The International ENVIRONMETRICS Society - TIES

Newsletter

Volume 10, No. 2, November 2004

Editors: Sylvia Esterby, Alessandro Fassò, Paul Sampson

In This Issue:

1. A Message from the President,

Anders Grimvall

TIES – a society connecting people

When TIES is going into negotiations with ISI it is more important than ever before to define and protect the identity of the society. Some of our members would probably say that *The Encyclopedia of Environmetrics* defines the scope of the society. Others would describe the society as an association of scientists, who have a common interest in quantitative methods for the environmental sciences, and represent various academic disciplines, such as statistics, ecology, chemistry, etc. Regardless of which definition we choose, I believe that TIES must have two driving forces: a commitment to environmental issues and a genuine interest in promoting the use of quantitative methods. Because of this double dedication, TIES must also be a society connecting people who otherwise would not meet.

Looking back at past activities, it is obvious that TIES has a strong ambition to attract different types of scientists. Moreover, TIES appears to have a large group of members who are socially very competent. The general atmosphere of the meetings is friendly and welcoming, and it is nice to meet old friends and make new acquaintances. However, TIES exists in a world where competitiveness is a must. It is not sufficient to be nice to each other, and there is always a risk that societies like TIES will be marginalized. When an

environmental issue is becoming hot, the people interested in that issue will form their own societies and take the lead in the necessary interaction between science and policy. Likewise, scientists interested in a particular type of quantitative method have their own organizations and meetings. This is nothing we can change or should be sorry about. But it has some implications for our efforts to develop TIES.

Personally, I would like to see more of regional activities between the annual meetings. Many of us are involved in workshops, working groups, evaluation committees, advisory groups etc. If we make it a rule to have TIES and its members in mind whenever we are looking for competent people and planning activities related to environmetrics, I believe that we can step by step strengthen TIES and make its objectives more widely known. There is no doubt that TIES could be more efficiently marketed as a society working on the edge of science and society, and this task will hopefully become easier if TIES achieves the status of an ISI section. Minor workshops on specific topics make up another activity I would like to support. Two workshops that are planned to be held in Europe 2005 (one in Italy and one in the U.K.) can illustrate how both the local organizers and TIES can benefit from closer collaboration. The local organizers can enjoy more expertise among the participants, and TIES can take another step towards a society that is connecting people.

Anders Grimvall (angi@mai.liu.se)

---

2. TIES News

2.1. New Members

Daniella Cocchi

Welcome to the 87 new members who have joined TIES between June and November 2004. Conferences, the web page and promotion of TIES by current members continue to be the major means by which individuals are learning about the Society.

Aberg, Sofia	Sweden
Banks, Christopher J.	UK
Berliner, Mark	USA
Calder, Catherine	USA
Cardoso, Tamre	USA
Chao, Chang-Tai	Republic of China
Chen, Li	USA
Christensen, William F.	USA
Cooley, Daniel	USA
Cooper, Cynthia	USA
Coulston, John	USA
Dailey, Megan	USA
Davis, Christopher A.	USA
DeVillers, Rodolphe	Canada
Dorren, Luuk	France
Doudova, Lucie	Czech Republic
Dowd, Michael	Canada
Ehlschlaeger, Charles	USA
Engel, Dave	USA
Ferguson, Claire A.	UK
Foster, Scott	Australia
Fowler, Tressa L.	USA
Gatliffe, Thomas R.	USA
Gattone, Stefano Antonio	Italy
Geelan-Small, Peter J.	Australia
Genizi, Dr.Abraham	Israel
Genton, Marc G.	USA
Giannitrapani, Marco	UK
Gil Pontius, R. Jr.	USA
Goovaerts, Pierre	USA
Goudey, Robert W.	Australia
Gove, Jeffrey H.	USA
Grady, Amy	USA
Grunwald, Sabine	USA
Haskard, Kathryn A.	Australia
Haslett, John	Ireland
Ho, Linda Lee	Brazil
Holbman, Christopher	USA
Ignaccolo, Rosaria	Italy
Jacques, Geoffrey M.	USA
Jensen, Olaf	USA
Kawashima, Hiroto	Japan
Kronenfeld, Barry J.	USA
Kuzera, Kristopher	USA
Land, Margaret F.	USA
Larocque, Guillaume	Canada
Li, Rui	USA
Liknes, Greg	USA
Lilburne, Linda	New Zealand

Lindgren, Finn	Sweden
Lindstrom, Johan	Sweden
Lippitt, Christopher D.	USA
Londo, H.Alexis	USA
Lowell, Kim	Canada
Lunetta, Ross	USA
Madsen, Lisa	USA
Malizia, Nicholas	USA
Mandula, Melissa	Canada
Mecklin, Christopher	USA
Millones, Marco	USA
Moser, W. Keith	USA
Munoz, Breda	USA
Myers, Donald E.	USA
Nairy, K. Subrahmanya	India
Orzanco, Maria Gabriela	Canada
Paladino, Louis	USA
Palmer, Michael	USA
Patterson, David	USA
Purucker, Tom	USA
Quintanilha, Jose Alberto	Brazil
Ramlal, Bheshem	Trinidad
Reams, Gregory A.	USA
Rennolls, Keith	UK
Riemann, Rachel	USA
Shekhar, Shashi	USA
Sinha, Gaurav	USA
Smith, Chris	Canada
Smith, Ruben	USA
Srebotnjak, Tanja	USA
Stewart, Robert	USA
Stewart, Susan	USA
Strong, Larry	USA
Stroud, Jonathan	USA
Thogmartin, Wayne E.	USA
Vincent, Matthew	USA
Voepel, Hal. E.	USA
Wahlin, Kalle	Sweden

2.2. Member's News

Fellow of the American Statistical Association, 2004. **David A. Marker**, Director and Senior Statistician, Weststat: For outstanding contributions in developing and implementing statistical studies to meet the diverse data needs of the federal government; for promoting and disseminating Total Quality Management principles and use of "best practices" in government statistical agencies through the world ; and for service to the profession.

International Statistical Institute (ISI) membership elections announced in the first round for 2004 included longtime TIES member **Carmen A. Capilla**, Department of Statistics, Polytechnic University of Valencia.

On behalf of all the members of TIES, the current editors of this Newsletter wish to express their sincere thanks to **Teresa Alpuim**, our past editor, who worked so hard and long to make the Newsletter the excellent vehicle for TIES that it is today. We also thank **Liliana Gonzalez**, outgoing editor of the Recently Published Books and Book Review sections of the Newsletter, for her long and excellent service. We are seeking a new Books editor. Volunteeers are welcome!

2.3. Society News

Special Lectures and Awards at TIES 2004 conference

Two special lectures and two awards are presented regularly at TIES conferences. The best student paper award is reported elsewhere in this Newsletter and the 2004 Abdel El-Shaarawi Young Researcher's Award was announced in the May issue of the Newsletter. Plaques were presented by TIES president Peter Guttorp.

Presentation of Abdel El-Shaarawi Young Researcher Award to Lance Waller at the lobster bake.

The topic of the J. Stuart Hunter Lecture, given by Richard L. Smith, University of North Carolina, was Bayesian kriging and Bayesian network design.

Allison Cullen, University of Washington, gave the President's Invited Lecture: The role of quantitative and precautionary analysis in environmental decision making.

TIES 2004: Best Student Presentation Award

Jim Zidek

The Committee had difficulty selecting a winner for the Best Student Presentation from among the many excellent candidates at this year's TIES meeting in Portland, Maine. In the end, two winners tied for that honor. They were (with their co-authors and paper titles):

Marco Giannitrapani (with Ron Smith, Marian Scott & Adrian Bowman, University of Glasgow). **Analysis of sulphur trends across Europe.**

Tanya Srebotnjak (with Daniel Esty, Yale University). **A multidimensional, composite index for assessing environmental sustainability.**

Each received a certificate and a cash prize.

The Committee was delighted by the overall high quality of student presentations and the large number of eligible candidates this year (in addition to the winners): Nicholas Malizia; Christopher Lippit; Nina Fefferman; Cynthia Cooper; Karl Wahlin; Rui Li; Barry Kronenfeld; Kristopher Kuzera; Zuzana Hrdlickova; Lucie Doudova; SA Gattone; Sofia Aberg; Daniel Colley; Guillaume Larocque; Gaurav Sinha; Olaf Jensen; Megan Daily; Kathryn Georgitis. The Committee noted that in almost all cases, the content of the presentations bore the hallmark of good environmental science, the work reported on being directed at solving an important scientific question. Conclusions supplied the answers to those questions or gave recommendations for the future work needed to find them. In almost all cases, the presentations revealed a strong dedication to the science and a passion for the work. Overall, the high caliber of these lively, well crafted, colorful, imaginative and stimulating talks made the work of the Committee very pleasant indeed.

The 2004 Committee: Montse Fuentes, Anders Grimvall, Peter Guttorp, Marian Scott, Jim Zidek (Chair).

Highlights from the 15th Annual General Meeting of TIES

Tuesday, June 29, 2004, Portland, Maine, USA.
by Daniela Cocchi

Report of the President

Peter Guttorp outlined the steps involved in the process by which TIES could become an ISI section. The most important consequence of becoming a section would be the prospect of increasing membership. The goals of TIES would not change, but section status would be beneficial both to TIES and ISI.

