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A MESSAGE FROM THE PRESIDENT

by Sylvia Richardson
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I hope that you all have had a productive break making full use of the conference season to spring towards new statistical challenges. It is remarkable to see how, nowadays, the Bayesian ideas are intertwined in so many sessions at the major statistical conferences. We must carry on striving to continue to create links with other societies and interest groups and the recent creation of ISBA sections is a step in this direction. Preparation for a high point in our calendar, the joint Valencia/ISBA meeting in 2006 is well under way and the ISBA programme committee chaired by Kerrie Mengersen is now calling for oral contributions. I am sure that all of you are looking forward to participate in our next conference and that we can anticipate a record number of abstracts being submitted!

While travelling over the summer, some Bayesian fellows visiting London made a pilgrimage to the Reverend Bayess grave at Bunhill Fields. They found that the grave has deteriorated, is at risk of collapsing and that the Reverend Bayess name is not clearly visible. The maintenance on the grave was last carried out in 1999 thanks to the personal effort of Tony OHagan. It is now becoming urgent to organise new repairs and to envisage a solution towards a regular upkeep. I will keep you posted on developments and ideas on how the society can be involved. I would like to thank Dale Poirier and Lisa Tole for their keen interest and finding out useful contacts with the city of London historic buildings department.

The last month has seen the remarkable achievement of the publication of our new electronic journal Bayesian Analysis. I must thank Rob Kass and his editorial board for all the work that they have put in on this venture and congratulate them on having produced such an exciting issue. It is now up to all ISBA members and the Bayesian community at large to help sustain the journal by submitting their recent work for publication in our journal.

A MESSAGE FROM THE EDITOR

by J. Andrés Christen
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This issue of the ISBA Bulletin is specially varied with several interesting columns to read. Of special interest for ISBA members are the ISBA Elections section and the Valencia/ISBA call for Oral Presentations. Also, the Bulletin web page is up again with all 2004 issues available: `http://www.cimat.mx/~jac/ISBABULLETIN`. I hope you enjoy reading this issue of the ISBA Bulletin.

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PLEASE, FEEL COMPLETELY FREE TO SEND US SUGGESTIONS THAT MIGHT IMPROVE THE QUALITY OF THE BULLETIN

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THIS YEAR ELECTIONS

by Jim Berger
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The 2005 elections of future ISBA officers will take place electronically at the ISBA web-site (http://www.bayesian.org/election/voter.html) from October 15 through November 15. Instructions for voting will be emailed to all current ISBA members prior to the election. I am delighted to announce that the 2005 Nominations Committee has assembled a remarkable slate of candidates for the election. In alphabetical order by office, the 2005 candidates are:

For President Elect:

- Peter Green (UK)
- Rob Kass (USA)

For Board Membership:

- Marilena Barbieri (Italy)
- Wes Johnson (USA)
- Steve MacEachern (USA)
- Manuel Mendoza (Mexico)
- Judith Rousseau (France)
- Simon Wilson (Ireland)
- Brani Vidakovic (USA)
- Jim Zidek (Canada)

Biographical information for each of the candidates appears below. The candidates for president have also included statements about what they intent to accomplish. This information is also currently accessible on the ISBA web-site.

The 2005 Nominations Committee was appointed by the ISBA Board under the direction of President Sylvia Richardson. The members of the Committee were Jim Berger (USA), Guido Consonni (Italy), Dipak Dey (USA), Chris Holmes (UK), Daniel Peña (Spain), Fabrizio Ruggeri (Italy), and Jon Wakefield (USA). Beginning our deliberations in early July, we compiled a large list of potential candidates for each office. The final slate was then selected through rounds of approval voting and ranking. Because of the abundance of talent in ISBA this was a nontrivial task, and I greatly appreciate the diligence of the committee members in making some tough choices. Finally, I am very grateful to all the candidates for their willingness to serve and lead ISBA. Through them the bright future of ISBA is assured.

President Elect Nominees

Peter Green

Affiliation and current status: Professor of Statistics, and Henry Overton Wills Professor of Mathematics, University of Bristol, UK. Web page and email address: http://www.stats.bris.ac.uk/~peter; *P.J.Green@bristol.ac.uk*.

Areas of interest: Bayesian computation and MCMC, graphical models, spatial statistics, mixtures and hidden Markov models, gene expression modelling, applications in physical sciences.

Honours: Fellow of the Royal Society, 2003; Fellow of IMS, 1991; Royal Statistical Society Guy medals in Silver (2001) and Bronze (1987). ISI Highly-cited Researcher (author #4 mathematical science paper, 1995-2005).

