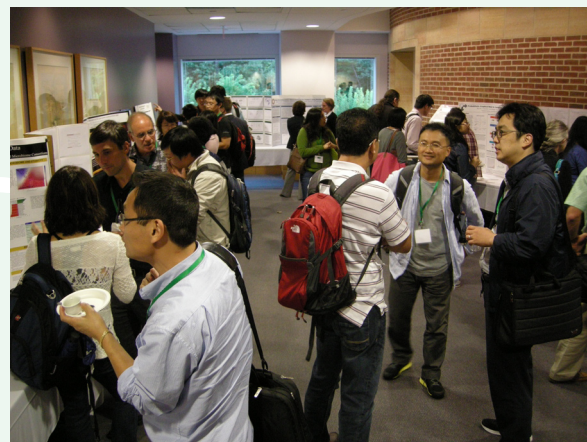
Many people preferred to go to the overflow room to listen to the lectures.

could fit into the auditorium, so an overflow room was set up. The overflow room had a relaxed atmosphere as people could watch the slides and listen to the presenter while drinking coffee. Twelve working groups were formed by the end of the week and these groups will meet throughout the academic calendar year.

One attendee remarked, "The broad coverage of topics in omics and the nice balance between biological and statistical talks" was what this person thought was a positive aspect of the workshop. Another person wrote, "There was a wide range of views. Great overview of current and future interesting problems in the field."

Eric Eager, Assistant Professor, Mathematical Biology, University of Wisconsin – La Crosse and ClarLynda Williams-DeVane, Assistant Professor, Bioinformatics/Biostatistics, North Carolina Central University, shared their perspective of attending the opening workshops on SAMSI's blog. You can read their reviews at:

samsiatrtp.wordpress.com.



The Beyond Bioinformatics poster session was held on the 2nd floor of the NC Biotech Center building.



Listening to a lecture at the Ecology Opening Workshop.

From the director...

A new academic year generally means two new research programs for SAMSI, and we are pleased to welcome the participants of both this year's programs. *Mathematical and Statistical Ecology* had their opening workshop in August, followed in early September by *Beyond Bioinformatics: Statistical and Mathematical Challenges*. Both programs are now well under way with a total of 18 working groups developing their research plans.

For the first time, we held our opening workshops at the North Carolina Biotechnology Center, which proved to be a great venue for a larger opening workshop. Another innovation was that we have a new videographer, Bill Elias, who filmed all the invited talks at both opening workshops: at the time of writing the videos are not yet online, but they should be shortly: please take the opportunity to view what I know will be really high-quality videos.

The new academic year also brings to SAMSI six new postdocs and many visitors coming to our programs; it is great to see them here. We also welcome our new directorate members: Sujit Ghosh as Deputy Director, Tom Witelski and Nell Sedransk as Associate Directors representing Duke and NISS respectively. Nell has taken over from Alan Karr who left NISS and SAMSI at the end of August; she previously served on the SAMSI directorate from 2006 to 2010.

This seems an appropriate moment to mark Alan Karr's long years of service to both NISS and SAMSI. Alan came to NISS as Associate Director in 1992, the year after I myself had arrived as Professor of Statistics in Chapel Hill. Of course we had known each other for a number of years before that – I can particularly remember him at a 1986 workshop on asymptotic statistics in Edinburgh, where the social activities included pickup soccer games on the lawn of the residence hall in which we were staying. Alan became Director of NISS in 2000, and shortly afterwards was one of the co-PIs for the successful NSF application that led to the creation of SAMSI in 2002. During the subsequent twelve years he has always been strongly committed to SAMSI, serving for eight years in total as the Associate Director of SAMSI representing NISS, and helping to organize several programs including *Data Mining and Machine Learning* in 2003/04, *Latent Variable Models in Social Sciences* 2004/05, *Data-Driven Decisions in Healthcare* in 2012/13 and the *Forensic Science* program that will take place next year. We wish Alan well in his new position in RTI; meanwhile Nell has taken over as Acting Director of NISS, and we look forward to working with the new permanent Director of NISS when that individual is appointed.



