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## A MESSAGE FROM THE PRESIDENT

### What Are the Open Problems in Bayesian Statistics?

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From time to time, I am approached by young students who are considering a career in statistics and who ask "What are the open problems in statistics?" While I'm often tempted to respond that "we don't tend to think that way in statistics," the nature of the question tends to imply a student with mathematical training of the kind that I usually look for in a prospective student, and so I do my best to give a thoughtful response and cast our activities in terms of "open problems."

This scenario came to my mind as I sat down to contemplate writing this column. It had already occurred to me that one of the consolations of being President of ISBA (or President of any society) is that one can ask others to do the actual work that's attributed to the President of the society. It was but a short step to realize that this might also apply to the writing of my column. Indeed, inspired by the notion of "crowd-sourcing" that is all the rage, I realized that as ISBA President I had been given an unparalleled opportunity for "statistician-sourcing." People might respond to the ISBA President in ways that they might not respond to humble old me. And so I thought that I would seize the opportunity, assemble a distinguished panel of statisticians and see what their views on the "open problems of statistics" might be. I imagined that this might be of interest beyond my recruiting scenario.

My polling methodology is rather open to critique, I am afraid. In particular, the individuals assembled are a highly non-random sample—they are a set of people who have the misfortune of being in the intersection of two sets: (a) highly-respected senior statisticians and (b) entries in my email address book.

The question that I asked was "What do you view as the top two or three open problems in Bayesian statistics?" The focus on Bayes is due to the ISBA context of course, but I also think that frequentist statisticians are more accustomed to thinking in terms of "open problems," and I wanted to make the question challenging (given that I didn't have to answer it myself). Here is the distinguished group that I wrote to: Andrew Barron, Susie Bayarri, Jim Berger, José Bernardo, Peter Bickel, Larry Brown, Brad Carlin, George Casella, Ming-Hui Chen, Merlise Clyde, Phil Dawid, Persi Diaconis, David Draper, David Dunson, Brad Efron, . . . *Continued on page* 2.

*In this issue*

**MESSAGE FROM THE PRESIDENT,** *Continued from page 1.* ... Steve Fienberg, Peter Green, Alan Gelfand, Andrew Gelman, Ed George, Malay Ghosh, Nils Hjort, Peter Hoff, Jay Kadane, Rob Kass, Jun Liu, Steve MacEachern, Xiao-Li Meng, Peter Mueller, Tony O'Hagan, Luis Pericchi, Sonia Petrone, Fernando Quintana, Adrian Raftery, Sylvia Richardson, Thomas Richardson, Christian Robert, Judith Rousseau, Fabrizio Ruggeri, Mark Schervish, David Spiegelhalter, Terry Speed, Steve Stigler, Aad van der Vaart, Stephen Walker, Larry Wasserman, Mike West, and Wing Wong. I (amazingly) had a response rate not too far from 100%, and the responses were invigorating.

I note parenthetically that one person didn't answer my question but instead conducted his own mini-poll of colleagues the results of which he transmitted to me; impressed by this skill in delegation of responsibility, I intend to nominate this person in the next ISBA presidential election.

I turn to the results of my poll. I have organized the results into categories, with examples of open problems listed within each category. In several cases I have used quotes from individuals when I felt that a paraphrase would be less clear than the original text. I organize my results as a "top-five list."

5. *Nonparametrics and semiparametrics*. Bayesian nonparametrics is viewed by some of my respondents as a class of methods looking for a problem, and so the main open problem in Bayesian nonparametrics is (for some people) that of finding a characterization of classes of problems for which these tools are worth the trouble.

   But the success stories in frequentist nonparametrics are alluring to many in my group of respondents, and the concrete open problems raised for nonparametrics by the group are generally frequentist in character. From Andrew Barron: "Suppose in an i.i.d. sampling model that the parameter value of the distribution from which the data are sampled has the property that the prior probability of Kullback neighborhoods of that value are given positive probability. Then, from that condition alone, does it follow that the risk of the Bayes procedure at that parameter value will converge to zero?" Wing Wong: "Can we construct priors on a very large parameter space (e.g., the space of all densities) so that a 'marginal inference' of a function of the parameter can be viewed as 'optimal' in some sense? Must the prior depend on the function?" Larry Wasserman: "Find a full nonparametric prior on a function space such that the $(1-\alpha)$ posterior probability region has frequentist coverage (approximately/asymptotically) equal to $(1-\alpha)$."

   Many of the problems listed in the other categories below were also raised in the nonparametric context. Indeed, problems surrounding prior specification and identifiability were viewed as particularly virulent in the nonparametric setting. David Dunson: "Nonparametric Bayes models involve infinitely many parameters and priors are typically chosen for convenience with hyperparameters set at seemingly reasonable values with no proper objective or subjective justification." And Stephen Walker: "Despite a lot of recent work on Bayesian nonparametric regression I am far from convinced that the current presented models will stand the test of time. The models are too big and too unidentifiable."

   Finally, it was noted by several people that one of the appealing applications of frequentist nonparametrics is to semiparametric inference, where the nonparametric component of the model is a nuisance parameter. These people felt that it would be desirable to flesh out the (frequentist) theory of Bayesian semiparametrics. For example, Thomas Richardson asked for "Bayesian approaches to dealing with mis-specification, e.g., when will a $(1-\alpha)$ posterior credible region for a parameter have $(1-\alpha)$ frequentist coverage even if some ('nuisance') parts of the likelihood are mis-specified?".

4. *Priors*. Not surprisingly, priors were on the minds of many. Elicitation remains a major source of open problems. Tony O'Hagan avers: "When it comes to eliciting distributions for two or more uncertain quantities we are working more or less in the dark." Mike West pointed to the fact that many scientific fields express their prior knowledge in terms of "scientifically predictive models," and using these models in a statistical setting involves the quintessentially Bayesian tasks of understanding assumptions and conducting detailed sensitivity

analyses. Aad van der Vaart turned objective Bayes on its head and pointed to a lack of theory for "situations where one wants the prior to come through in the posterior" as opposed to "merely providing a Bayesian approach to smoothing." And Sonia Petrone noted that we often wish to model data that arise from human behavior and human beliefs, and in such settings the modeling of human beliefs thus arises (implicitly at least) in both the likelihood and the prior, and there should be some consistency in our approaches to these specifications.

3. *Bayesian/frequentist relationships*. As already mentioned in the nonparametrics section, many respondents expressed a desire to further hammer out Bayesian/frequentist relationships. This was most commonly evinced in the context of high-dimensional models and data, where not only are subjective approaches to specification of priors difficult to implement but priors of convenience can be (highly) misleading. Open problems discussed here often are couched as statements about frequentist coverage of Bayesian procedures. More broadly, Brad Efron reminds us that "two connecting technologies are empirical Bayes and the bootstrap." Some respondents pined for non-asymptotic theory that might reveal more fully the putative advantages of Bayesian methods; e.g., David Dunson: "Often, the frequentist optimal rate is obtained by procedures that clearly do much worse in finite samples than Bayesian approaches." Finally, some respondents, whose names I will not reveal for their own protection, asked whether there might be a sense in which it is worthwhile to give up some Bayesian coherence in return for some of the advantages of the frequentist paradigm, including simplicity of implementation and computational tractability.