Motion from the Board of Directors

Before the Annual Meeting, the Ties Board of Directors moved that the membership authorize the President to negotiate with the International Statistical Institute the formation of an ISI environmetrics section based on the draft TIES ISI statutes (available on the TIES Discussion Board and at the Annual General Meeting).

An extensive discussion of the advantages and disadvantages of TIES becoming an ISI section followed.

The motion was adopted, with the vote in favor of the motion being by acclamation (with one abstention). Twenty TIES members voted electronically prior to the general meeting, all in favor of the motion.

Membership Report

Rick Katz (Secretary) presented the report, focusing on the present membership statistics.

The number of membership options has increased in recent years, with nearly every option being utilized. In particular, the number of members adopting the online option for subscription to Environmetrics is increasing. The change to no dues for Student membership has resulted in a substantial increase in student members.

Publications: Newsletter, Environmetrics, Web page

The publications report was delivered by Paul Sampson (web page manager, Publications Officer-Elect).

Newsletter. Alessandro Fasso has agreed to serve as Co-Editor of the Newsletter along with Sylvia Esterby and Paul Sampson.

Publications Committee. Paul recommended that the Editor-in-Chief of Environmetrics serve as a member of this committee as well.

Web Page. A volunteer with experience handling web sites is needed to serve as web master. A Discussion Board was started during the past year.

Brochure

A society brochure is now available and has been distributed at conferences held by other societies.

Conferences and Liaison with other societies

TIES 2005. The meeting will be held in Beijing as planned.

TIES 2006. The Board has received two proposals, one from a group in the Czech Republic led by Jana Jureckova to hold the meeting in Brno, another from Anders Grimvall to hold the meeting in Kalmar, Sweden.

Other business

Sylvia Esterby proposed a vote of thanks to the TIES 2004 conference organizer, Ron McRoberts.

Highlights from the 14th Annual General Meeting of TIES

Thursday, November 6, 2003 at Caesars Gauteng, Johannesburg, South Africa
by Bronwyn Harch

Report of the President

Peter Guttorp started his report by commenting that the society is going well and has had a slight increase in membership during 2003. TIES has signed a contract with Wiley since the last meeting that provides more specifics on the relationship the society has with Wiley. Peter commented that he felt the contract was good for the society with nothing unusual in it. It is a four-year contract that is now aligned with the election term of the President and President Elect. This is a change from the initial five-year contract Wiley suggested.

Peter then summarised the intended directions for the society that the Board are currently working toward and two points focused on included:

Members Benefits: The Board will be working to enhance the benefits currently provided with initial emphasis on the provision of additional benefits being accessible through the society's web page.

Maintain Breadth of the Society: The breadth of the society is reflected in its aim to cover all quantitative aspects of environmental sciences. To maintain this breadth the society needs to get the right people involved in the society at various operational levels.

The breadth of the society will also be maintained by collaborating with other societies. One way of collaborating is to organise exchange sessions at their conferences and at our conferences. This will allow for more breadth and communication and provide opportunities to focus on communalities.

Nominations Committee Report
Peter Guttorp noted that some of the election candidates being considered became members at the TIES2002 meeting in Genoa, but their membership technically did not start until 2003, because of the change in rules during the 2002 Board meeting. The implication to elections was not considered when the Board changed the policy. The current Board agreed that such candidates would be allowed to stand this time in spite of not satisfying the two previous year membership requirement in the by-laws.

Web Page
Paul Sampson outlined that a TIES Discussion Board will be established with updates of relevant journals for the membership, details of job postings, grants, etc. TIES members (only) will be able to post items to the Discussion Board by being provided a username and password in the near future. Members will be able to receive automatic email messages when something is posted to specific sections of the Discussion Board, which they have elected to receive. Paul asked members to send him any relevant links for the web page.

Environmetrics
Abdel El-Shaarwai commented that the journal is going well and that the impact factor has increased. He also noted that while the journal gets listed as an environmental sciences journal the impact factor is actually in relation to statistics journals.

TIES Brochure
Peter Guttorp reported that the brochure is now completed and will be available to download from the web page. Tony Olsen, Peter Guttorp and Eric Smith have all contributed to the production of the TIES brochure.

Other Business
Elena Naumova moved a vote of thanks to TIES on behalf of her student Nina Fefferman for providing Nina with NSF funding support to attend the TIES 2003 conference in Johannesburg, South Africa.

3. Environmetrics Conferences

3.1. Forthcoming TIES Conferences

TIES 2005
Beijing, China
21-26 August
Friendship Hotel

Ray Correll

The **16th Annual International Conference on Quantitative Methods for the Environmental Sciences**, to be held at the Friendship Hotel in Beijing China, has as its major theme "Quantifying How our Environment Affects Us". The scientific program will consist of invited, contributed and poster paper sessions, over 4 conference days. Contributions for the contributed and poster paper sessions are invited in any area of Environmetrics and especially in line with the major themes. Titles and abstracts should be submitted via the Abstract Templates for TIES 2005 (http://www.cmis.csiro.au/ties2005/templates.htm) in Microsoft WORD or in plain ASCII text format.

All Abstracts should be submitted via e-mail (using attachments) by July 29th 2005 to ties2005-abstracts@csiro.au with the subject **"**TIES2005 Abstract"

For people without access to e-mail, the completed Abstract template can be forwarded by mail to:

Ray Correll
TIES2005 - Abstract Submission
CSIRO Mathematical & Information Sciences
PMB 2
GLEN OSMOND SA 5064
AUSTRALIA

For further information see the conference website:
http://www.cmis.csiro.au/ties2005/

3.2. Report on the TIES 2004 Conference

Paul D. Sampson

The *15th Annual Conference of The International Environmetric Society* was held June 28 to July 1 in Portland, Maine, USA, jointly with the *6th (biennial) International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental*

Sciences. This TIES/ACCURACY 2004 meeting reflected the mutual interest of these organizations in the quantification of environmental and natural resources processes and the uncertainty associated with them. The conference program included four special invited lectures, six invited sessions, and 22 contributed paper sessions, and a poster session. The special invited lectures were:

- Spatial Accuracy Invited Lecturer: "Why aren't we making better use of uncertainty information in decision-making?", *Kim Lowell, University of Laval, Canada*
- TIES President's Invited Lecture: "The role of quantitative and precautionary analysis in environmental decision making", *Alison Cullen, University of Washington, USA*
- TIES J. Stuart Hunter Lecture: "Bayesian kriging and Bayesian network design", *Richard L. Smith, North Carolina State University, USA*
- Spatial Accuracy Invited Lecturer: "Modeling uncertainty about pollutant concentration and human exposure using geostatistics and a space-time information system: application to arsenic in groundwater of southeast Michigan", *Pierre Goovaerts, Biomedware, Inc., USA*

The six special invited sessions addressed the following topics.

- Current directions in space-time process modelling
- Space-time predictions
- Environmental standards and assessment of goal achievement
- Forest wildfire
- Issues of spatial scale in environmental data analysis
- SPRUCE Invited Paper Session: Monitoring Environmental Standards

The complete program is available from the conference web pages on the TIES web site, http://www.nrcse.washington.edu/ties/events/ties2004/index.html. Section 2 of this newsletter reports on the Special Lectures and Awards at TIES 2004, the Best Student Presentation Award, and the 15th Annual General Meeting of TIES. An abbreviated version of Kim Lowell's invited lecture appears in the Environmetrics Form of Section 5.

TIES President-elect David Brillinger and TIES outgoing President Peter Guttorp at a waterfront outdoor restaurant.

The conference was held at the "Portland by the Bay" Holiday Inn in this old seacoast town, which is also a funky city filled with galleries, one-of-a-kind boutiques and shops, and incredible restaurants serving everything from traditional New England clam chowder to nouveau cuisine.

The highlight of the social calendar was the Wednesday afternoon harbor cruise and old-fashioned New England lobster bake on a nearby island. The younger TIES members enjoyed a vigorous game of volleyball and attendees young and old from around the world were instructed in the skill of eating a boiled lobster.

All of the attendees expressed their thanks to the Chair, Ron McRoberts of the USDA Forest Service, St Paul, MN, USA, for a well organized and fruitful conference.

3.3. Other Forthcoming Conferences

A National Research Symposium will be sponsored by the Centre for Mathematics and its Applications of the Australian National University (ANU), Canberra, Australia, on 14-15 December 2004. The Symposium will be held at the Australian Academy of Science and is entitled **'A Celebration of Modelling and Applied Probability'**, in honour of Joe Gani's 80th birthday. Joe Gani retired from the University of California, Santa Barbara, in July 1994, but has remained active as a Visiting Fellow in the ANU's Centre for Mathematics and its Applications. He recently contributed an article on 'The spread of a viral infection in a plantation' jointly with Linda Stals in Environmetrics Vol.15, No.5 (2004) 555-560; he has frequently reviewed books for the TIES Newsletter.

.

The Séminaire Européen de Statistique 2004, SemStat2004, "**Statistics of Spatio-Temporal Systems**", is going to be held on 12-19 December 2004, Castle Höhenried, Bernried, near Munich, Germany.