Journals and books: JRSS(B), JASA, Biometrika, Scandinavian Journal of Statistics, Journal of Computational and Graphical Statistics, Highly Structured Stochastic Systems (edited jointly with N. L. Hjort and S. Richardson), Nonparametric regression and generalized linear models: a roughness penalty approach (with B. W. Silverman), Complex Stochastic Systems (ed. Barndorff-Nielsen, Cox, and Klüppelberg).

Previous service to ISBA: none yet, but I would be pleased and honoured to begin.

Service to other Societies: Royal Statistical Society (member of Council, 1986-89, Hon. Secretary, 1988-94, Chair Research Section, 1996-99, President, 2001-03); Institute of Mathematical Statistics (member of Council, 1998-2001); Bernoulli Society (member of Council, 1991-96); Chair, European Science Foundation network on Highly Structured Stochastic Systems (1993?95); Associate Editorships: Journal of the Royal Statistical Society, Series B (1984-89), Journal of the American Statistical Association (1988-93), Annals of Statistics (1995-2000), Biometrika (1998-2002, 2005-), Scandinavian Journal of Statistics (1994-98).

My view of ISBA

The last 15 years or so has been a great success story for Bayesian statistics, and ISBA has played a big part in this. With imaginative leadership, a strong, lively and truly international research community has been built. It is time now to build on past successes, to create an even livelier future for the subject and its participants.

Members often cite the "family" qualities of ISBA as key to its success, and to their motivation

to join in its activities. It is extraordinary, and very rewarding, to be part of a circle of friends who may be broadly dispersed geographically but are nevertheless close scientifically, easy to communicate with spontaneously by email, and magically there, in person (eager to buy you a drink even) when you check in to that hotel in Chile, or Crete, or Istanbul, or Cape Town! This network of relationships is very special and we must preserve it. But healthy families do not keep all their relationships "in the family" and I think we should continue to strengthen our network of relationships outside the Bayesian community. We should do so for both "inward" and "outward" reasons: to enliven our own debates by input from other communities –both of statisticians and other researchers– and to give ourselves new channels for extending the reach and influence of Bayesian ideas into other disciplines.

We probably need to have a debate about how best to do this, but some steps in the right direction could be:

- Expanding the range of ISBA sections.
- Further encouragement of joint meetings with other societies, in statistics, in other data-analytic disciplines, and in applied fields.
- Dissemination of Bayesian ideas in popular science media.
- More material for non-experts on the ISBA website.
- Establishing "policy" working parties on major areas of statistical application where Bayesian approaches have been resisted (e.g. official statistics, drug regulation?).

The other priority area I see for ISBA is activity that gives further support and encouragement to younger statisticians. They are the future of our discipline. What do they need? Some tried and trusted activities include the Savage award, student sessions and travel support at conferences, tutorial sessions and summer schools. A very successful ingredient of the Highly Structured Stochastic Systems programme in Europe in the 90's was the system supporting individual research visits, which was biased towards younger participants. ISBA does not have the resources to replicate this, but it could sponsor applications to funding agencies that do. I don't know what else younger researchers need, let's ask them!

And on the subject of grass-roots participation and empowerment, are we doing enough to help all our members participate in deciding where ISBA goes and what it does?

Rob Kass

Affiliation and current status: Professor, Department of Statistics and Center for the Neural Basis of Cognition, Carnegie Mellon University. `http://www.stat.cmu.edu/~kass`; *kass@stat.cmu.edu*.

Areas of interest: Bayesian methods (duh!), Statistics in neuroscience; functional data analysis.

Honors: Elected Fellow, ASA, IMS, AAAS; 3rd most highly cited researcher in mathematical sciences, 1995-2005 (Institute for Scientific Information).

Previous service to ISBA: Vice President, 1994-1996; Board of Directors, 1998-2000; Founding Editor-in-Chief of Bayesian Analysis (2004-2006).

Service to other societies: U.S. National Academy of Sciences, Board of Mathematical Sciences and its Applications, 2003-2005; U.S. National Institute of Statistical Science, Board Member, 2004-2006; Chair-elect, Chair, Past-Chair, Section on Statistics, American Association for the Advancement of Science, 2003-2006; IMS Council 1999-2002; Chair-elect, Chair, Past-chair, ASA Section on Bayesian Statistical Science, 1996-1998; Executive Editor, Statistical Science, 1992-1994; Editorial board member: Annals of Statistics, 1985; JASA, 1986-1992; Biometrika, 1996-2003; Statistics in Medicine, 1991-1992.