2. *Computation and statistics*. It was interesting to see some disagreement on the subject of computation, with some people feeling that MCMC has tamed the issue, and with others (the majority by my count) opining that many open problems remain. E.g., Alan Gelfand: "Arguably the biggest challenge is in computation. If MCMC is no longer viable for the problems people want to address, then what is the role of INLA, of variational methods, of ABC approaches?".

   Several respondents asked for a more thorough integration of computational science and statistical science, noting that the set of inferences that one can reach in any given situation are jointly a function of the model, the prior, the data and the computational resources, and wishing for more explicit management of the tradeoffs among these quantities. Indeed, Rob Kass raised the possibility of a notion of "inferential solvability," where some problems are understood to be beyond hope (e.g., model selection in regression where "for modest amounts of data subject to nontrivial noise it is impossible to get useful confidence intervals about regression coefficients when there are large numbers of variables whose presence or absence in the model is unspecified a priori") and where there are other problems ("certain functionals for which useful confidence intervals exist") for which there is hope. Terry Speed raised the intriguing possibility of a connection between the notion of "inference being possible" when (and only when) simulation from a model is possible (and this may well be the subject of a future column; not mine, but Terry's).

   Several respondents, while apologizing for a certain vagueness, expressed a feeling that a large amount of data does not necessarily imply a large amount of computation; rather, that somehow the inferential strength present in large data should transfer to the algorithm and make it possible to make do with fewer computational steps to achieve a satisfactory (approximate) inferential solution.

   Other respondents were concerned with interactions between model complexity and algorithmic complexity; for example Jun Liu referred to a notion of "weak identifiability" in complex latent variable models where even though parameters might be identifiable via a proper posterior the inference algorithm might run aground (e.g., MCMC failing to mix).

1. *Model selection and hypothesis testing*. I have placed this topic as number one not only for the large numbers of respondents mentioning it, but also for the urgency that was transmitted. From Jim Berger: "We just don't have any agreed upon methods, and

the problem is especially important because the Bayesian and frequentist methods can differ so much. This is also crucially important because science is choking on the multiplicity problem, and Bayesian model selection is likely the way forward to its solution." George Casella is concerned about lack of theory for inference after selection: "We now do model selection but Bayesians don't seem to worry about the properties of basing inference on the selected model. What if it is wrong? What are the consequences of setting up credible regions for a certain parameter $\beta_1$ when you have selected the wrong model? Can we have procedures with some sort of guarantee?". And many people feel that prior specification for model selection is still wide open.

There are also open problems at the foundations of model selection. José Bernardo: "My favorite problem is to reach some form of agreement on hypothesis testing and model selection. There are two rather different Bayesian attitudes: to compute a posterior probability for the hypotheses (which needs a sharp prior, very different from those commonly used for estimation) or to use decision analysis to minimize an expected loss (which may be done with conventional, possibly noninformative, priors)." David Draper agrees for the need for more work on decision-theoretic foundations in model selection (and he adds that he views Bayesian decision theory for group decision-making as entirely open). Christian Robert holds out for some radical new framework.

On a more practical note, many people noted the lack of off-the-shelf methods for model criticism and diagnostics. Steve MacEachern: "Our current diagnostics are in a sorry state." And David Spiegelhalter: "How best to make checks for prior/data conflict an integral part of Bayesian analysis?" And the last word on the matter goes to Andrew Gelman: "For model checking, a key open problem is developing graphical tools for understanding and comparing models. Graphics is not just for raw data; rather, complex Bayesian models give opportunity for better and more effective exploratory data analysis."

And thus ends my statistician-sourced column, which I've quite enjoyed "writing." I will forgo drawing any grander conclusions at this point, for at least two reasons: (1) I am past my deadline and am being pursued by the Editor of the Bulletin, and (2) I am well over my page limit. I do wish to take the opportunity, however, to solicit reactions from the larger community. I'd enjoy hearing from anyone who feels that my panel of experts has missed a fundamental "open problem" or otherwise wishes to comment on the material presented here. My email is jordan@stat.berkeley.edu. With any luck I'll get enough responses to fill my second column.▲

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## A MESSAGE FROM THE EDITOR

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Spring has arrived (in the northern hemisfere) and with the new season we are witness of a variety of changes. For example, in this issue of the Bulletin we have the first MESSAGE from our 2011 ISBA President, Michael Jordan. The list of distiguished Bayesians that have collaborated with him to produce this list of *Open Problems in Bayesian Statistics* is impressive. Hopefully, this contribution will trigger a fruitful discussion among our members!

Also in this issue, you will find other interesting and useful sections. In particular, I call your attention to the Annotated Bibliography Section where the Editor, Beatrix Jones, asked Nicholas Cummings to write an article on the use of the Bayesian methods in Ecology. He focusses on the capture-recapture problem and provides a wide list of interesting references. In addition, and following the idea he started in the December issue, our Student's Corner Editor, Luke Bornn, poses another question to his panel of distiguished colleagues. The result is a revealing set of answers. The Interviews Section presents the conversation of our Editor, Donatello Telesca, with Jeff Rosenthal where some aspects of the use of MCMC methods in Bayesian Statistics are discussed.

In this issue, we also introduce the ISBA - SECTIONS Section. There, you will find relevant information from the Sections of the Society. Finally, I want to encourage all members of ISBA to contribute to the Bulletin with their suggestions, manuscripts and announcements. Please do not hesitate to contact me or any member of the Editorial Board. ▲

## BAYESIAN ANALYSIS - A MESSAGE FROM THE EDITOR

### UPDATE FROM BA

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2010 was a good year for Bayesian Analysis, as we saw a large increase in the number of submissions in the second half of the year. We added an editor and several AEs to deal with the increased load, although it seems that our response times did slow a bit. Of the submissions in 2010, five are still under review as of mid-March, and the median time for review completion of the rest was 68 days. I will work to bring that number back down this year.