Postdoctoral Fellow Profile: Daniel Taylor-Rodriguez

Daniel Taylor-Rodriguez is a new postdoctoral fellow at SAMSI, participating in the Ecology program this year. He came from the University of Florida. His wife, Natalia, is still in Gainesville currently working on her Ph.D. in animal science.

Daniel grew up in the bustling metropolis of Bogota, Colombia. When he was 10, Daniel and his family moved to White Plains, New York. After a year and a half, Daniel's family moved back to Colombia. Daniel entered a bilingual school to continue his skills in English. He continued at a school that offered an International Baccalaureate (IB) program. Tony Cleaver, an inspiring IB economics teacher, strongly influenced Daniel's decision to pursue a degree in economics.

Daniel studied economics at the Universidad Los Andes from 1998-2003, "I especially enjoyed the econometric courses; to me it made more sense to let data speak by itself," commented Daniel. He then went on to get a specialization (similar to a professional Master's degree in the United States) in statistics. At the same time, he started working as a consultant under his game theory professor Luis Jorge Ferro. In particular, they developed optimal incentive and penalty mechanisms in contracts for large-scale highway concession projects required by the National Concessions Institute of Colombia.

A group of his friends from National University of Colombia, who were wildlife veterinarians, were starting up a wildlife conservation organization called FVSN. They invited Daniel to come work with them and he decided to help them out. Their first project was to help cattle ranchers identify what management practices reduced the risk of predation from panthers (pumas) using various quantification protocols. These findings informed local governments in the implementation of programs to mitigate predation risk in livestock ranches.

Daniel went to work as a quantitative risk analyst at Bancolombia, Colombia's largest banking institution. There he developed models to quantify credit risk components. He also built in-house

models to forecast macroeconomic series affecting risk behavior of client portfolio. Through Bancolombia he applied for a Fulbright Scholarship, which he was awarded to pursue a Master's degree in statistics at the University of Florida (UF).

While at the University of Florida, he studied under George Casella. He stayed at UF to receive his Ph.D., but eager to learn more about ecology, he enrolled in the interdisciplinary ecology program with a concentration in statistics. Daniel truly appreciates the strong bonds and collaborative approach to research that George Casella fostered within his working group. After Dr. Casella's passing he received the continued and insightful supervision of Professors Linda Young and Nikolay Bliznyuk.

He contributed to projects with researchers in the Animal Sciences, Ophthalmology, and Horticulture Departments at UF, and took part in the NSF funded program IGERT Quantitative Spatial Ecology, Evolution, and Environment (QSE3). In his collaborations he worked jointly with scientists from diverse backgrounds to develop interdisciplinary solutions to important applied problems.

Daniel's doctoral research focused on developing Bayesian procedures for variable selection with good frequentist properties, and adapting these methodologies to models widely used in population ecology. The Jaguar Corridor Initiative, a large-scale conservation effort lead by Panthera foundation, inspired Daniel's work.

At SAMSI Daniel will study questions associated with the dynamics of infectious diseases, and will expand his work on population ecology, modeling the joint behavior of species sharing the same ecosystem. His two years at SAMSI will give him the opportunity to meet and collaborate with researchers from different backgrounds and to engage in new and exciting projects.

Daniel also enjoys running, mountain biking, watching movies and, of course, spending time with Natalia.



Workshops by SAMSI Held Around the Country

A series of several different workshops were held this past Spring and Summer by SAMSI, spanning from Canada to the Carolinas.

SAMSI and CANSSI hosted a workshop May 22-23 on “Geometric Topological and Graphical Model Methods in Statistics” at the Fields Institute in Toronto, Ontario. About 40 people attended the event. The workshop was developed partially as a result of the LDHD program that was held at SAMSI last year.

About 28 people attended the SAMSI and CANSSI workshop “Computational Methods for Survey and Census Data in the Social Sciences” June 20-21 in Montreal, Canada. The participants included statisticians working in survey and census methodology and population studies with social scientists in collaborating disciplines.

SAMSI, along with the Institute for Mathematics Applied to Geosciences

(IMAGE) at the National Center for Atmospheric Research (NCAR), hosted the summer program entitled, “*The International Surface Temperature Initiative (ISTI)*” July 8-16 in Boulder, Colorado. Participants were divided into small groups that worked on the development and application of several techniques that were identified by program participants and using data from the ISTI databank. Over 45 people participated in the program.