My view of ISBA

The new journal Bayesian Analysis matched its founding organization in both name and spirit, hoping to reflect an outward-looking view of its subject as something of interest not only to statisticians but to a very broad spectrum of quantitative researchers. Living up to this promise remains a major challenge to both ISBA and its fledgling journal.

I am frequently struck by the remarkably wide use of Bayesian analysis in diverse scientific and technological domains. ISBA should represent both the "core" of theoretical and methodological development, and the many disciplinary application areas that continue to bring fresh issues back to the core. Many ISBA members sit at the interface with a favorite area, and some identify themselves strongly with these. While there have been some commendable efforts to establish firm cross-disciplinary connections, it seems to me that our professional society must try to do more in this direction. There is likely much to be gained by additional communication and collaboration.

What should ISBA do? I would suggest first gathering some information on existing application-area involvement of ISBA members, including an assessment of current status and need

for more formal involvement of ISBA through both meetings and publications. There is probably a lot to be learned, and a lot to be done, even in areas where ISBA members participate actively. Second, it is possible to search out researchers who do Bayesian analysis, yet have little interaction with those who specialize in Bayesian methodology—I meet such people within my own realm of neuroscience, and they are usually quite keen to get help and to increase their own depth of knowledge. We ought to be able to welcome them into the fold via invitations to speak and write for us.

After retiring as department head at Carnegie Mellon, after nine years of service, I have found myself thinking occasionally about where I might put some new organizational effort. Advancing ISBA's cross-disciplinary presence seems to me a highly worthwhile goal, and one that fits well with my work organizing the Case Studies in Bayesian Statistics workshops (now at number 8) and the Statistical Analysis of Neuronal Data workshops (now at number 3). One particular point is that I would like to see ISBA play a formal role in the Case Studies workshops (and maybe the Neuronal workshops too). In addition, we can and should right away begin trying to have Bayesian Analysis increase the breadth of its audience. I would like to mention, however, that while my work on the new journal has developed into a kind of labor of love, I am nonetheless looking forward to turning it over to a new steward, who would bring new vision and energy to it. As a second priority for ISBA, therefore, I would like to see the establishment of a transition plan for the journal, with a clear notion of how editorship will function in steady state.

ISBA is a strong organization, and it remains for me a primary source of professional identification. I trust the bulk of our members feel the same way, and will be willing to work on behalf of furthering ISBA's goals.

Nominees for Board of Directors 2005–2007

Marilena Barbieri

Marilena Barbieri (Ph.D. '92, Università di Roma "La Sapienza") is Professor of Statistics, Università Rome Tre, Italy. Her main areas of interest are Bayesian model selection; time series analysis; Bayesian computation. She has published papers on several journals, including Annals of Statistics, Biometrika, IEEE Transactions on Signal Processing, Journal of the Italian Statistical Society. She has written an "Introduction to MCMC methods" for the Monograph Series of the Italian Statistical Society in 1996. She has served on the ISBA Nomination committee and as Corresponding Editor of the ISBA Bulletin.

Wes Johnson

I am currently a Professor of Statistics at the University of California at Irvine after having recently moved from UC Davis. My interests are in the development of non and semiparametric methods in a variety of contexts including longitudinal and survival data analyses, the development of practical Bayesian methods in Epidemiology, the development of informative priors in general mixed regression models, and in asymptotic methods. Over the years I have published methodological papers in JASA, Biomtrika and JRSSB. I have also had long term collaborative arrangements with the veterinary and medical schools at UC Davis and these have resulted in many (Bayesian) papers that are published in subject matter journals as well as in Biometrics, Statistics in Medicine and Biostatistics. Over the years I have primarily contributed efforts to SBSS, but recently I was the chair of the Savage Trust Committee, I was also a member of the Savage Award Committee and am currently an Associate Editor for Bayesian Analysis. I am very pleased to be a part of a statistics community that actively encourages truly cooperative efforts between statisticians and scientists. This conveniently coincides with my decision some years ago to operate primarily as a Bayesian since I believe this is the most natural route to develop and maintain successful collaborations. More details can be found at `http://www.ics.uci.edu/~wjohnson`.