SemStat2004 takes place under the auspices of the European Regional Committee of the Bernoulli Society for Mathematical Statistics and probability and the European Mathematical Society (EMS summer school).

Invited lectures are given by: Peter Diggle (Lancaster University, United Kingdom), Montserrat Fuentes (North Carolina State University, Chapel Hill, USA), Peter Guttorp (University of Washington, Seattle, USA), David Higdon (Los Alamos National Laboratory, Los Alamos, USA), Ulf Dieckmann (International Institute for Applied Systems Analysis, Laxenburg, Austria) and Richard Law (University of York, United Kingdom), Valerie Isham and Richard Chandler (University College, London, United Kingdom), Eva Vedel Jensen (University of Aarhus, Denmark), Tilmann Gneiting (University of Washington, Seattle, USA)

Preliminary Programme:
http://www.stat.uni-muenchen.de/semstat2004/

The Italian Group of environmental Statistics is organizing the **GRASPA Conference**, Bertinoro, Italy, on 21-23 April 2005.

Sessions include: Space-time models, Environment – health interactions, Spatial sampling, Environmental indices, Statistical support to environmental decisions, Identification of areas at environmental risk.

The preliminary program includes the following invited talks:

S. Hajat, "*Heat effects on health given the proposed increases in global temperatures and the impact of last years heat-wave in Europe*"; P. Guttorp, "*Advances on environmental standard*"; A. Grimvall, "*Nonparametric approaches to the estimation environmental responses*"; J. Mateu, "*Recent Advances in Spatio-temporal Modelling for Environmental Processes*"; M. Scott, "*Decisions about the environment and setting policy: what is the statistician's role".*

Preliminary Programme and Info:
http://www.graspa.org/Bertinoro2005/

The Italian Statistical Society is organizing the Conference "**Statistics and Environment**" which will be held at the Universtiy of Messina, Sicily, Italy on 21-23 September 2005.

The Scientific Program is characterized by two Plenary Sessions: "*New challenges of environmental statistics*", Keynote speaker: Peter Guttorp, Past President of TIES, and "*Kyoto protocol and statistics*", Keynote Speaker: Alessandro Lanza, President of Mattei Foundation, Milan.

Moreover the preliminary program schedules some Invited Specialized Sessions on: Environmental Indices, Sustainable development, Models for complex systems in ecology, Forecasting climate changes, Monitoring and assessment of air quality standards, Environmental sampling, Environmental accounting.

Preliminary Programme: http://ww2.unime.it/sis2005/

The **Joint Statistical Meetings** (JSM) is the largest gathering of statisticians held in North America. It is held jointly with the American Statistical Association, the International Biometric Society (ENAR and WNAR), the Institute of Mathematical Statistics, and the Statistical Society of Canada. The JSM 2005 will take place in Minneapolis, Minnesota from, August 7-11. More information may be seen on the website at:

http://www.amstat.org/meetings/jsm/2005/index.cfm

The statistics and the environment section will be organizing a number of invited and contributed sessions.

3.4. Reports on Related Events

Pacific Northwest Statistics Meeting at University of British Columbia, Fri 8 Oct, 2004.

Over eighty people attended the special Pacific Northwest Statistics Meeting held at the University of British Columbia on 8 October 2004. The meeting was held in honour of Professor Jim Zidek, who has been influential in the development of the Department of Statistics at UBC and in the development of Statistics discipline in the Pacific Northwest region. An interview with Jim was published in *Liaison* (the Newsletter of the Statistical Society of Canada), October 2002, v 16, issue 4 (see http://www.ssc.ca/main/about/history/zidek_e.html/.). Jim's many honours and awards are listed there; more recently in 2003 he was named as a Fellow of the Royal Society of Canada.

The meeting (http://www.stat.ubc.ca/pnwstats.php/) had a theme of talks by speakers with whom he has had research collaborations. In addition, there were four posters presented by graduate students.

William Welch, chair of the Department of Statistics, UBC, chaired the statistics meeting and the dinner reception tributes. The speakers were Dr Christian Genest, a former PhD student of Jim Zidek, who spoke on "Testing independence revisited", and Dr Constance van Eeden, a research collaborator of Jim Zidek, who spoke on "Group-Bayes Estimation". At the dinner reception, a number of colleagues spoke about Jim's achievements and told anecdotes about Jim.

Thanks to Harry Joe, Department of Statistics, UBC, for providing the article and picture.

4. Young Environmetricians

For this inaugural edition of the Young Environmetricians Section, the Editors have invited the recipients of the Best Student Paper Award at TIES 2004 to write articles. They have done a splendid job and we delight in seeing that they share the enthusiasm for the field that we more seasoned Environmetricians feel.

We invite graduate students to submit contributions to the Section on topics that are of particular interest to students and are not covered by other Sections of the Newsletter. We also ask for your suggestions about the content of the Section.

Marco(left) with Armand Maul and Daniela Cocchi, enjoying dinner at the wharf in Portland during TIES 2004 conference.

Ciao! I am Marco! I am an Italian PhD student in the Department of Statistics of the University of Glasgow. I am from a fantastic island located in the middle of the Mediterranean Sea called Sicily!

I received my first degree in the Sciences of Statistics and Economics at the University of Palermo. My experience in the Statistics Department of Palermo was really great! I met loads of teachers that communicated to me their passion for the subject. My supervisor there, Professor Gianfranco Lovison, gave me the opportunity to go to the Department of Statistics of the University of Glasgow, to work on my undergraduate

dissertation. Gianfranco has been an important person to whom I have always referred whenever I had research and career doubts.

From July to December 2001, I worked on my dissertation, Nonparametric Analysis of Air Pollution in United Kingdom and Ireland, supervised by Professor Marian Scott (Department of Statistics, University of Glasgow). Marian has been really important to my research and to helping me settle down quickly and comfortably in a very nice department. Being in a new country where I did not know anyone, with a different language, away from my family and my friends, has been an exciting experience that however has not been the easiest one. Other important professional support has been the collaboration with Ron Smith (Centre of Ecology and Hydrology, Edinburgh) and with Professor Adrian Bowman (Department of Statistics, University of Glasgow).

This was my first research project and working with Marian made me understand how exciting research is. The programming challenges, the boring routines of data set up, the frustration of discovering mistakes (and redoing analysis!), the excitement of presenting your work in a talk, the satisfaction of printing out the final draft of an article; all of these are the feelings that made me decide to keep on doing research, and to start my PhD. I choose Glasgow for several reasons. First, working with such knowledgeable people as Marian, Ron and Adrian, makes the research extremely exciting and productive. Secondly, by the end of the 5 month undergraduate project, directions for further research on a topic I knew interested me had been identified. Thirdly (but not less important), the opportunity of living a bit longer in Scotland, is giving me the chance to further explore the magic isolated highlands, and new pubs.

In the 1st year of my PhD, I mainly focused on the detection of discontinuities in air pollution data across Europe over the last 25 years. A discontinuity test that accounts for correlation has been implemented at 113 sites across 16 European countries, and in a number of stations. Discontinuities have been detected, and most of these seem to be due to meteorological conditions. Therefore, it became necessary to model air pollution data using meteorological variables as covariates. Some preliminary modelling has been carried out using additive models, which have been fitted through the `gam(.)` function in Splus. This function estimates each component of the Additive Model using "loess" smoothers with an iterative procedure called the backfitting algorithm.

Some restrictions of the existing methodologies are: 1) inability to fit circular smoothers, as would be suitable for variables like weeks of the year and wind direction, 2) assumption of independent errors, and 3) the backfitting algorithm, used for estimating the additive model, does not produce the projection matrix for the estimates of f_j, once the algorithm converges (useful for testing purposes).Therefore my work has focused on developing and fitting some smoothers that suit the characteristics of our data, and reformulating the backfitting algorithm.

The pollutant data that have been analyzed are the weekly means of the natural logarithm of the daily concentration of SO_2, monitored in Scotland (1 site), Germany (5 site) and the Czech Republic (1 site), covering the period 1973-2000. The meteorological variables are the weekly values of temperature, humidity, amount of precipitation, and wind direction weighted by speed.

A spatial temporal analysis has also been carried out limited to looking at monthly values of SO_2 as a function of years, months, latitude and longitude for 130 sites across Europe from 1990 to 2001. Because of dimensionality problems, the backfitting algorithm has been amended for the binned case, where the raw data are reduced to frequencies over a fine grid. Hence, the dimensionality of the smoothing matrix is controlled by the number of bins rather then by number of observations. Further work still needs to be done in several directions.

While I am working on my research (with all my new frustrating and exciting moments!), I wish all the best to my PhD colleagues everywhere,

Ciao! Marco Giannitrapani
marco@stats.gla.ac.uk

Dear TIES Newsletter Readers

I feel honored by this opportunity to write a short profile of myself for the Young Environmetricians section and would like to thank the Editors of TIES Newsletter and also the organizers of TIES/ACCURACY 2004 for the possibility to attend the excellent meeting.