The March issue of BA features a close look at support vector machines from a statistical perspective, with new techniques for computation, by Nicholas Polson and Steven Scott. Use of latent variables provides a familiar framework for both interpretation and computation. Additional interpretation and perspective appears in discussions by Bani Mallick, Sounak Chakraborty, and Malay Ghosh; by Babak Shahbaba, Yaming Yu, and David van Dyk; and by Chris Hans. This issue also contains other fine articles in nonparametrics, functional data analysis, and computational methods.▲

## ISBA - SECTIONS

### OBJECTIVE BAYESIAN SECTION

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I would like to extend a warm welcome to ISBA members to join the new ISBA Objective Bayesian Section, and also to join us in Shanghai, China from June 11-15, 2011 for O-Bayes 2011, the ninth workshop in a series initiated in 1996. The program committee and local organizers of the workshop (led by Dongchu Sun and Yincai Tang) are working hard to ensure that it will be an unforgettable experience; see http://www.sfs.ecnu.edu.cn/obayes2011/index.html for further information regarding the workshop. Note also that registration for the workshop is now possible through the ISBA website (thanks to Merlise Clyde), and can be accessed through the conference webpage above.

On behalf of the other OB Section officers (Dongchu Sun - program chair; Jaeyong Lee - secretary; and Brunero Liseo - treasurer), I would also like to solicit ideas for future activities of the section. We will, of course, have a section meeting in Kyoto at the 2012 ISBA World Meeting. And we would appreciate suggestions or proposals for locations to hold O-Bayes 2013 (the workshop being biennial).▲

# ANNOTATED BIBLIOGRAPHY

## Bayesian Mark-Recapture Analysis

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Bayesian methods of inference are now commonly used for many ecological applications, including mark-recapture studies. The complexity of data structures, frequent modeling of hidden data processes, and existence of previous studies and scientific knowledge concerning survival, recapture, and other probabilities and population parameters that can be incorporated via prior distributions all point to the utility of Bayesian techniques.

Historically, mark-recapture and related procedures were developed for estimating population sizes and survival probabilities for populations of interest, including birds, fish, and many mammals. Recapture problems like these could generally be managed by traditional frequentist statistics. In recent years, though, these studies have expanded their use to include estimation of population dynamics in a more general sense, including parameters governing movement patterns; mortality, birth, and other state transition probabilities; and even markers of natural selection in the wild. These new ways of exploiting the full potential of mark-recapture data (now often including a variety of covariates in addition to a simple headcount) required more sophisticated and flexible data analyses.

The lack of a uniform terminology within ecological population estimation can make discussion of the topic difficult. There are many study types and subtleties within the discipline. A summary of common terms follows (Schwarz and Seber, 1999):

Mark-recovery (also called ring-recovery, band-return): Marking and releasing individuals (often at regular intervals, such as each year) and then recording the recovery of marked individuals after a specified event (usually death).

Mark-recapture (also called capture-recapture, capture-mark-recapture): Capturing individuals in the wild, marking and releasing them, and then returning one or more times to recapture individuals (sometimes specifically targeting marked individuals, sometimes taking a new random sample and recording the number already marked).

Mark-resight: Individuals are only captured once, marked, and released. Sighting data are then collected on the marked individuals periodically but are not recaptured.

While this bibliography focuses specifically on mark-recapture, it includes resources that discuss each of these study designs.

Bayesian methods offer ecologists an ideal system of incorporating preexisting knowledge and covariate effects in the form of prior distributions, provide a way to manage missing data (common due to low recapture probabilities and naturally mortality) via hierarchical structures, allow for multiple interacting processes inherent to ecological processes, and allow for highly interpretable estimates. Additionally, the availability of greater computing power and the development of user-friendly (and free) programs like WinBUGS allow the analysis of mark-recapture data with relative ease.

Below, I summarize key contributions to the mark-recapture and Bayesian mark-recapture literature.

- Schwarz CJ, Seber GAF (1999) Estimating animal abundance: review III. *Statistical Science*, **14**: 427–456. This article is not strictly Bayesian (nor strictly about mark-recapture), but the authors provide a nice overview of animal abundance estimation methods that includes both topics. Though over ten years old, the paper is a good starting point for learning the terminology and various techniques used within the field.

- Gazey WJ, Staley MJ (1986) Population estimation from mark-recapture experiments using a sequential Bayes algorithm. *Ecology*, **67**: 941–951. A foundational, early article, Gazey and Staley outline the insufficiencies related to traditional estimation methods for mark-recapture studies, particularly for studies with low sample sizes. The authors justify using Bayesian techniques with noninformative priors, which eliminates bias, produces narrow confidence intervals, and allows for straightforward interpretation.

- George EI, Robert CP (1992) Capture-recapture estimation via Gibbs sampling. *Biometrika*, **79**: 677–683. The authors employ Gibbs sampling to obtain Bayesian estimates from mark-recapture data. They demonstrate the advantages of extending the possible choices of prior distributions (though still staying limited to prior distributions that produce easily evaluated conditional posterior distributions).

- Dupuis JA (1995) Bayesian estimation of movement and survival probabilities from capture-recapture data. *Biometrika*, **82**: 761–772. Dupuis details the missing data structure inherent in capture-recapture studies and proposes using the Gibbs sampling algorithm as a natural way of accounting for it. The author also uses multiple-site data to obtain movement probability estimates.

- Vounatsou P, Smith AFM (1995) Bayesian analysis of ring-recovery data via Markov chain Monte Carlo simulation. *Biometrics*, **51**: 687–708. This article is restricted to ring-recovery (band-return) data in a Bayesian context but continues to expand the modeling possibilities by introducing the Metropolis-Hastings (here called the Hastings-Metropolis) algorithm to the discussion. The authors compare the efficiency and accuracy of Gibbs, Metropolis-Hastings, and maximum likelihood methods as they are applied to several potential models of a ring-recovery dataset, demonstrating the greater flexibility and reduction of assumptions offered by the Bayesian methods.

- Brooks SP, Catchpole EA, Morgan BJT (2000) Bayesian animal survival estimation. *Statistical Science*, **15**: 357–376. Brooks et al. expand on the work presented in Vounatsou and Smith on band-return models as well as detailing the specific mechanics of Bayesian inference for open population capture-recapture models. This is a useful paper for statisticians wishing to actually implement the methods for these cases, as the authors explicitly derive conditional distributions and include BUGS code. Also included are fairly general sections on the use of model assessment and model averaging.

- Brooks SP, Catchpole EA, Morgan BJT, Barry SC (2000) On the Bayesian Analysis of Ring-Recovery Data. *Biometrics*, **56**: 951–956. As Bayesian methods for population estimation becomes more ubiquitous, the authors weigh some of their advantages and drawbacks in the context of ring-recovery. They caution against reckless implementation, citing high sensitivity of parameter estimates to prior choice. They also conclude, however, that in cases where a unique maximum likelihood estimate is unavailable or difficult to obtain, Bayesian estimation still provides narrow, accurate credible intervals.

- Madigan D, York JC (1997) Bayesian methods for estimation of the size of a closed population. *Biometrika*, **84**: 19–31. Though not strictly on the topic of capture-recapture, this article proposes an interesting Bayesian strategy for incorporating several different sources of data (lists of uniquely identified individuals in a population, which can be specified as having various dependency structures) to estimate population size. The method involves matching individuals across lists and using the numbers of matches as well as the numbers unique to each list as a way to estimate the number of individuals missing from all lists in order to estimate total population size.