Steve MacEachern

Steven MacEachern (Ph.D. 1988, University of Minnesota) is a Professor in the Department of Statistics at the Ohio State University. Steve's research interests include nonparametric Bayesian methods, computational methods, applications of Bayesian methods to psychometrics, and how to formally incorporate difficult to quantify information for inference. He has published papers in volumes such as the CMU Case Studies in Bayesian Statistics series and in journals which include Biometrics, Biometrika, JASA, JCGS and JRSSB. Steve served on the ISBA Nominating Committee in 2003. More information is available at his web site `http://www.stat.ohio-state.edu/~snm`.

Manuel Mendoza

Manuel Mendoza (PhD 1988, Universidad Nacional Autónoma de México) is Professor of Statis-

tics at the Instituto Tecnológico Autónomo de México (ITAM) where he also is Director of the Applied Statistics Centre and the Risk Management master's program. His research interests include reference analysis, Bayesian modelling, stochastic processes, time series and applications to finance and health sciences. He has published in Biometrics, Communications in Statistics, Journal of Applied Statistics, Test, Biometrical Journal, Journal of Business and Economic Statistics, North American Actuarial Journal and Advances in Econometrics, among other journals. He has been one of the organisers of the III World Meeting of ISBA, III International Workshop on Objective Bayesian Methodology and the II Latin American Congress on Bayesian Statistics. He was President of the Mexican Statistical Association (1998-1999).

Judith Rousseau

After my Ph.D. in 1997 at the University Paris 6, I have been working until 2004 at the University Paris 5 as an Assistant Professor and I am currently Professor at the University Paris-Dauphine (FRANCE) in the department of applied mathematics (CEREMADE). My research interests include interactions between Bayesian and frequentist analyses, asymptotics, nonparametric Bayesian statistics and biomedical applications. I have published papers in Annals of Statistics, Bernoulli, JASA, JCGS, Scandinavian Journal of statistics etc. Further information about my research can be found in my web-page: `http://www.ceremade.dauphine.fr/~rousseau/`.

Simon Wilson

I am a Senior Lecturer (from Oct 05) in the Department of Statistics at the University of Dublin, Trinity College (Ireland). My areas of interest are image processing, distributed computing for Bayesian methods, reliability and applications of Bayesian methods in a variety of other fields. I have published in the Journal of the Royal Statistical Society Series C, Statistics and Computing, IEEE Transactions on Signal Processing, SIAM Review, Advances in Applied Probability and IEEE Transactions on Reliability. My previous services to ISBA have been to contribute articles to the ISBA newsletter. As a board member, I would like to see ISBA have higher visibility in other fields where Bayesian methods are becoming an active topic of research; from my own research I am thinking particularly of machine learning. I believe it is vital for our profession that we engage with these very active research communities, to our mutual advantage. `http://www.tcd.ie/Statistics/staff/simonwilson.shtml`.

Brani Vidakovic

Brani Vidakovic (PhD Purdue University) is Professor of Statistics at Georgia Institute of Technology and Adjunct Professor of University of Georgia and Emory University. His current research interest include wavelets, in particular Bayesian wavelet shrinkage, functional data analysis, modeling of high-frequency data, statistical scaling and Bayes-minimax compromise. He has published a book on wavelets and articles in a range of journals and edited volumes. He is current president of Georgia ASA section, associate editor of several statistical journals, and an editor-in-chief of Wiley's second edition of Encyclopedia of Statistical Sciences. Brani is a member of ISBA since its inception and served on ISBA's nomination committee (2003-2004) and as a corresponding editor of ISBA Journal. (1999-2001). He is also interested in Bayesian education and created a first course in Bayesian Statistics at Georgia Institute of Technology. `http://www.isye.gatech.edu/~brani`.

Jim Zidek

Jim Zidek (PhD Stanford, FRSC) I am at the Statistics Dept, U British Columbia. My early interests in the foundations of Bayesian decision analysis have swung to applications, particularly in environmental science where I have published extensively, culminating in a co-authored book on modelling environmental space time processes. My experience has made me see ISBA as providing a unique framework for addressing issues in "post normal science" (with its radical uncertainty, high risks and multiplicity of legitimate perspectives, eg global climate change). As background, I have served with Morrie DeGroot as an Editor of Statistical Science and on Committees as well as Councils of the IMS/SSC. I was President of the latter. Honors are listed in my full CV reached through `http://hajek.stat.ubc.ca/~jim/fullcv.pdf`, but include the Gold Medal of the Statistical Soc of Canada as well as Election to the Royal Soc of Canada. `http://www.stat.ubc.ca/people/jim`.