My name is Tanja Srebotnjak and I am a second year doctoral student at Yale University's School of Forestry and Environmental Studies where I work with my advisors Professor Timothy Gregoire and Professor Daniel Esty on environmental performance indicators. Prior to coming to Yale, I studied biostatistics and theoretical medicine at the University of Dortmund in Germany and the University of Auckland in New Zealand. Following graduation in 2000, I joined the United Nations Statistics Division in New York to work in the area of international environmental statistics. This marks the beginning of my interest in the nexus of environmental information analysis and policy-making, which has subsequently led to a leave of absence in 2003 to obtain the in-depth training that, I hope, will enable me to make some contributions to this field.

In a nutshell, I am interested in developing statistical measures for the assessment of environmental performance primarily at the national level. Composite indicators play an increasingly important role in the way national, regional, and international environmental regimes collect information in order to track changes in the behavior of actors, assess progress toward objectives, and test the impacts of policies on targeted environmental systems. The Environmental Sustainability Index (ESI), which is part of the Environmental Performance Measurement Project that I am directing at the Yale Center for Environmental Law and Policy, is an example of a country-level index gauging progress toward environmental sustainability. The index requires consideration of a variety of statistical issues including variable selection algorithms, aggregation and weighting methods, and techniques for handling missing observations.

In my thesis, I plan to address these issues within the context of an environmental quality index that allows policy-makers to get feedback on the impact of their programs and policies, assists the public to hold their elected officials accountable for the improvement or deterioration of environmental systems and can be used to test hypotheses on the drivers of environmental change.

At present, the statistical methodology of the index is still at a very early stage of development. Conceptually, it represents an aggregated measure of six key environmental policy areas in the form of the weighted distance between current performance and targets established for each policy area: i) clean air, ii) clean and sufficient water, iii) protected soils and habitat, iv) safe waste disposal, v) low exposure to environmental toxins, and vi) protected global environmental public goods. The policy targets will be selected carefully from existing regulations, guidelines, and scientific studies, while striking a balance between optimal and feasible objectives. Building on the theoretical results of my research, I plan to test and re-evaluate the index in a case study.

Tanja Srebotnjak
Tanja.Srebotnjak@Yale.edu

5. Environmetrics Forum

Kim Lowell's invited lecture at TIES 2004 addressed one of the most fundamental issues that environmetricians face in research and in application: the role of uncertainty in decision-making. After noting that uncertainty and risk are generally not considered in current decision-making in the natural resources, he challenges us with research suggestions for tools that must be developed to effectively account for uncertainty in this field.

Editors note: Professor Lowell kindly permitted the editors of the Newsletter to shorten his full text for its presentation here. Any errors or important omissions are the responsibility of the editors. The editors encourage TIES members to use the TIES Discussion Forum, where the current issue of the TIES Newsletter is posted, to contribute to discussion of the issues raised in this Forum article. (http://www.stat.washington.edu/cgi-bin/discus_ties/discus.cgi)

Why aren't we making better use of uncertainty information in decision-making?

Kim Lowell
Centre de recherche en géomatique, Université Laval
Kim.Lowell@scg.ulaval.ca

Human decision-making revolves around the management of risk. It is ironic, then, that this is not how we manage natural resources. If one considers forest management, for example, one uses decision-support tools that indicate the most likely outcomes of different management strategies; the one that is projected to provide the largest return is then implemented. Similarly, in natural disaster management such as forest fires or floods, managers also react to the most likely scenario. In both cases, the means of determining a land management strategy is not the same as evaluating risk relative to consequences. If human beings managed their lives comparably, no one would ever buy lottery tickets (the risk of winning is too low) and everyone would always take the route home that was the quickest over the long term (i.e., no consideration of crisis situations or unique needs from one day to the next). In natural resource management, virtually the only sector within which risk is part of decisions is in the oil exploration and mining sectors. These sectors are forced to relate the cost of drilling for oil or developing a mine against the consequences of not finding oil or the mineral desired.

After 10 years of research on uncertainty and many more on quantitative decision-support tools, it seems odd that we would continue to employ a management paradigm that is so different from the one used in daily human life. The goal of this article is to discuss why a different decision paradigm is used for managing natural resources than is used in every-day human life and the consequences of doing this. It will then be explained how the use of uncertainty can overcome this, and how it would be beneficial to use uncertainty to do so.

Co-evolution of Natural Resource Decision-Support Tools and Uncertainty Decision-Support Tools

The state in which natural resource decision-support finds itself presently can be traced to how decision-support tools and the study of uncertainty have evolved. To understand the former, the example of forest management decision-support tools is sufficiently general to be useful.

Natural Resource Decision-Support Tools

When computers became relatively accessible in the mid-1960s, forest management tools were produced to, for example, identify understocked and fully stocked areas, and project temporal evolution of a "normal forest". Computers provided a sophisticated means of presentation, and, more importantly, provided objective quantitative analysis of statistically rigorous data to produce such tools. Hence various types of sophisticated growth models were produced – e.g., those that focussed on individual tree growth and the spatial arrangement of the stand in which a tree was located (e.g., Ek 1974, Tennent 1982). Moreover, it became standard practice to report the uncertainty associated with model outputs, usually in the form of confidence intervals. These confidence intervals were based on the well-defined errors that are associated with statistical sampling from a larger population and tended to only consider a single factor – i.e., there was no consideration of error propagation from intermediate models. For example, volume for a tree or stand would have been estimated from ground-based data using a statistically derived function having an associated confidence interval for time t_1. This estimated volume would then have been projected to time t_2 using a statistically derived function having an associated confidence interval. The confidence interval placed on the estimate at time t_2, however, would only be the error associated with the temporal model with no consideration of the error associated with the tree/stand volume model. This approach remains largely in place today.

Uncertainty

Arguably, the study of uncertainty started coming of age with the widespread availability of computerized systems of spatial analysis – generally thought of as geographic information systems (GISs). The author of this article is someone whose interest in uncertainty started at this time and whose interest evolved largely from a growing awareness of the fundamental differences between cartographic and ground-based data. Whereas the uncertainty in ground-based data was well-known and readily quantifiable, the uncertainties associated with spatial data bases were initially not readily recognised.

Initial interest in spatial uncertainty tended to be positional (e.g., Dunn et al. 1990). Given that most of the people drawn to the evolving field of GIS were quantitative in nature, positional error – which can be quantified and expressed in a manner similar to statistical confidence intervals – was an obvious choice

for initial studies. Moreover, in the late 1980s there was a certain naïveté among people working in the spatial community about the reliability of different types of map-based data at various spatial scales. At that time, it was assumed that, for example, the topographic slope measured on the ground would not be radically different from slope as estimated from a digital terrain model (DTM).

As awareness and knowledge of spatial uncertainty expanded, people working with spatial data and spatial decision-support tools began to recognise the omnipresence of uncertainty and the importance of addressing it. This occurred in the early 1990s and this awareness is reflected in the fact that the present symposium – the first ever on spatial uncertainty -- was first held in 1994 (Congalton 1994). Practitioners at that time began expanding their study of spatial uncertainty.

Among other themes in uncertainty studies, more types of spatial uncertainty than positional began to be examined. There was still a growing interest in positional uncertainty – in part because of evolving access to, and improvements in, the Global Positioning System (GPS). But researchers also began expending effort to understand errors of map attributes. While some of this effort was associated with isorithmic maps having ratio-level quantitative attributes, others were focussing on the attributes of choropleth maps that are nominal-level and qualitative. Scientists also began to recognise existential error – the likelihood that a boundary on a map does not actually exist in the real-world.

Sources of uncertainty were also a subject of study (e.g., Thapa and Bossler 1992). Sometimes uncertainty was present due to the nature of the data used to produce a map. For example, the uncertainty (or "error") associated with a topographic map derived from 1:10000 photographs is much smaller than the uncertainty associated with a topographic map derived from 1:1000000 photographs. People also recognized and studied uncertainty due to data entry, "digitising error," and uncertainty due to the classification systems used to create maps – particularly choropleth maps derived from interpretive processes. For example, soils maps may have Type A defined as "80% A with no more than 20% inclusions of B." However, when this information is combined with specifications of the minimum mapping unit for a given map, different maps are possible – all of which are equally correct.

To organise the information being produced by such studies, a number of researchers developed error models. The first of these was the epsilon band model (Chrisman 1982) that remains the error model most strongly associated with the vector data structure in GIS. Field-based error models (e.g., Goodchild et al. 1992) were also described and they remain most closely associated with the raster data structure in GIS.

Error propagation has also received considerable attention (Heuvelink 1998). The study of error propagation was initially of interest in spatial systems because of the potential for conducting sophisticated multi-source data analysis using spatial and aspatial data. Relative to decision-support tools, it remains an important topic because it provides a means to provide estimates of uncertainty that consider a combination of different sources of error – something that has been lacking even from aspatial decision-support tools.

The magnitude of different errors has also been studied. In doing so relative to isorithmic maps (e.g., Lopez 2000), one assesses the magnitude of the difference between a ratio-level quantitative variable in the digital spatial database and the same variable measured explicitly on the ground for a number of locations. For choropleth maps, there are three possibilities for assessing the magnitude of error. First, one can examine the positional reliability of the mapped lines – i.e., whether or not their real-world coordinates match their digital database coordinates. Second, one can examine the correctness of the attributes with which a polygon is labelled (Thierry and Lowell 2000). Third, provided that the boundaries of the map polygons are not geopolitical or other boundaries that exist by definition, one can study the uncertainty associated with the actual existence of a line. That is, when one looks at a choropleth map whose polygons are defined by interpretive human processes, it is possible that the lines do not in reality exist on the ground.