- Brooks SP, King R, Morgan BJT (2004) A Bayesian approach to combining animal abundance and demographic data. *Animal Biodiversity and Conservation*, **27**: 515–529. This article offers a state-space framework with which to combine capture-recapture data with other data sources-in particular at the population level-in order to obtain more accurate parameter estimates describing population dynamics. The authors discuss using the Kalman filtering for estimation as well as an MCMC algorithm to avoid model assumptions of normality and linearity that might otherwise be required. Advantages and disadvantages of using WinBUGS for ecological analyses are presented along with their WinBUGS code.

- Barry SC, Brooks SP, Catchpole EA, Morgan BJT (2003) The analysis of ring-recovery data using random effects. *Biometrics*, **59**: 54–65. The authors detail their methodology for incorporating random effects into band-return data models, particularly as a way of accounting for overdispersion (for example, an effect for year of recapture). They include these random effects in hierarchical logit models of the appropriate transition probabilities. The paper argues that in the common case of overdispersion, adding random effects obviates the need to have an overall inflation factor scaling the standard errors.

- Gimenez O, Rossi V, Choquet R, Dehais C, Doris B, Varella H, Vila JP, Pradel R (2007) State-space modelling of data on marked individuals. *Ecological Modelling*, **206**: 431–438. Gimenez et al. propose using a state-space framework as a more flexible, hierarchical way to model recapture data. The article suggests multinomial distributions for both a hidden-Markov process and a data observation process, the latter including "unobserved" as a potential state. Unlike many traditional mark-recapture methods, the technique recommended here uses individual-based data as opposed to animal counts for each time period. This allows covariate data to be incorporated into the prior distributions for the appropriate parameters.

- Clark JS, Ferraz G, Oguge N, Hays H, DiCostanzo J (2005) Hierarchical Bayes for structured, variable populations: from recapture data to life-history prediction. *Ecology*, **86**: 2232–2244. As with the article by Gimenez, et al., this paper uses a hidden data structure and hierarchical matrix transition models to attempt parameter estimation. The methods described here allow for a more realistically heterogeneous population, with recapture probabilities dependent on covariates. Clark et al. demonstrate the high probability of biased parameter estimates for populations dynamics when using traditional maximum likelihood methods compared to the Bayesian hierarchical framework.

- Ovaskainen O, Rekola H, Meyke E, Arjas E (2008) Bayesian methods for analyzing movements in heterogeneous landscapes from mark-recapture data. *Ecology*, **89**: 542–554. This article uses a hierarchy of process and observation models to tackle some of the problems inherent in using mark-recapture data collected from a geographic grid to estimate movement parameters. By classifying areas by habitat type and assuming different parameters for each of these types, Ovaskainen et al. improve mortality estimates, though movement estimates remain challenging, leading the authors to suggest improvements in study design that will take greater advantage of their modeling method.

The methods above focused on parametric models. It has been suggested that nonparametric methods offer greater flexibility and more satisfactory estimates as compared to parametric methods. Two examples:

- Tardella L (2002) A new Bayesian method for nonparametric capture-recapture models in presence of heterogeneity. *Biometrika*, **89**: 807–817. Tardella proposes an unconstrained nonparametric model to estimate the unknown distribution of recapture probabilities, citing the strong assumptions and insufficiency of traditional parametric models as well as the need to account for the heterogeneity of these probabilities within a population. The article concludes that nonparametric methods could be used in more complicated capture-recapture models and that Bayesian estimation is effective in this context even if prior knowledge is not incorporated via prior distributions.

- Gimenez O, Covas R, Brown CR, Anderson MD, Brown MB, Lenormand T (2006) Nonparametric estimation of natural selection on a quantitative trait using mark-recapture data. *Evolution*, **60**: 460–466. Gimenez, et al. present an interesting use of mark-recapture data to evaluate natural selection on a quantitative trait in the wild (specifically, body mass of birds), modeling the data nonparametrically by using penalized splines. The authors used noninformative priors throughout and employed MCMC methods as the most efficient way to evaluate the complex data structure.▲

# INTERVIEWS

## JEFF ROSENTHAL

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Jeffrey Rosenthal is Professor of Statistics at the University of Toronto, Canada. He received his Masters and Ph.D. at Harvard working with Persi Diaconis on seminal contributions to the convergence theory of Markov chains. Prior to joining the University of Toronto, Jeff started his career at the University of Minnesota. His research focuses on the theory of Markov chain Monte Carlo, probability, statistical computation and stochastic process. Jeff is a fellow of the Institute for Mathematical Statistics and has received several national and international awards. Among his recognitions we cite the Premier's Research Excellence Award and the COPSS President's Award. Jeff's CV currently lists more than 80 technical papers.

I had the pleasure of meeting Jeff at MCMSki 2011 and he graciously agreed to answer some of our questions.

1. *Bayesian, as well as non-Bayesian practitioners often learn and use MCMC techniques in the form of simple algorithms and get along with their lives without too much emphasis on the theory of Markov chains. Such practitioners might be tempted to ask, what is Theory good for?*

Hello Donatello, thanks for interviewing me!

Certainly the biggest impact of MCMC has come from the wide variety of successful applications. However, theory still has an important role to play. Basic theoretical concepts such as irreducibility, stationarity, laws of large numbers, and so on, underlie virtually all uses of MCMC. In addition, more sophisticated theoretical notions such as quantitative and qualitative convergence rates (e.g. geometric ergodicity), and central limit theorems, and optimal proposal covariance (obtained from diffusion limits), can offer great insights into how to improve and tune and understand the MCMC algorithms when they are run.

In addition, many advances in MCMC techniques, such as tempering, hybrid chains, transdimensional chains, and now adaptive MCMC, all would not have been possible without a deep understanding of the theory to determine which algorithm extensions are valid and which are not.

I don't suggest that applied MCMC users should all become theorists – on the contrary, they should keep the applications coming. But we should all be aware that theory has also been an important part of MCMC development and has a lot to teach us too, including useful advice and guidance for MCMC practitioners.

2. *Often adaptive techniques are left out of the basic MCMC curriculum and even standard textbooks sometimes dismiss the topic with few excuses. Are there concepts, you think should absolutely make it into our classrooms?*

Well, adaptive MCMC is still fairly new, but it seems very promising and exciting, and I predict that it will be more and more important in the years ahead. I do think that everyone should at least understand how it has the potential to improve MCMC so much, but how it can fail if certain conditions are violated. Indeed, I think it's fair to say that theory has been central to the development of adaptive MCMC, and practitioners avoid it at their peril.