CALL FOR ORAL PRESENTATIONS: ISBA 2006

by Kerrie Mengersen and Peter Müller
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The Valencia/ISBA Eighth World Meeting on Bayesian Statistics will be held in Benidorm (Alicante, Spain) from June 1st to June 7th, 2006. See the conference website http://www.uv.es/~bernardo/valenciam.html.

As part of the programme, ISBA is organizing a limited number of contributed oral presentations. A total of 32 such presentations will be scheduled, each of 25 minutes duration (20 minutes talk, 5 minutes for discussion).

If you are interested in giving an oral presentation at this meeting, you are invited to submit an abstract of no more than three pages (including references), accompanied by one additional page listing no more than five relevant published references by the author/s. Any additional pages will not be considered.

Submissions can be made via email to *isba06@qut.edu.au* Please use the header ABSTRACT NAME where NAME is the first author's name. Attach the abstract and accompanying page as .ps, .pdf or .doc files.

Abstracts will be accepted between 1st September and 30th October 2005. No late submissions will be accepted. The ISBA Conference Programme Committee will review and vote on the submissions during November and the list of selected presentations will be available on the conference website by 15th December 2005.

In keeping with the Valencia/ISBA tradition, this series of oral presentations is intended to complement the conference poster sessions which form the seminal means of communication of research by conference participants. A call for posters will be made separately.

The ISBA Conference Programme Committee comprises the following: Kerrie Mengersen (Australia, co-chair), Peter Mueller (USA, co-chair), Herbie Lee (USA, co-chair Finance), Jose Bernardo (Spain, past Chair; Valencia Programme Committee), Subashis Ghosal (USA), Paolo Giudici (Italy), Merlise Clyde (USA), Yanan Fan (Australia), Judith Rousseau (France), Cathy Chen (Taiwan), Richard Arnold (New Zealand), Paul Mostert (South Africa), Robert Wolpert (USA), Josemar Rodrigues (Brazil), Jiangsheng Yu (China), Antonietta Mira (Italy), Mark Steel (UK), Fabrizio Ruggeri (Italy).

THE FERMI'S BAYES THEOREM

by Giulio D'Agostini
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Enrico Fermi is usually associated by the general public with the first self-staining nuclear chain reaction and, somehow, with the Manhattan Project to build the first atomic bomb. But besides these achievements, that set a mark in history, his contribution to physics - and especially fundamental physics - was immense, as testified for example by the frequency his name, or a derived noun or adjective, appears in the scientific literature (fermi, fermium, fermion, F. interaction, F. constant, Thomas-F. model, F. gas, F. energy, F. coordinates, F. acceleration mechanism, etc.). Indeed he was one of the founding fathers of atomic, nuclear, particle and solid state physics, with some relevant contributions even in general relativity and astrophysics.

He certainly mastered probability theory and one of his chief interests through his life was the study of the statistical behavior of physical systems of free or interacting particles. Indeed, there is a 'statistics' that carries his name, together with that of the co-inventor Paul Dirac, and the particles described by the Fermi-Dirac statistics are called fermions.

Among the several other contributions of Enrico Fermi to statistical mechanics, perhaps the most important is contained in his last paper, written with John Pasta and Stan Ulam. Without entering into the physics contents of the paper (it deals with what is presently known as the 'FPU problem') it is worth mentioning the innovative technical-methodological issue of the work: the time evolution of a statistical system (just a chain of non-linearly coupled masses and springs) was simulated by computer. The highly unexpected result stressed the importance of using numerical simulations as a research tool complementary to theoretical studies or laboratory experiments. Therefore, Fermi, who was unique in mastering at his level both theory and experiments, was also one of the first physicists doing 'computer experiments'.

In fact, with the advent of the first electronic computers, Fermi immediately realized the importance of using them to solve complex problems that lead to difficult or intractable systems of integral-

differential equations. One use of the computer consisted in discretizing the problem and solving it by numerical steps (as in the FPU problem). The other use consisted in applying sampling techniques, of which Fermi is also recognized to be a pioneer. It seems in fact, as also acknowledged by Nick Metropolis (`http://library.lanl.gov/cgi-bin/getfile?00326866.pdf`), that Fermi contrived and used the Monte Carlo method to solve practical neutron diffusion problems in the early nineteen thirties, i.e. fifteen years before the method was finally 'invented' by Ulam, named by Metropolis, and implemented on the first electronic computer thanks to the interest and drive of Ulam and John von Neumann.