All of the topics mentioned have led to a topic currently of great importance in decision-support tools and uncertainty: fitness-of-use (De Bruin and Hunter 2003). The term "fitness-of-use" reflects a recognition that the data that we currently possess may not support the analysis that we would like to conduct at a particular spatial or temporal scale. This concept can also be used to diagnose weaknesses in databases for conducting a particular analysis or supporting a particular use, and assists in targeting databases whose improvement can most contribute to improving the reliability of a given analysis. While this is an

important advance in the way that we think about decision support and uncertainty, it does not yet incorporate the concept of risk into the way that we make land management decisions. Nonetheless, the way in which the study of uncertainty has evolved has brought us to the point where such an advance is possible.

Using Uncertainty and Risk in Natural Resources Decision-making

So why is it that we are not using the advances made in uncertainty research to include the concept of risk as a fundamental input – rather than an after-the-fact piece of metadata – into our natural resources decision-making? Simplistically put, and political considerations aside, human beings tend to function with the idea that "the way it has always been done" is synonymous with "the only way it can be done." This is an important consideration given that land management traditionally has been done based on the strategy that is best "on average." Moreover, human beings want to make land management decisions based on information that is "black-and-white" even though our day-to-day decisions are made on information and preferences that are overwhelmingly "gray."

So what does it mean to say that we are not considering risk in our natural resource decision-making? To respond to that question we consider examples of forest management and forest fire control and forest management.

For forest fire control, the case of an already-ignited fire is considered. To combat such a fire, fire managers would employ models that are based on the location of fuel sources, the topography of an area, and the current or prevailing wind direction and speed; outputs from such models would be the likely direction and rate of spread. Fire suppression activities would then be undertaken to respond to the estimates of the most likely speed and direction produced by the model. However, the accuracy of the location of the fuel sources used for modelling purposes might depend on the classification accuracy of the satellite image used to identify the fuel sources. Were the fire to turn unexpectedly due to the presence of an unmapped fuel source, it is conceivable that human dwellings would be at risk rather than the recreation area that lies in the most likely direction of the fire. To include risk in the decision-making, instead of managing the most likely direction of the fire, it would be necessary to know the likelihood of the fire turning towards the human dwellings as well as the likelihood of it continuing on its path to the recreation area. Given such information, the fire manager could then decide if the risk of the fire turning towards the dwellings was sufficiently large relative to their value – political, economic, or otherwise – to protect against that possibility even if such a likelihood was much lower than for the fire burning the recreation area.

How to Include Uncertainty Information into Natural Resources Decision-making

This fire example illustrates a crucial point. It seems inherently intuitive that we use our decision-support tools to identify the most likely outcome of a particular event, and then manage our natural resources in response to this most likely event. This is not, however, how we manage our day-to-day lives; instead of managing the most likely outcome of a particular situation, we manage the potential consequences relative to the risk or likelihood of a given event occurring. In the context of wildfire (and other catastrophic events), we are not really interested in "average fire behaviour" which is what fire models tend to give us. Rather we are interested in "this fire" and how to respond to it. Similarly, in forest management, we do not want to make a decision about whether or not to fertilise "this area" based on an expected average return of 10%; we want to make that decision knowing what the likelihood is of getting 7%, 10% or 13%.

Effectively, therefore, decision-support tools need to provide information that indicates the likelihood that the "average outcome" is wrong, the potential consequences associated with even the least likely outcomes, and then a human decision-maker must weigh the risks against the potential consequences to decide a final action. This is not a matter of simply simulating all possible strategies and estimating the costs and benefits of each. Rather this is a matter of providing information as to the potential consequences of an event and giving the likelihood/probability of different events occurring. In Table 1, the conventional management indicates that the gain from fertilisation will be 10% + 3%. However, if a decision-support tool produced the Example 1 likelihoods, decision-makers would know that there is a 60% chance that a certain treatment would produce at least a 7% gain, and a 30% probability that it would produce a 13% gain. Given the information on the economic feasibility of different gains – intentionally specified in probabilistic terms albeit using linguistic constructs -- the decision made based on this information might be very different than if the decision-support tool produced the Example 2

likelihoods. The Example 2 likelihoods indicate a high likelihood of obtaining a 7% increase, but only a 30% chance of attaining the 10% suggested by the conventional decision-support information.

Table 1. Fictitious example of information produced by a conventional decision-support tool and an uncertainty-based decision-support tool.

Conventional Decision-Support Information	**Alternative Decision Support Information**			
Level of Gain	*Level of Gain*	*Economic Feasibility*	*Cumul. Likeli-hood: Ex. 1*	*Cumul Likeli-hood: Ex. 2*
10% ± 3%	7%	Low	0.9	0.9
	10%	Probable	0.6	0.3
	13%	Definite	0.3	0.1

As for what analytical tools or methods exist for producing such information, Bayesian Networks (Friedman et al. 1997) are one possibility. Bayesian Networks fall under the umbrella of Evidential Reasoning tools (Peddle et al. 1994) and provide a means for using data and its uncertainty as fundamental inputs into a decision-support process. A Bayesian Network inputs data and associated uncertainty and uses conditional probabilities to produce the "likelihood information" presented in Table 1. Once this information is produced, it is the land manager who must assess how risk-averse he/she is and then decide on a course of action. A key to all of this is that the resulting decision-making process can then better mimic the way in which human beings make decisions than the paradigm currently employed.

So how can this be applied spatially and will it make a difference to the land management decisions we make? As an answer, a fictitious example is presented. In the traditional approach to land management (Figure 1, top row), the likelihood of each area becoming sodic is identified and compared to the community assets to be protected. Because a) the rectangle in the west has the highest likelihood of becoming sodic, b) the area surrounding the source of drinking water has a low likelihood of being affected, and c) the rectangle in the northeast with a higher likelihood of being affected is not "near" the drinking water source, in conventional land management, treatment would be applied to the western rectangle. However, consideration of uncertainty would lead to a completely different conclusion (Figure 1, bottom row). Though the western rectangle has a high likelihood of becoming sodic, its likelihood of becoming sodic is actually as low as 30% (or as high as 90%). Moreover, because its boundary is highly certain, any negative effects that do actually occur are likely to be confined to the area mapped. Conversely, the north-eastern rectangle has a likelihood of becoming sodic between 40% and 50% with a boundary that is highly uncertain. Moreover, the boundary of the potable water source is of medium certainty and may extend as far as the northeastern rectangle (or be further away from this rectangle than mapped). Hence not treating the zone between the north-eastern rectangle and the water source could have potentially disastrous consequences. Thus in the new paradigm, the boundary of the north-eastern rectangle would be treated.

This example demonstrates the potential flaw and negative consequences associated with the current land management paradigm. Though protection of the western rectangle – as determined by the conventional land management paradigm – is inherently logical, consideration of uncertainty – the alternative, proposed paradigm – indicates its potentially hidden flaw. Clearly this example has been chosen to illustrate and support the points made in this paper. However, it provides a concrete example of how a failure to consider uncertainty can lead to less-than-optimal decisions. Similar effects are likely even when the effects of uncertainty on the decision-making process are not as obvious.

This example also demonstrates the potential complexity of the analytical tools that will be necessary to employ the suggested uncertainty-based management paradigm. The examples presented in this article have demonstrated the manner in which uncertainty can be included in decision support tools and the type of information that can be extracted from such uncertainty-based decision support tools. However, even the simplistic example in Figure 1 demonstrates the need for a computer-based "intelligence engine" to analyse this information. In this example, an extremely small number of spatial entities was considered, and the example was designed to lead to a definite conclusion. In the real-world, however, many more entities will be considered, and conclusions will not be as obvious. Human beings will not be able to absorb and assimilate all of the information presented in an uncertainty-based database, and will not have the capacity to analyse all of it efficiently. This will require the creation of new analytical and visualization tools capable of providing

humans with a logical summary of the uncertainty information present in the system.

References

Chrisman, N., 1982. A theory of cartographic error and its measurement in digital data bases. *Proceedings, AUTO-CARTO 5*, pp. 159-168.

Congalton, R. (editor), 1994. *Unlocking the Puzzle*. Proceedings: International Symposium on the Spatial Accuracy of Natural Resource Data Bases. American Society for Photogrammetry and Remote Sensing. 271 pp.

De Bruin, S., Hunter, G., 2003. Making the trade-off between decision quality and information cost. *Photogrammetric Engineering and Remote Sensing* 69, pp. 91-98.

Dunn, R., Harrison, A., White, J., 1990. Positional accuracy and measurement error in digital databases of land use: an empirical study. *International Journal of Geographical Information Systems* 4, pp. 385-398.

Ek, A., 1974. Nonlinear models for stand table projection in northern hardwood stands. *Canadian Journal of Forest Research* 4, pp. 23-7.

Friedman, N., Geiger, D., Goldszmidt, M., 1997. Bayesian Network Classifiers. *Machine Learning* 29, pp.131-163.

Goodchild, M., Guoqing, S., Shiren, Y., 1992. Development and test of an error model for categorical data. *International Journal of Geographical Information Systems* 6, pp. 87-104.