More generally, I think every MCMC user should have some basic understanding of Markov chain theory, convergence rates, error bounds, optimal scaling, central limit theorems, and so on, regardless of their particular area of emphasis. Of course, such theory will not solve all of the challenges that arise in applied work, but it is still an important and useful part of the field.

3. *The last MCMSki meeting included a panel on the challenges associated with MCMC-driven inference and high dimensional problems. Do you think the increasing trend in the consideration of data-intensive problems will eventually lead to the abandonment of these techniques?*

High dimensional problems certainly present lots of challenges for MCMC. But they present challenges for all other methods too! I think MCMC is so versatile and powerful that it will be around for many years to come – though we should also maintain the flexibility to use other methods when appropriate, rather than automatically assume that MCMC is the answer to every problem.

4. *Your book "Struck by Lightning: The Curious World of Probabilities" is among the best selling nonfictional books in Canada. Did you have to do things like book signings or have to keep obsessed fans at bay?*

Actually, yes! My book was much more popular than expected, and as a result I ended up doing a very large number of media interviews, public talks, book signings, etc. (see www.probability.ca/sbl). It was a very interesting experience, meeting lots of different people and getting invited to speak to all sorts of groups that otherwise would never have even heard of me. And I still get e-mails from readers and viewers asking me various probability questions, ranging from the interesting to the mundane to the bizarre. This has given me a whole new perspective about how statistics and probability are viewed "out there" by the general public with no academic training in these areas. Not to mention a peek at the inner workings of such unusual worlds as television and news media, the publishing business, speakers bureaus, documentary makers, and so on. It's been quite a ride!

5. Looking at your web page (fun section) I see fun things ranging from drawing to social dancing. My favorite is improvisational comedy, so I will put you to the test: any comedic acronyms we can assign to ISBA?

Hm, let's see. Perhaps "I See Big Apes"? Or "Infinity Seems Big, Actually". Or "Instant Satisfaction, Before Analysis!" Or a strange question, like "Isn't Seven Before Ate?"

But actually, improvisational comedy isn't so much about clever word play, as it is about learning to "go with the moment" and make an interesting scene out of whatever audience suggestion or performer's line happens to arise. In that sense, it has useful lessons for real life too: when unexpected events arise, we can either worry and complain about them, or accept them and go with the flow, and improvisers are trained to do the latter (as best as we can). Anyway, performing improv is a lot of fun, at least when it goes well and generates lots of spontaneous laughs and entertainment.

In addition to improv, I have also done a fair bit of musical performing. This has included sometimes participating in the musical "cabarets" at the closing banquets of some of the Bayesian meetings, so some of your readers might have seen me perform there. If so, then I hope they will forgive me for whatever suffering I have caused!

*Thanks to Jeff, for the kindly answering our questions.*

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## STUDENTS' CORNER

### Q & A

Luke Bornn
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In this issue's Students' Corner, we continue our Q & A with a panel of leading Bayesian statisticians. If you have a question for the panel for future issues, please email me. Following the Q & A, find the dissertation abstract of Andrea Riebler, entitled "Multivariate Age-Period-Cohort Models." If you are newly graduated and would like to publish your thesis abstract, don't hesitate to contact me.

### "Who is the Statistician or Scientist you admire the most? Why?"

Dani Gamerman
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This is certainly a very tough question as there are many scientists that have changed the way the world is and the way we think about it. There is no way to avoid admiring people like Galilei, Newton, Gauss, Einstein, Freud for their immense contribution to Science and mankind.

I think that Statistics' preeminence in Science is some orders of magnitude smaller than other branches of Science. This may be related to the relative young age it has, when compared to other fields. Future generations will witness how important Statistics will become in everyday life. Despite that, I prefer to name one of us. Firstly because we should be praising our own and secondly because these are the people we are more familiar with their contribution to Science.

We have in Statistics a long and glorious list of names that have changed the way Statistical Science is with an enormous amount of work to our discipline. And we should be proud of them! The list must start with Fisher and must include names of Pearson, Neyman, Jeffreys, Rao, Lindley, and last but not least, Rev. Thomas Bayes. I am certainly forgetting a few names but these are the names that came more easily to my mind and that must say something about their contribution.

Despite the presence of both classical and frequentist statisticians in the above list, I have decided to take a frequentist as my top statistician. There are a few reasons for doing it: a) I may get fired from this ISBA bulletin position more easily (and nobody here would complain!); b) I may stir up this discussion corner by adding some controversy; c) by highlighting what is missing among us we can aim at mitigating this apparent deficiency.

Good reasons to admire a scientist are the importance of his research input through many decades even after reaching retirement age and important contributions scattered about many different areas of Statistics. The importance of a research contribution may be associated with having opened new ways to see things or new things to see, but also due to the dissemination of ideas to others statisticians and scientists in general through scientific books at all levels.

For these reasons, I have decided to single out Sir David Cox. His areas of research cover a diversity that is very rarely seen and include Foundations of Inference, Regression Models, Survival Analysis, Design of Experiments, Stochastic Processes, and Time Series. The full list of his publications includes some 17 books and more than 300 papers. More important than the quantity and the diversity is the relevance of his work to all the areas that he touched on. My own Ph.D. thesis is a testimony to that as it revolved around extensions of his seminal 1972 JRSSB discussion paper Regression Models and Life Tables. Cox celebrated his 80th birthday in 2004. His unstoppable strive for (top quality) work made him publish 1 Biometrika paper and 2 JRSSB papers that year!

Despite his firm adherence to the classical or frequentist paradigm, one can find strong Bayesian connections in his work. One of his main contributions to Statistics is nowadays known as Cox processes. This idea appeared in a paper that is half a century old but is still very popular. This paper proposed a model with an important component that may (or should) be interpreted as a prior distribution.

His CV lists more than 20 Honorary Doctorates at universities around the world and I am proud to belong to one of them. When UFRJ awarded him an Honorary Doctorate in 2000, our Vice-Rector for Research and Graduate Studies said he was very pleased to meet the person behind so many of the papers that were important to his own research work. That may not seem much given that Cox's work covers many areas of Statistics we work on today...but that Vice-Rector is a biophysicist!

I personally have only spoken to Prof. Cox on a few occasions and he always greeted me cordially and with interest on the project under discussion. Other than that I know very little of his personal life. But his continuous and relentless approach to work (always at top level) are worth admiring and should be taken as an example for others trying to make a dent in Statistics.

PS: Just after writing the above text I learnt about the recent knighthood of Prof. Adrian Smith. This fact cannot go unnoticed when we discuss top scientists. Adrian is a dear colleague to many of us. This accolade was entirely well deserved and places him in a very close standing to Sir David Cox. The route he took was somewhat different from Cox's but his contributions so far have already earned him a position among the very top statisticians.

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This is a tough question! I have so many heroes and heroines... to make it a little easier I will interpret the present tense in 'is' to refer only to my admiration, and not to the object of that admiration still being alive.