After this short presentation of the character, with emphasis on something that might concern the reader of this bulletin, one might be interested about Fermi and 'statistics', meant as a data analysis tool. During my studies and later I had never found Fermi's name in the books and lecture notes on statistics I was familiar with. It has then been a surprise to read the following recollection of his former student Jay Orear, presented during a meeting to celebrate the 2001 centenary of Fermi's birth: *"In my thesis I had to find the best 3-parameter fit to my data and the errors of those parameters in order to get the 3 phase shifts and their errors. Fermi showed me a simple analytic method. At the same time other physicists were using and publishing other cumbersome methods. Also Fermi taught me a general method, which he called Bayes Theorem, where one could easily derive the best-fit parameters and their errors as a special case of the maximum-likelihood method"*

Presently this recollection is included in the freely available Orear's book "Enrico Fermi, the master scientist" (`http://hdl.handle.net/1813/74`). So we can now learn that Fermi was teaching his students a maximum likelihood method *"derived from his Bayes Theorem"* and that *"the Bayes Theorem of Fermi"* - so Orear calls it - is a special case of Bayes Theorem, in which the priors are equally likely (and this assumption is explicitly stated!). Essentially, Fermi was teaching his young collaborators to use likelihood ratio to quantify how the data preferred one hypothesis among several possibilities, or to use the normalized likelihood to perform parametric inference (including the assumption of Gaussian approximation of the final pdf, that simplifies the calculations).

Fermi was, among other things, an extraordinary teacher, a gift witnessed by his absolute record in number of pupils winning the Nobel prize - up to about a dozen, depending on how one counts them. But in the case of probability based data analysis, it seems his pupils didn't get fully the spirit of the reasoning and, when they remained orphans of their untimely dead scientific father, they were in an uneasy position between the words of the teacher and the dominating statistical culture of those times. Bayes theorem, and especially his application to data analysis, appears in Orear's book as one of the Fermi's working rules, of the kind of the 'Fermi golden rule' to calculate reaction probabilities. Therefore Orear reports of his ingenuous question to know *"how and when he learned this"* (how to derive maximum likelihood method from a more general tool). Orear *"expected him to answer R.A. Fisher or some textbook on mathematical statistics"*. *"Instead he said, 'perhaps it was Gauss' "*. And, according to his pupil, Fermi *"was embarrassed to admit that he had derived it all from his Bayes Theorem"*.

This last quote from Orear's book gives an idea of the author's unease with that mysterious theorem and of his reverence for his teacher: *"It is my opinion that Fermi's statement of Bayesian Theorem is not the same as that of the professional mathematicians but that Fermi's version is nonetheless simple and powerful. Just as Fermi would invent much of physics independent of others, so would he invent mathematics"*.

Unfortunately, Fermi wrote nothing on the subject. The other indirect source of information we have are the "Notes on statistics for physicists", written by Orear in 1958, where the author acknowledges that his *"first introduction to much of the material here was in a series of discussions with Enrico Fermi"* and others *"in the autumn 1953"* (Fermi died the following year). A revised copy of the notes is available on the web (`http://nedwww.ipac.caltech.edu/level5/Sept01/Orear/frames.html`).

When I read the titles of the first two sections, "Direct probability" and "Inverse probability", I was hoping to find there a detailed account of the Fermi's Bayes Theorem. But I was immediately disappointed. Section 1 starts saying that *"books have been written on the 'definition' of probability"* and the author abstains from providing one, jumping to two properties of probability: statistical independence (not really explained) and the law of large numbers, put in a way that could be read as Bernoulli theorem as well as the frequentist definition of probability.

In Section 2, "Inverse probability", there is no mention to Bayes theorem, or to the Fermi's Bayes Theorem. Here we clearly see the experienced physicist tottering between the physics intuition, quite 'Bayesian', and the academic education on statistics, strictly frequentist (I have written years ago about this conflict and its harmful consequences, see `http://xxx.lanl.gov/abs/physics/9811046`). Therefore Orear explains *"what the physicist usually means"* by a result reported in the form 'best value $\pm$ error': the physicist *"means the 'prob-*

ability' of finding" "the true physical value of the parameter under question" in the interval '[best value - error, best value + error]' is such and such percent. But then, the author immediately adds that *"the use of the word 'probability' in the previous sentence would shock the mathematician"*, because *"he would say that the probability"* the quantity is in that interval *"is either 0 or 1"*. The section ends with a final acknowledgments of the conceptual difficulty and a statement of pragmatism: *"the kind of probability the physicist is talking about here we shall call inverse probability, in contrast to the direct probability used by the mathematicians. Most physicists use the same word, probability, for the two different concepts: direct probability and inverse probability. In the remainder of this report we will conform to the sloppy physics-usage of the word 'probability' "*.