Heuvelink, G., 1998. *Error Propagation in Environmental Modelling with GIS*. Taylor and Francis, London. 144 p.

Lopez, C., 2000. On the improving of elevation accuracy of Digital Elevation Models: a comparison of some error detection procedures. *Transactions in GIS* 4, pp. 43-64.

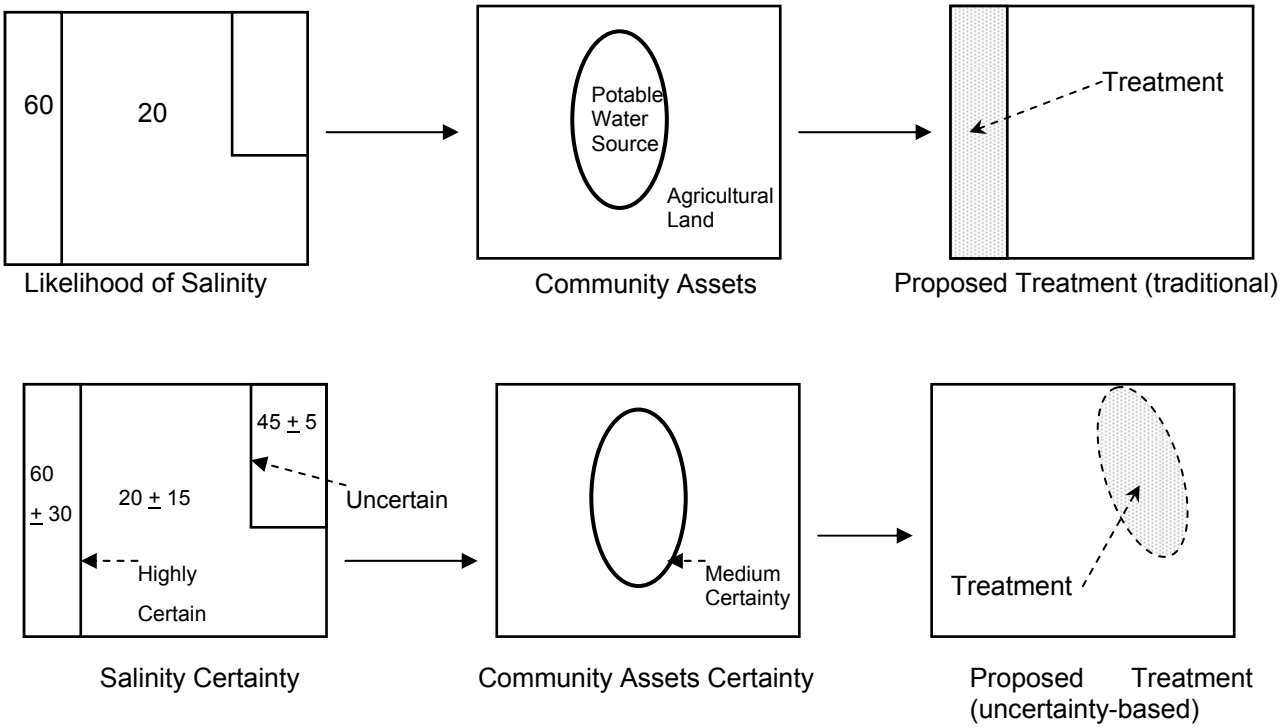
Peddle, D., Foody, G., Zhang, A., Franklin, S., Ledrew, E., 1994. Multi-source image classification II: an empirical comparison of evidential reasoning and neural network approaches. *Canadian Journal of Remote Sensing* 20, pp. 396-407.

Tennent, R., 1982. Individual tree growth model for pinus radiata. *New Zealand Journal of Forestry* 12, pp. 62-70.

Thapa, K., Bossler, J., 1992. Accuracy of spatial data used in geographic information systems. *Photogrammetric Engineering and Remote Sensing* 58, pp. 835-841.

Thierry, B., Lowell, K., 2000. An uncertainty-based method of photo-interpretation. *Photogrammetric Engineering and Remote Sensing* 67, pp. 65-72.

Figure 1. Different methods for determining where to treat to combat dryland salinity. The top row represents the conventional method and the bottom row represents the alternative methodology proposed.



6. Research Projects and Programmes

In this section of TIES Newsletter members are invited to describe the Environmetrics research projects they are involved with. It is our aim, not only to show the many different ways quantitative methods are being applied to Environmental Sciences, but also to give knowledge about who is working on what problems. Academic programmes related to environmental problems are welcome. We believe that this will contribute to increased scientific interchange among TIES members. Contributions should be sent to Paul D. Sampson, email: pds@stat.washington.edu .

Colorado State University's PRIMES

Jennifer Hoeting

At Colorado State University, faculty and students with research interests related to quantitative ecology are working together as part of an innovative program called *PRIMES* (PRogram for Interdisciplinary Mathematics, Ecology, and Statistics). PRIMES is an interdisciplinary graduate training program which is supported by an Integrative Graduate Education and Research Training (IGERT) grant from the National Science Foundation (NSF).

PRIMES is designed to address the challenges of studying complex ecological systems. The idea underlying PRIMES is to equip graduate students from ecology, mathematics, and statistics with the skills to work at the interface of the three disciplines and to support research on ecological problems involving advanced quantitative tools. PRIMES students receive a degree from their primary department (such as mathematics, statistics or biology), but receive additional training and opportunities through PRIMES. Students obtain the necessary tools to do interdisciplinary research through reciprocal course offerings among the participating graduate programs, interdisciplinary courses, and colloquia, workshops, and conferences. An on-going seminar series brings distinguished researchers in quantitative ecology to the CSU campus. Opportunities for internships at local federal agencies are also available. Students are strongly encouraged to participate in interdisciplinary research projects with students and faculty from across the university.

Twenty-three graduate students are currently participating in the program as well as a large number of faculty from across the university. Day-to-day operations of PRIMES are overseen by Don Estep (Mathematics) who serves as co-director of the program with Richard Davis (Statistics). Key participants of the program include the members of the PRIMES Council including Mike Antolin (Biology), Brad Biggerstaff (CDC), Paul Doherty (Fisheries and Wildlife Biology), Tom Hobbs (Natural Resources Laboratory), Jennifer Hoeting (Statistics), Barry Noon (FWB), LeRoy Poff (Biology), Simon Tavener (Mathematics) and Collen Webb (Biology). The council oversees the program and works together to evaluate student applications to the program.

Students spend a part of their first year of the program taking the regular classes required for their degree plus one of more additional courses in an interdisciplinary area. For example, in their first semester, a first-year statistics student might take a basic ecology class along with her other statistics courses. An ecology student might take an additional mathematics or statistics course in addition to his program requirements. In the second semester, students are required to take a class called "Team Research in Ecology" (TREE). Last year's TREE course focused on mathematical and statistical models of disease. The class was co-taught by Antolin (Biology), Estep (Mathematics) and Jay Breidt (Statistics). To make course concepts more concrete, the course focused on the application of these models to plague in prairie dogs, an area of research interest for Antolin. Guest lecturers included Brad Biggerstaff, who works at the CDC Division of Vector-Borne Infectious Diseases. Towards the end of the semester, student teams were created which included at least one student from ecology, mathematics, and statistics. The groups worked together on a class project to model data on prairie dog plague. Students were encouraged to be creative in developing their own questions to pursue in the research projects. The final week included presentations from each group. This class was unique in that it integrated all three areas of statistics, mathematics and ecology.

There is a wide range of interdisciplinary research projects being undertaken by the PRIMES participants. One example is a NSF funded research project on chronic wasting disease (CWD) in deer. CWD is a prion disease, like mad cow disease, which occurs in cervid species such as deer and elk. The

research covers a comprehensive array of areas including basic biology, mapping of the spatial extent, and mathematical modeling of the disease. PRIMES participants of this project include Hobbs, Hoeting, Tavener, and two graduate students as well as researchers from the Colorado Division of Wildlife and University of Wyoming.

The PRIMES program is currently seeking high quality students with interests in quantitative ecology to enter the program in future years. Students may have a background in any of the three focus areas of statistics, mathematics and ecology. In addition to funding for graduate students, there are opportunities for long- and short-term visitors and post-doctoral positions for researchers with interests related to quantitative ecology. For more information, please view the PRIMES website at http://www.primes.colostate.edu/ .

7. Job Opportunities in Environmetrics

Faculty Position at Department of Mathematics and Statistics, UMBC

The department has authorization to recruit for two tenure-track faculty positions starting in the fall of 2005 and invites applications for positions in statistics at the rank of assistant professor. The successful candidate should have a Ph.D. in an area of statistics, an active, independent research program, strong potential for obtaining external funding, and a commitment to excellence in teaching. Preference will be given to candidates with a demonstrated record of applications-oriented research. Although all areas will be considered, special consideration will be given to those who have the potential to make strong theoretical and interdisciplinary contributions in areas of the department's particular strengths and/or interests: bioinformatics, biostatistics, environmental statistics and national security. **UMBC has a number of active research centers focusing on the environment (http://www.umbc.edu/cuere/, http://www.jcet.umbc.edu/, http://gest.umbc.edu/).** Pending funding, exceptional applicants of higher rank will also be considered.