Among a still-large crowd, I'm going to select Jack Good. From a Polish-Jewish background in London, he had a brilliant university career in mathematics at Cambridge, before becoming a cryptologist at Bletchley Park in 1941. Here, working alongside Alan Turing (another hero), he made huge contributions to the war effort by devising methods for decrypting German military communications. After the war, he was a pioneer in computer science, a key figure in the early development of electronic computing. Good spent the final 42 years of his life as an academic statistician at Virginia Tech.

Along the way, he made very many remarkable and original discoveries, across many fields. He was a pioneer in Bayesian statistics (its role in cryptography was probably originated by Turing) as a practical tool for modern applications, especially in assessing probability and risk. As well as probabilist, statistician and computer scientist, he was a number theorist - and one place where these talents came together was in devising an early version of the FFT. Good was a chess champion, and a populariser of 'Go'; he was one inspiration for '2001, a Space Odyssey' and later a consultant in the filming. Throughout his life he was brilliant, flamboyant, conceited and very very funny.

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Admiration is like icecream - it comes in many colours and flavours; it's sticky; it can change our perspective on life; the memory can linger for a long time, and it's often impossible to name a single favourite type.

I have four favourites, and with a (strong) dose of imagination I can map these to statisticians that I admire.

Macadamia icecream is associated with Julian Besag. Complex in character, Julian taught me about Bayesian statistics and MCMC by drawing pictures in the sand. He taught me to care about rigour in modelling and computation, and in writing about it. His support of ECRs and his early training placed me on my wonderful Bayesian rollercoaster career. Wikipedia (http://en.wikipedia.org/wiki/Julian_Besag) and Peter Green (http://www.sustain.bris.ac.uk/JulianBesag/) eloquently describe Julian's contributions to our discipline.

Richard Tweedie is recalled with chocolate icecream. Like Julian, Richard laid foundations in modern Bayesian statistics and MCMC, and was concerned with both the development of rigorous methodology and its application. Richard taught me about Markov chains and MCMC convergence by semaphore; he instilled a commitment to research and a capability in consulting; and he kept talking sensibly even when small children were crawling up my legs. I admired him greatly for this. A kind obituary of Richard is found at http://www.jstor.org/pss/4128174

Finally, Florence Nightingale holds my admiration as a woman who merged worlds: across time, across disciplines and across genders. She is recognised as a pioneer and seminal contributor in both nursing and statistics. She demonstrated that statistics can contribute to all disciplines and that it can be used to make a real impact on really important problems and, in parallel, that applications can inspire the invention of new statistical technology. Again, her story is detailed in Wikipedia (http://en.wikipedia.org/wiki/Florence_Nightingale). I award her my favourite flavour, lemon sorbet: a step to the left of icecream and a step up from sweet.

Florence also reminds me of my biometry lecturer at University, Vic Bofinger, who knew the mathematical and statistical foundations of his discipline by heart and devoted his career to assisting generations of students across a range of disciplines understand and apply statistics. Sitting by his side in consultations, he taught me in his characteristic unassuming manner a love of our discipline and of interdisciplinary research. Like many of our most inspiring teachers, he didn't make it to Wikipedia, but the sweet memory and admiration lives on.

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Artists such as musicians or painters are admired for their work. If the question was "who is the artist you admire the most?", the answer would be a lot easier, as there is typically a great deal of subjectivity in such statements, and every single person has his/her own views on art and artwork (there is no accounting for taste!). Scientists in general and statisticians in particular are also admired for their work, but this case is different from the former in the sense that there is much less room (if any) for subjectivity. Many statisticians have done pioneering and/or path-breaking work for their time, and we find it difficult (if not impossible) to come up with a single name. From the time of Reverend Thomas

Bayes to our days, many fine Bayesians (and some frequentists too!) have contributed to push the limits of knowledge beyond many people's imaginations, using the tools at their disposal. We thus believe that singling out a name would be unfair to all the others.

### Christian Robert

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This is obviously an impossible question. First, let me exclude all living statisticians and scientists to avoid making a choice among all those people I admire and hurting anyone's feeling (and also because this is somehow unfair to younger researchers). So let us stick to dead individuals! Second, I am quite hesitant to choose between a scientist (broad category!) and a statistician (restrictive category!). Again, let me [first?] stick to statisticians, avoiding the impossible choice between Albert Einstein, Marie Curie, Srinivasa Ramanujan, Henri Poincaré, Evariste Galois, Ada Byron, and others... Even in this smaller statistical world, I remain hesitant between many names, the two primary contenders being Pierre-Simon de Laplace and Harold Jeffreys. They both share an image of universal scientists (or "honnêtes hommes") in that they dealt with many topics on a wide-ranging scale and developed new methodologies that impacted the field for years and even centuries. They both worked in statistic as a side occupation, their main field being mathematics and astronomy, and geophysics, respectively. Nonetheless, maybe thanks to their outsider quality, they imagined fundamental changes to our field. Not only did Laplace re-derive Bayes' theorem but he also saw to its implementation and reflected on the choice of priors. Similarly, Jeffreys set the ground for the construction of reference priors in an essential piece of work. While I could claim some low-level kinship with Laplace (since we both spent our childhoods in Pays d'Auge, Normandy, went to study in Caen, and end up living in neighbouring cities south of Paris [where an RER stop is named after him]), and. more seriously, while I tremendously enjoyed Laplace's Traité Philosophique sur les Probabilités, I nonetheless end up voting for Harold Jeffreys as I have a great fondness for Theory of Probability. Which remains in my opinion the most important book written for Bayesian analysis.

### Stephen Walker

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I am impressed by so many things. Inventions, such as the TV and mobile phones, the composition of music, extraordinary engineering constructions, classic works of art, modern medicine, in fact anything where a human talent is cleary exposed.

In science, it is those who, in addition to their bright ideas, had to fight against the tide that amaze the most, and there are so many instances. Copernicus, for example. To be labelled a heretic for supporting a scientific theory, as with Galileo, must have been hard. And this is most likely an understatement.

Also impressive are those scientists who took years, even decades, to develop a theory, check out the evidence and to meticulously write it down. Charles Darwin springs to mind here, but of course, there are many others.

Though I can't explain it, from my school days, it was learning about the periodic table and Mendeleev that I recall standing out above everything else.

And in statistics, the person who first said "The parameter is a random variable" gets my vote.

## Dissertation Abstracts

### MULTIVARIATE AGE-PERIOD-COHORT MODELS

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Age-period-cohort (APC) models are used to analyse age-specific disease or mortality rates provided for several periods in time with respect to three time scales: age, period (calendar period during which the incidence or mortality rates were observed) and cohort (time of birth). Frequently, several sets of such age-specific rates are observed because data were recorded according to one further stratification variable resulting in one set of rates for each stratum of this variable. For example, rates might be available for males and females or for several geographical regions.