Then, in the following sections he essentially presents a kind of hidden Bayesian approach to model comparison (only simple models) and parametric inference under the hypothesis of uniform prior, under which his guiding Fermi's Bayes Theorem held.

Historians and sociologists of science might be interested in understanding the impact Orear's notes have had in books for physicists written in the last forty-fifty years, and wonder how they would have been if the word 'Bayes' had been explicitly written in the notes.

Another question, which might be common to many readers at this point, is why Fermi associated Gauss' name to Bayes theorem. I am not familiar with all the original work of Gauss and a professional historian would be more appropriate. Anyway, I try to help with the little I know. In the derivation of the normal distribution (pp. 205-212 of his 1809 "Theoria motus corporum coelestium in sectionibus conicis solem ambientum" – I gave a short account of these pages in a book), Gauss develops a reasoning to invert the probability which is exactly Bayes theorem for hypotheses that are *a priori* equally likely[1] (the concepts of prior and posterior are well stated by Gauss), and, later, he extends the reasoning to the case of continuous variables. That is essentially what Fermi taught his collaborators. But Gauss never mentions Bayes, at least in the cited pages, and the use of the 'Bayesian' reasoning is different from what we usually do: we start from likelihood and prior (often uniform or quite 'vaque') to get the posterior. Instead, Gauss got a general form of likelihood (his famous error distribution) from some assumptions: uniform prior; same error function for all measurements; some analytic property of the searched-for function; posterior maximized at the arithmetic average of data points.

Then, why did Fermi mention Gauss for the name of the theorem and for the derivation of the maximum likelihood method from the theorem? Perhaps he had in mind another work of Gauss. Or it could be – I tend to believe more this second hypothesis – a typical Fermi unreliability in providing references, like in the following episode reported by Lincoln Wolfenstein in his contribution to Orear's book: *"I remember the quantum mechanics course, where students would always ask, 'Well, could you tell us where we could find that in a book?' And Fermi said, grinning, 'It's in any quantum mechanics book!' He didn't know any. They would say, 'well, name one!' 'Rojanski', he said, 'it's in Rojanski'. Well, it wasn't in Rojanski – it wasn't in any quantum mechanics book."*

I guess that, also in this case, most likely *it wasn't in Gauss*, though some seeds *were* in Gauss. In the pages that immediately follow his derivation of the normal distribution, Gauss shows that, using *his* error function, with the same function for all measurements, the posterior is maximized when the sum of the squares of residual is minimized. He recovered then the already known least square principle, that he claims to be his principle (*"principium nostrum"*, in Latin) used since 1795, although he acknowledges Legendre to have published a similar principle in 1806. Therefore, since Gauss used a flat prior, his 'Bayesian' derivation of the least square method is just a particular case of the maximum likelihood method. Fermi must have had this in mind, together with Bayes' name from modern literature and with many logical consequences that were not really in Gauss, when he replied young Orear.

[Some interesting links concerning this subject, including pages 205-224 of Gauss' 'Theoria motus corporum coelestium', can be found in `http://www.roma1.infn.it/~dagos/history/`.]

[1] Something similar, also independently from Bayes, was done by Laplace in 1774 (see Stephen Stigler's 'The History of Statistics'). However Gauss does not mention Laplace for this result in his 1809 book (while, instead, he acknowledges him for the integral to normalize the Gaussian!). Therefore the 'Fermi's Bayes Theorem' should be, more properly, a kind of 'Laplace-Gauss Theorem'.

A "Bayesian Classics" Reading List

by Stephen E. Fienberg
fienberg@stat.cmu.edu

Introduction

While Bayes' theorem has a 250-year history and the method of inverse probability that flowed from it dominated statistical thinking into the twentieth century, the adjective "Bayesian" was not part of the statistical lexicon until relatively recently. In my paper for *Bayesian Analysis*, "When Did Bayesian Inference Become "Bayesian"?" [1], I included references to approximately 170 papers and books. As work on the paper progressed, I realized how few of the older papers and books were part of modern statistical education. I also realized the extent to which my bibliography would be of only limited help to someone approaching this literature for the first time. As Jimmie Savage [2] noted:

> Large, unannotated, unclassified bibliographies alphabetized by author are likely to be a by-product of scholarship. For example, a Xerox copy of such a list compiled by me is on our shelf. This list is useful to me because I remember a little something about almost every item on it and am familiar with the names of most of the authors. To sit down and pore over such a list will do you little good and probably bore you to tears, but it may help you occasionally if you are hunting for works by a specific author, and there is always the possibility of alighting on an intriguing title.
>
> Annotated bibliographies like the one below seem promising to me. That they are rarely published is perhaps because it is rash to take the responsibility for a host of one-line book reviews, often of books that one has not had time to read but only hopes to some day. There is such a bibliography in (Savage [15]). Please look through the entries there that are actually annotated.