The department offers BS, MS and Ph.D. degrees in statistics and in applied mathematics. Refer to the department's web page (http://www.math.umbc.edu) for more information. Applicants should send a vita, a summary of their current research program, and have three letters of reference sent to Statistics Recruitment Committee, Department of Mathematics and Statistics, University of Maryland Baltimore County, Baltimore, MD 21250. Screening of applicants will commence December 1, 2004, and will continue until the position is filled.

UMBC is an Affirmative Action, Equal Opportunity Employer.

Nagaraj K. Neerchal
nagaraj@math.umbc.edu

8. Forthcoming Papers in *Environmetrics*

Abdel El-Shaarawi, Editor-in-Chief

- **T.C. Bailey, C. Barcellos and W.J.Krzanowski:** Use of spatial factors in the analysis of heavy metals in sediments in a Brazilian coastal region.
- **Haiganoush K. Preisler, Alan A. Ager, Bruce K. Johnson, and John G. Kie:** Modeling animal movements using stochastic differential equations
- **N Aladin, J-F Crétaux, I. S. Plotnikov, A. V. Kouraev, A. O. Smurov, A. Cazenave, A. N. Egorov, F. Papa:** Modern hydro-biological state of the Small Aral Sea
- **Lin Xue, James C.Fu, F Wang and L Wang:** Mixture model approach to analyzing major elements chemistry data of the Changjiang (Yangtze River).
- **Christian Mulder, Tom Aldenberg, Dick de Zwart, Harm J. van Wijnen and Anton M. Breure:** Evaluating the impact of pollution on plant-Lepidoptera relationships
- **Carla Nunes and Amillcar Soares:** Geostatistical Space-Time Simulation Model for Air Quality Prediction
- **Christian Walter, Alex. B. McBratney, Raphael A. Viscarra Rossel and Julie A. Markus:** Spatial Point-Process Statistics Concepts and Application to the Analysis of Lead Contamination in Urban Soil.
- **David I. Warton**: Most multivariate abundance data do not have extra zeros, compared to thenegative binomial

- **Fern´andez-Ponce, J.M.1 and Infante-Mac´ıas, R** : A New Approach to Influence Diagnostic in Superpopulations
- **Douglas P. Wiens**: Robustness in Spatial Studies I: Minimax Prediction
- **Douglas P. Wiens**: Robustness in Spatial Studies II:Minimax Design
- **Dale L. Zimmerman and David M. Holland:** Complementry Co-Kriging: Spatial Prediction Using Data Combined from Several Environmental Monitoring Networks

9. Recently Published Books

Liliana Gonzalez (liliana@cs.uri.edu)

The objective of this section of the Newsletter is to provide a list of recently published books of interest to members of our society. I encourage every one to send the editors of the Newsletter information about books they think should be listed in this section in future issues of the Newsletter.

- *Environmental Monitoring and Characterization* (2004) by Janick Artiola and Mark Brusseau, Academic Press.
- *Environmental Statistics : Methods and Applications* (2004) by Vic Barnett, Wiley.
- *Risk, Reliability, Uncertainty & Robustness of Water Resource Systems* (2001) by Janos Bogardi and Zbigniew W. Kundzewicz, Cambridge University Press.
- *Statistical Analysis of Ocean Waves and Other Environmental Data* (2004) by Leon E. Borgman, John Niedzwecki, Norman W Scheffner, John W Kern and Mihail Petrakos,World Scientific Publishing Company.
- *Sustainable Environments: A Statistical Analysis* (2003) by A. K. Ghosh, J. K. Ghosh and Barun Mukhopadhyay, Oxford University Press.
- *Statistical Methods for Detection and Quantification of Environmental Contamination* (2001) by Robert D. Gibbons and David E. Coleman, Wiley.
- *Statistical Tools for Environmental Quality Measurement* (2003) by Michael E. Ginevan and Douglas E. Splitstone,Chapman & Hall/CRC.
- *Hydrological Models for Environmental Management* (2003) by Lars Gottschalk, Irina Krasovskaia and Robert J. Moore, Kluwer Academic Publishers.
- *Spatial Data Analysis : Theory and Practice* (2003) by Robert Haining, Cambridge University Press.
- *Nondetects and Data Analysis: Statistics for Censored Environmental Data* (2004) by Dennis R. Helsel,Wiley.
- *Spatial Modelling of the Terrestrial Environment* (2004) by Richard E. J. Kelly, Nicholas A. Drake and Stuart L. Barr, Wiley.
- *Introduction to Environmental Toxicology: Impacts of Chemicals Upon Ecological Systems*, 3rd Edition (2004) by Wayne G. Landis and Ming-Ho Yu, CRC Press.
- *Multivariate Analysis of Ecological Data using CANOCO* (2003) by Jan Lepš and Petr Šmilauer, Cambridge University Press.
- *Remote Sensing and GIS Accuracy Assessment* (2004) by Ross S. Lunetta and John G. Lyon, CRC Press.
- *Statistics in Spectroscopy*, 2nd Edition (2003) by Howard Mark, Academic Press.
- *Exposure Assessment in Occupational and Environmental Epidemiology* (2003) by Mark J. Nieuwenhuijsen, Oxford University Press.
- *Structural Equation Modeling: Applications in Ecological and Evolutionary Biology* (2002) by Bruce H. Pugesek, Adrian Tomer and Alexander von Eye, Cambridge University Press.
- *Experimental Design and Data Analysis for Biologists* (2002) by Gerry P. Quinn and Michael J. Keough, Cambridge University Press.
- *Experimental Ecology: Issues and Perspectives*, New Edition (2002) by William J. Resetarits and Joseph Bernardo, Oxford University Press.
- *Statistical Methods for Geography* (2001) by Peter A Rogerson, SAGE Publications.

- *Design and Analysis of Ecological Experiments* (2001) by Samuel M. Scheiner and Jessica Gurevitch, Oxford University Press.
- *Multivariate Statistics for the Environmental Sciences* (2003) by Peter Shaw, Oxford University Press.
- *Sampling Rare or Elusive Species : Concepts, Designs, and Techniques for Estimating Population Parameters* (2004) by William Thompson, Island Press.
- *Practical Statistics for Environmental and Biological Scientists* (2002) by John Townend, Wiley.
- *Landscape Ecology in Theory and Practice: Pattern and Process* (2001) by Monica Turner, R. H. Gardner and R. V. O'Neill, Springer Verlag.
- *Statistics in Genetics and in the Environmental Sciences* (2001) by Luisa Turrin Fernholz, Stephan Morgenthaler and Werner Stahel (Eds), Springer Verlag.
- *Time-Series Analysis and Cyclostratigraphy : Examining Stratigraphic Records of Environmental Cycles* (2003) by Graham P. Weedon, Cambridge University Press.
- *Statistics for the Life Sciences*, 3rd Edition (2003) by Jeffrey A. Witmer and Myra L. Samuels, CRC Press.
- *GGE Biplot Analysis: A Graphical Tool for Breeders, Geneticists, and Agronomists* (2002) by Weikai Yan and Manjit S. Kang, CRC Press.

10. Book Reviews

Liliana Gonzalez, Editor

After six years of service this is the last Book Review Section I am coordinating for the Newsletter. I wish to sincerely thank all the reviewers who contributed timely and thoughtful reviews for our newsletter. I also wish to thank the editors of the publishing companies who kindly provided our reviewers with complementary copies of the books we reviewed. Special thanks to Professors Joe Gani and Nick Hamm for providing the two reviews we are publishing in this issue of the newsletter ... It was an absolute pleasure to work for the Society and to serve as the Book Review Editor ... muchas gracias y hasta luego!

Mathematical Models for Society and Biology, by Edward Beltrami. Academic Press, San Diego, California, 2002, Hardcover, pp. x + 199, US$ 74.95, £119.00, Euro178.50 A$ 125, ISBN 0-12-085561-5.

Reviewer: Joe Gani, Mathematical Sciences Institute, Australian National University, Canberra ACT 0200, Australia. Emal: gani@maths.anu.edu.au

This advanced undergraduate text brings together a collection of mathematical models designed to throw light on diverse problems in society and biology. In his Preface, the author points out that the nine chapters of the book describe various mathematical models and their applications to such areas as political science, sociology, economics, ecology, public policy and management science, molecular biology, epidemiology, biochemistry and cell biology. Each Chapter is followed by a set of Exercises. The book ends with a brief section on "Afterthoughts on Modeling", an appendix on "Conditional Probability", two pages of "References", some "Solutions to Select Exercises" and a two and a half page "Index".

Chapter 1, Crabs and Criminals, outlines the concept of an absorbing Markov chain, and its use in problems of social mobility. Illustrations include the migration of hermit crabs from one shell to another, and the transition of criminals through states such as jail, probation and freedom.

Chapter 2, It Isn't Fair: Municipal Workers, Congressional Seats and the Talmud, is concerned with optimization in manpower scheduling (integer programming), the apportionment of Congress seats among the states of the USA, and the division, as reported in the Talmud, of an estate among heirs whose claims exceed the total value of the estate.

Chapter 3, While the City Burns, deals with the spatial distribution in a city of a fixed number of fire companies, to minimize their response times to alarms. The Poisson Process and the Inverse Square Root Law are used to discuss the number of fire companies, which are busy at any time, and the optimal deployment of such companies.