Each set of rates could be analysed separately by means of an univariate APC model. However, because of similar relevant risk factors it might be beneficial to analyse all sets of rates jointly treating some sets of time effects as common across strata. Multivariate APC models share sets of time effects, for example the age effects, while the remaining parameters can be different. This dissertation aims at improving the methodology for statistical inference in multivariate APC models.

We first show that differences of stratum-specific time effects in multivariate APC models are identifiable, so that the well known identifiability problem for univariate APC models is avoided. We develop a multivariate Bayesian APC model based on smoothing priors to analyse heterogeneous time trends. This approach represents an attractive alternative to maximum likelihood (ML) based approaches when age groups and periods are given for the same time-interval widths and avoids the artefacts, e.g. artificial cyclical patterns, which occur in the case of unequal time- interval widths.

Subsequently, we present a conditional approach for inference in multivariate APC models. In contrast to the unconditional approach which includes many nuisance parameters, the conditional approach directly models the parameters of interest, namely the differences of stratum-specific time effects. Furthermore, we extend this approach to analyse datasets with multiple stratification factors. ML estimation is performed using software for multinomial logistic regression. The use of cubic smoothing splines is proposed to avoid artificial cyclical patterns in the case of unequally spaced time-intervals of age and period.

Finally, we propose the use of correlated smoothing priors and correlated overdispersion parameters to capture the potential dependence present between multiple health outcomes. By means of case studies we demonstrate that correlated multivariate APC models are useful to improve the precision of relative risk estimates and to extrapolate missing data. We implement the methodology using Markov chain Monte Carlo (MCMC) and the recently proposed integrated nested Laplace approximation (INLA). With INLA it is possible to correlate a wide range of other latent Gaussian models, e.g. conditionally autoregressive models or seasonal models.

In an application to Swiss suicide data from 1950 to 2007, we analyse gender-specific differences using both ordinary and correlated multivariate Bayesian APC models. Results indicate that males have approximately three times the risk of committing suicide as women. Elderly men and those between 15 – 24 are especially at risk. Furthermore, we use univariate and multivariate APC models to investigate whether explanatory variables related to family integration can explain gender-specific suicide trends.▲

## NEWS FROM THE WORLD

# Announcements

### Call for 2011 Savage Awards, Mitchell Prize and DeGroot Prize

The Prize Committee is ISBA is pleased to announce two Savage Awards for outstanding Bayesian PhD dissertations in Theory and Methods and Applied Methodology. The committee is also pleased to announce the 2011 Mitchell and DeGroot prizes. The Mitchell prize is in recognition of an outstanding paper that describes how a Bayesian analysis has solved an important applied problem and the DeGroot prize is in recognition of an outstanding textbook or monograph. Submissions for each award/prize will be accepted until 31st May, 2011.

Additional information can be found at `www.bayesian.org/awards/index.html`.

### 2012 ISBA World Meeting

Planning has already begun for the 11th ISBA World Meeting, to be held in June 2012 in Kyoto, Japan. See the June 2010 issue of the ISBA Bulletin for the announcement and more information `www.bayesian.org/bulletin/1006.pdf`.

### Special Issue on Monte Carlo Methods in Statistics. ACM Transactions on Modeling and Computer Simulation

Over the last two decades Monte Carlo methods have attracted much attention from statisticians as they provide enormous scope for realistic statistical modeling. This is a very active research field with recent developments including adaptive Markov chain Monte Carlo methods, population Monte Carlo methods and approximate Bayesian computation among others. The recent introduction of Graphics Processing Units shows also great promise and open new research directions. The purpose of this special issue of TOMACS, whose Guest Editors are Arnaud Doucet and Christian P. Robert, is to propose a selection of high quality papers reporting the latest research covering the methodology and implementation of recent developments in Monte Carlo methodology for statistics. Topics include but are not limited to: Markov chain Monte Carlo, Sequential Monte Carlo, Stochastic approximation, Approximate Bayesian computation and other approximations and Massive parallelization for high-dimensional problems. The submission deadline is October 30, 2011. The special issue should appear in early 2012. For the editorial policy, instructions to authors, and further details, please consult the ACM TOMACS Web page (http://linklings.net/tomacs/). The submission process is electronic only. When submitting your paper, select the appropriate special issue, on Monte Carlo Methods in Statistics, and make sure that you carefully follow the instructions.

## Meetings and conferences

**Conference in Honour of Professor Adrian F. M. Smith on Hierarchical Models and Markov Chain Monte Carlo**, Heraklion, Greece. 2-5th June, 2011.

In Bayesian statistics, two influential papers in the latter part of the 20th Century (reprinted in Volume III of Breakthroughs in Statistics, Springer-Verlag) were co-authored by Adrian Smith. These papers contain two central ideas in the theory and practice of modern Bayesian statistics, namely Hierarchical Models (Lindley and Smith, Journal of the Royal Statistical Society, Series B, 1972) and Markov chain Monte Carlo (Gelfand and Smith, Journal of the American Statistical Society, 1990). This conference will showcase many key advances that continue to be made, using these ideas, by many established and younger researchers.

Research involving hierarchical models and MCMC continues to grow at an astonishing rate, spanning a broad spectrum of topics in medicine, engineering, scientific computation, business, psychology, bio-informatics, computational physics, graphical models, neural networks, geosciences, and public policy. This explosion of Bayesian ideas is, in part, the result of papers authored or co-authored by Adrian Smith.

Additional information can be found at afmsmith.com/index2.htm.

**International Research Conference on Bayesian Learning**, Istanbul, Turkey. 15-17th June, 2011.

In all domains of research, a major part of the problem that needs to be solved involves the task of managing the uncertainty inherent in the problem. In that instance, Bayesian Learning provides a powerful methodology to researchers, enabling them to reach effective decisions in light of evidence. With its ability to incorporate prior knowledge to the inference process, Bayesian Learning appeals to researchers for both of its theory and applications.

Interested individuals from academic and business worlds are invited to come together to discuss and communicate on challenging issues related to theory of Bayesian learning and applications in finance & accounting, general management, marketing, organizational behavior and production & operations within the historic and mystic environment of Istanbul while we will celebrate the 310th birthyear of Rev. Bayes.

Additional information can be found at marc.yeditepe.edu.tr/yircobl11.htm.

**8th World Congress in Probability and Statistics**, Istanbul, Turkey. 9-14th July, 2011.

Jointly organized by the Bernoulli Society and the Institute of Mathematical Statistics and scheduled every four years, this meeting is a major worldwide event for statistics and probability, covering all its branches, including theoretical, methodological, applied and computational statistics and probability, and stochastic processes. It features the latest scientific developments in these fields.