The Graduate Workshop on Environmental Data Analytics was held July 28-August 1 in Boulder, Colorado along with co-sponsors the National Center for Atmospheric Research, who hosted the meeting, and the National Science Foundation. The workshop had tutorials on climate data analytics, Bayesian statistics and Monte Carlo integration strategies and hierarchical models for massive spatio-temporal data analysis. About 45 people attended the workshop.

A Recent Publication from a SAMSI Workshop

In October 2013, SAMSI hosted the workshop Dynamics of Seismicity, Earthquake Clustering and Patterns in Fault Networks as part of the Mathematics of Planet Earth 2013 activities. This workshop brought together seismologists, applied mathematicians working on earthquake dynamics and statisticians developing stochastic models for earthquakes, for three days of intensive discussions.

One of the participants was David Harte of Statistical Research Associates in New Zealand. He gave a talk on Stochastic Earthquake Models: Ways to Improve and Insights into the Physical Process. The focus of his talk was the Epidemic Type Aftershock Sequence (ETAS) model, which is a model for earthquake clusters that is motivated by similar models used for epidemics. In this model, each background event (earthquake not preceded by earlier earthquakes) is treated like a new infected arrival in an epidemic. The aftershocks of the initial seismic event are regarded as similar to the individuals in an epidemic who become infected as a result of contact with earlier infected individuals. As a result, the mathematics of epidemic

models can be applied to earthquakes. However, in his SAMSI talk, David explained that this model has a number of deficiencies when applied to earthquake data in New Zealand. In particular, the ETAS model typically underestimated the number of mainshock-aftershock sequences while overestimating events of normal seismicity (those without major sequences). David proposed various extensions of the ETAS model that allow for more heterogeneity in aftershock sequences. The result is a stochastic model that better explains the observed earthquake data and therefore leads to a better representation of the physical processes in seismology. The full paper has now been published with acknowledgement to SAMSI: D.S. Harte, An ETAS model with varying productivity rates, *Geophysical Journal International*, volume 198 (1), pages 270-284.

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Directorate:

Richard Smith | Director
The University of North Carolina at Chapel Hill

Sujit Ghosh | Deputy Director
North Carolina State University

Ilse Ipsen | Associate Director
North Carolina State University

Nell Sedransk | Associate Director
National Institute of Statistical Sciences

Thomas Witelski | Associate Director
Duke University

SAMSI Staff:

Gordon Campbell | Operations Director
campbell at samsi.info

Rita Fortune | Financial Analyst
rita at samsi.info

Thomas Gehrmann | Program Assistant
tgehrmann at samsi.info

Karem Jackson | Workshop Specialist
kjackson at samsi.info

Katherine Kantner | Webmaster
kak at niss.org

Sue McDonald | Senior Program Coordinator
sue at samsi.info

Jamie Nunnally | Communications Director
nunnally at niss.org

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19 T. W. Alexander Drive
P.O. Box 14006
Research Triangle Park, NC 27709-4006

Calendar of Events for SAMSI

Undergraduate Workshop focusing on Mathematical and Statistical Ecology Program

February 26-27, 2015 at SAMSI, Research Triangle Park, NC

Graduate Workshop on Current Trends in Statistical Ecology (co-sponsored by NIMBioS)

April 15-17, 2015 at NIMBioS, Knoxville, TN

Undergraduate Modeling Workshop

May 17-22, 2015 at NC State University in Raleigh, NC

Industrial Mathematical and Statistical Modeling Workshop (IMSM) 2015

July 12-22, 2015 at NC State University in Raleigh, NC

Opening Workshop for Challenges in Computational Neuroscience

August 17-21, 2015 at NC Biotech Center in Research Triangle Park, NC

Opening Workshop for Statistics and Applied Mathematics in Forensic Science

August 31-September 4, 2015 at NC Biotech Center in Research Triangle Park, NC

For more information about SAMSI programs and workshops, visit SAMSI's website at <http://www.samsi.info>