Chapter 4, Clean Streets, makes use of graph theory to attack the problems which arise in street cleaning.

Euler's Konigsberg bridge problem is sketched, and the minimum time tour of cleaners through the street network is discussed, as well as the smallest number of mechanical brooms required to do the job. Vehicle scheduling concludes the chapter.

Chapter 5, The Coil of Life, introduces the Gauss Linking Number, namely the number of times two space curves link each other (are entwined). This concept is then applied to the twisting and writhing of DNA strands in cells.

Chapter 6, Measles and Blood Clots, examines equilibrium and stability in first and second order differential equations, with the van der Pol equation as an example. Linearization is used as an approximation. An SEIR epidemic model for measles is presented, and the issue of randomness versus chaos is raised. A simple model for blood clotting is considered.

Chapter 7, Sardines and Algae Blooms, begins with a model of fishing with catastrophe, the result of overfishing practices. This is followed by a model for the proliferation of algae and the possible development of cycles in their blooming. An alternative model for fish harvesting is also presented.

Chapter 8, Red Tides and Whatever Happened to the Red Squirrel?, deals with problems of diffusion in one and two dimensions. The spread of algal patches, and traveling waves are discussed. The replacement of the English red squirrel by its more prolific American cousin, the gray squirrel is modeled.

Chapter 9, Submarines and Trawlers, first considers the hide and seek problem of a surface vessel searching for an evasive submarine. The second part of the chapter revisits the fishery example, but this time when access is restricted. Some comments on strategy conclude the chapter.

In his "Afterthoughts on Modeling", the author writes that "the goal of modeling is to gain insight into some problem that occurs in the natural world of real events"; the goal of insight is illustrated in his numerous examples. Another point mentioned is the recurrence of common themes in different settings.

Beltrami's book provides an excellent introduction to mathematical modeling; its clear and simple style is a pleasure to read. The text should prove popular with all students of the subject. I can recommend it wholeheartedly: no university library should be without it.

Spatial Statistics and Computational Methods, by Jesper Møller (Ed.), Springer Verlag, 2003, Softcover, pp. 202, US$67.95, ISBN 0-387-00136-0.

Reviewer: Nick Hamm, School of Geography, University of Southampton, Southampton SO17 1BJ, United Kingdom. Email: n.hamm@soton.ac.uk

This edited book has been published as part of Springer-Verlag's series of "Lecture Notes in Statistics". The book arose from a workshop on Spatial Statistics and Computational Methods which was held at the University of Aalaborg, Denmark in August 2001 (www.math.aau.dk/~mbh/SS-and-CM2001/). The workshop was supported by the Danish Network in Mathematical Physics and Stochastics (MaPhySto) (www.maphysto.dk/) and by the European Union's Training and Mobility of Researchers (TMR) network (www.cordis.lu/tmr/).

The reader of this review should be aware of the context in which it is written. I am an environmental scientist who has an interest in applying statistical techniques within my work and who has undergone some training in statistics. I was interested in understanding the techniques presented with a view to applying them within my own work rather undertaking a detailed critique of the theoretical and methodological developments.

The book is split into four chapters, each of which comprises one day's material for the associated course. The chapters adopt a tutorial, rather than reference book, style. As stated in the preface, the four chapters are closely related, so there are several cross-references. However, each chapter is a valuable reference in its own right.

The first chapter, by Petros Dellaportas and Gareth Roberts, provides and "Introduction to MCMC". This begins with a general introduction before describing the Gibbs sampler and Metropolis-Hastings algorithms. There are two further sections and an appendix covering theory and practical implementation. An extended example is also given. The chapter also gives web-links to freely available software. This chapter is well written and informative and provided a good background for the rest of the book, since the other authors make substantial use of MCMC. However, the reader will need to consult more widely to gain a broader introduction to MCMC.

The second chapter, by Peter Diggle, Paulo Ribeiro and Ole Christensen covers model-based

geostatistics. This refers to the "application of explicit parametric stochastic models and formal, likelihood-based methods of inference to geostatistical problems" (p. 44). The application of this common approach to estimation and prediction, they argue, differs from the "classical" approach to geostatistics as developed in mining, engineering geology and the environmental sciences. This chapter includes sections on maximum likelihood estimation as well as Bayesian inference before presenting an example based on the famous Swiss rainfall data set. The final substantial section provides an overview of generalised linear spatial models (GLSM). This chapter also provides links to R packages, which can be used for the implementation of model-based geostatistics and GLSM. These R packages include some example data sets. A targeted reading list is also provided. This is an excellent chapter to read before consulting some of the research papers on this subject or actively using model-based geostatistics.

Chapter 3, by Merrilee Hurn, Oddvar Husby and Havard Rue, provides "A Tutorial on Image Analysis". It begins with a discussion of the aims of image analysis and introduces the concepts of low-level (where the objective is to improve image quality) and high level tasks (which aim to locate and identify objects). It then outlines the contribution that statistics (in particular, Bayesian statistics) can make to a subject which is widely covered in computer science and engineering. The chapter then proceeds to cover Markov random field models, binary and categorical images and grey-level images before moving onto high-level imaging. The chapter concludes with an extended example, drawn from ultrasound imaging, which is used to illustrate many of the ideas presented previously. Overall this chapter was well written and informative. However, I did feel that more signs could be given to allow the reader to take this subject further. There is a short section providing some further reading, but some web-based examples would have been helpful.

The final (fourth) chapter, by Jesper Møller and Rasmus Waagepterson provides "An Introduction to Simulation-Based Inference for Spatial Point Processes". This chapter begins with a general introduction and definition for a spatial point process. It also introduces two data sets, which are used for illustrative purposes throughout the chapter. It then moves on to provide substantial sections on Poisson point processes, summary statistics, aggregated point-processes and Markov point-processes. I found this to be the most "tough going" chapter. The authors make heavy use of notation, which required substantial application to get to grips with. The writing style could also be improved. Overall, this chapter is informative and the use of common examples is very helpful. However, wider reading is required to get a basic grasp of this subject. The chapter also provides pointers towards further reading and software packages.

Overall, I found this book to be a valuable contribution. As stated in the preface, MCMC and spatial statistics have undergone major development over the past ten years. The tutorials covered in this book capture some of these developments and present them in a manner that is accessible to the statistically minded scientific community.

---

11. TIES Board of Directors

The following are the names of the elected members of TIES Board of Directors. All terms are from September 1, 2004, to August 31, 2006, except the 4-year terms of the regional directors.

President:

Anders Grimvall
(angri@mai.liu.se)

President-Elect:

David Brillinger
(brill@stat.berkeley.edu)

Secretary:

Daniela Cocchi
(cocchi@stat.unibo.it)

Treasurer:

Bronwyn D. Harch
(Bronwyn.Harch@csiro.au)

Publications Officer:

Paul D. Sampson
(pds@stat.washington.edu)

Regional Representatives (date term ends**):**

North America:

Montserrat Fuentes (31/08/08)
(fuentes@stat.ncsu.edu)

Jeanette O'Hara Hines (31/08/06)
(johara@uwaterloo.ca)

Europe:

Peter Challenor (31/08/08)
(P.Challenor@soc.soton.ac.uk)

Gudmund Host (31/08/06)
(gudmund.host@nr.no)

Other Regions:

Lelys Bravo de Guenni (31/08/08)
(lbravo@cesma.ub.ve)

Jacky Galpin (31/08/06)
(jacky@galpin.co.za)

TIES Newsletter is a publication of the International Environmetrics Society (TIES). It is published semiannually, or whenever the need arises, by The International Environmetrics Society and distributed to TIES members as part of their annual dues. Contact Anders Grimvall,

angri@mai.liu.se,

or Bronwyn Harch,

Bronwyn.Harch@csiro.au,

for questions regarding membership and other benefits.

Objectives of the Newsletter include (but are not limited to):

- To keep TIES members informed of what is happening within the Society;
- To cover news in latest developments in theory and applications of environmetrics;
- To be a forum for discussion of a broad range of issues which are of interest to members of TIES and are consistent with the objectives of the Society.
- To facilitate communication between environmental scientists and statisticians about research problems of mutual interest.
- To provide details about upcoming conferences and workshops related to Environmetrics;
- To announce members' news that are worthy of notice or recognition (e.g., awards, prizes and honors received, promotions, appointments, etc.)

Communications, (e.g., contributions, comments and suggestions) regarding this publication should be addressed to the TIES Newsletter editors: Sylvia Esterby (SREsterby@ouc.bc.ca), Alessandro Fasso (alessandro.fasso@unibg.it), or Paul Sampson (pds@stat.washington.edu).

The Editors would like to encourage TIES members to submit items for publication in the Newsletter. We would like to have a very comprehensive publication that is of interest to our members by including items such as members' and regional news, Environmetrics and related conferences, research projects and programmes, book reviews, letters to the editor and articles of general interest.

We would like to thank the members who responded to our call and contributed to this issue. It is our hope that the Newsletter will be a valuable platform for discussion and exchange of ideas among us. We will be happy to hear your views about the contents and style of this issue. We hope that you will be a reader as well as a contributor.

TIES Webpage:
http://www.nrcse.washington.edu/ties