The program will cover a wide range of topics in statistics and probability, presenting recent developments and the state of the art in a variety of modern research topics, with in-depth sessions on applications of these disciplines to other sciences, industrial innovation and society. It will feature several special plenary lectures presented by leading specialists. In addition, there will be many invited sessions highlighting topics of current research interests, as well as a large number of contributed sessions and posters.

The venue of the meeting is Grand Cevahir Hotel & Convention Center located in Istanbul which is a vibrant, multi-cultural and cosmopolitan city bridging Europe and Asia. Istanbul has a unique cultural conglomeration of east and west, offering many cultural and touristic attractions, such as Hagia Sophia, Sultanahmet, Topkapõ Palace and Maiden's Tower.

Additional information can be found at www.worldcong2012.org.

## Short courses and workshops

**2011 Rimini Bayesian Econometrics Workshop**, Rimini, Italy. 31 May - 1 June, 2011.

The Rimini Centre for Economic Analysis invites papers to be considered for its "Rimini Bayesian Econometrics Workshop". Invited speakers will be Todd Clark and Simon Potter who will deliver the Arnold Zellner Lecture. Simon Potter is the Director of Economic Research at the Federal Reserve Bank of New York. Todd Clark is a Vice President and Economist in the Economic Research Department of the Federal Reserve Bank of Kansas City. Any Bayesian paper with an econometric focus will be considered. If you are interested in presenting a paper at the workshop, please email an abstract to Rodney Strachan (rodney.strachan@anu.edu.au) by Monday 11th April 2011. Authors will be notified of the workshop scientific committee's decision by Monday 25th of April 2011. Final papers should be provided by Monday 16th of May 2011.

Additional information can be found at http://www.rcfea.org.

**2011 International Workshop on Objective Bayesian Analysis**, Shanghai, China. 11-15th June, 2011.

Following earlier meetings on objective Bayes methodology the principal objectives of O-Bayes2011 are to facilitate the exchange of recent research developments in objective Bayes methodology, to provide opportunities for new researchers to shine, and to establish new collaborations and partnerships that will channel efforts into pending problems and open new directions for further study. O-Bayes2011 will also serve to further crystallize objective Bayes methodology as an established area for statistical research.

Additional information can be found at www.sfs.ecnu.edu.cn/Obayes2011/index.html.

**2011 Applied Bayesian Statistics School: Hierarchical Modeling for Environmental Processes**, Bolzano/Bozen, Italy, 20-24th June, 2011.

The ABS schools, organised in Italy since 2004 by CNR IMATI and University of Pavia, aim to present state-of-the-art Bayesian applications, inviting leading experts in their field. The 2011 topic is Hierarchical Modeling for Environmental Processes and the lecturer will be Alan Gelfand, Duke University, USA. This course is intended to expose the value of hierarchical modeling within a Bayesian framework for investigating a range of problems in environmental science. In particular, we focus on stochastic modeling for such problems driven by the general hierarchical perspective, [data — process, parameters][process — parameters][parameters]. This specification is richer than it may appear, as the course will demonstrate. More importantly, it allows the model development to focus on the environmental process of interest, integrating the sources of information that are available. Primary problems of interest include assessment of environmental exposure, fusion of environmental data from different sources, and assessing environmental change and its potential impact on ecological processes.

The course will have a practical orientation, emphasizing model development, computation and inference driven by real examples. The school will make use of lectures, practical sessions, software demonstrations, informal discussion sessions and presentations of research projects by school participants.

Additional information can be found at www.mi.imati.cnr.it/conferences/abs11.html.

**Eight Workshop on Bayesian Nonparametrics**, Veracruz, Mexico. 26-30th June, 2011.

The workshop aims at presenting the latest developments on Bayesian nonparameteric statistics, covering a wide range of theoretical, methodologic and applied areas. The meeting will be structured in 4 tutorials on special topics, a series of invited and contributed talks and contributed posters sessions. For those interested this event will be preceded by the Mexican Workshop on Bayesian Statistics (TAMEB) which will feature a day of introductory courses (in Spanish) to Bayesian statistics.

Scientific committee: David B. Dunson, Subhashis Ghosal, Jim Griffin, Nils L. Hjort, Michael I. Jordan, Yongdai Kim, Antonio Lijoi, Ramses H. Mena, Peter Müller, Luis E. Nieto, Igor Pruenster, Fernando A. Quintana, Yee W. Teh and Stephen G. Walker.

Additional information can be found at www.bnpworkshop.org/.

**Bayesian Inference in Stochastic Processes Workshop**, Getafe (Madrid), Spain. 1-3rd September, 2011.

In this workshop, we will bring together experts in the field to review, discuss and explore directions of development of Bayesian Inference in Stochastic Processes and in the use of Stochastic Processes for Bayesian Inference. Theoretical and applied contributions to any area of Bayesian inference for stochastic process will be welcome. The workshop will be held in an informal environment to encourage discussion and promote further research in these fields. The workshop will be located in the Universidad Carlos III de Madrid, in the Getafe campus, less than a 20 minute train journey from the centre of Madrid.

Additional information can be found at http://www.est.uc3m.es/bisp7/.

**First Workshop on Case Studies in Bayesian Statistics and Machine Learning**, Carnegie Mellon University, Pittsburgh, USA. 14-15th October, 2011.

The Workshop will focus on applications of Bayesian statistics and Machine Learning to problems in science and technology. It will feature three different tracks: In-depth contributed presentations and discussions of substantial research, shorter presentations by young researchers and poster presentations. The workshop builds upon the Case Studies in Bayesian Statistics Workshop which was held at CMU for the last two decades. In conjunction with the workshop, the Department of Statistics' Twelfth Morris H DeGroot memorial lecture will be delivered by Professor Daphne Koller, Stanford University.

We are calling for abstracts for all three tracks. The first is for major case studies. Each presentation is expected to be delivered by both, the statistician / ML researcher and, most desirably, their collaborator(s) from the applied area. These presentations will be allocated a 2 hour slot and are expected to be detailed and represent long standing, successful collaborations. A detailed abstract (2-3 pages) from those interested in presenting one of these collaborations is due Tuesday, April 14th, 2011. Abstracts should emphasize the scientific and technological background, and should clarify the extent to which the inferential work will address key components of the problems articulated. The second track is for 15-minute presentations by young researchers (students or those who completed PhD within the last five years). Abstracts for this track should be 1-2 pages and are due July 1, 2011. Abstracts should emphasize the scientific problems and how the statistical work solves the problems. Abstracts not selected for presentation would be considered for a poster session. In addition, we invite additional submissions for posters (1 page) which are due September 1, 2011. Submission of abstracts should be done through the Workshop website at: http://bayesml.stat.cmu.edu/. Abstracts for Case Studies from two previous workshops can be also found on the website. For additional information, please contact Russell Steele (steele@math.mcgill.ca). ▲