It is my strong belief that a well-educated modern Bayesian should read to be aware of the historical roots of our methods. Thus I have extracted two short lists from the longer list of references in [1], ones of papers and the other of books. In the spirit of Jimmie Savage's [2] reading list on the foundations of statistics which he prepared in connection with a course at Yale, I have provided annotations on each of these sources, explaining why I think you should want to read each entry. In several instances my short lists overlap with Savage's longer and broader list, and for these papers and books I've reproduced Savage's annotations following mine in italics.

My choices begin with Bayes [16] and Laplace [21] and then span the 200 plus years that followed, with a special emphasis on the neo-Bayesian revival of the 1950s and some of the papers it spawned in the following decade. At least three papers are decidedly not Bayesian, those by Fisher [20], Neyman [24] and Tukey [29], and another is only incidentally Bayesian, that by Birnbaum [17], although several of its discussants including Savage carried the Bayesian message. Two papers are from the 1970s. I chose Lindley and Smith [23] because it represents for many the start of the modern hierarchical Bayesian literature (even though it was preceded by many equally impressive contributions on the topic, e.g., see the discussion in Fienberg [1]), and Savage's 1970 Fisher lecture, "On Rereading R.A. Fisher," which was published posthumously in 1976.

My original goal was to have "the top 10 classics" for each of books and papers, but limiting the choice to only 10 proved too difficult a task, and presenting a rank-ordering list, in the spirit of those on David Letterman's late-night television show, made no sense whatsoever. So, in the end I share with you my choice of 15 "classic" books (counting a pair of multiple volume treatises) and 13 "classic" papers, with annotations. Other I suspect would make different choices!

References

[1] Fienberg, Stephen E. (2006). "When did Bayesian Inference Become "Bayesian"?" *Bayesian Analysis*, **1**, 1-40.

[An essay on the evolution of Bayesian thinking from 1973 to the present including an explanation for why the adjective "Bayesian" entered the statistical vocabulary so late. Many Bayesians are surprised to learn who seems to have been the first to use the term.]

[2] Savage, Leonard J. (1970). "Reading Suggestions for the Foundations of Statistics." *American Statistician*, **24**, 23–27. [Reprinted in Savage, Leonard J. (1981). *The Writings of*

Leonard Jimmie Savage: A Memorial Selection. American Statistical Association and Institute of Mathematical Statistics, Washington, DC, 536–546.]

[An eclectic bibliography not only with classic Bayesian papers and books, but also with papers on inference topics that spaned the spectrum of the inferential waterfront in 1970. following each entry there is a brief and sometimes remarkably frank annotation. For items in the lists below these annotations are included , *in italics.*]

Classic Bayesian Books

[3] Blackwell, David and Girshick, Meyer A. (1954). *Theory of Games and Statistical Decisions.* Wiley, New York. (Paperback edition, Dover, New York, 1979.)

[A frequentist "bible" for statistical decision theory, it also includes some fundamental results on the sufficiency of experiments that have come to play a mayor role in Bayesian theory. Blackwell later became a major proponent of the subjective Bayesian approach to statistics.]

[4] Box, George E. P. and Tiao, George C. (1973). *Bayesian Inference in Statistical Analysis.* Addison-Wesley, Reading, MA.

[One of the first Bayesian texts by key contributors in the 1960s. It includes many insights and techniques that have withstood the test of time.]

[5] de Finetti, Bruno (1974). *Theory of Probability. Volume I.* (1975). *Theory of Probability. Volume II.* Translated by A. Machi and A. Smith, Wiley, New York.

[Forty years after his seminal contributions of the 1930s, de Finetti published this pair of volumes updating and integrating his ideas on probability and statistics, exchangeability, etc. These volumes are tough going but rewarding reading, and they have influenced a generation of Bayesian researchers.]

[6] DeGroot, Morris A. (1970). *Optimal Statistical Decisions.* McGraw-Hill, New York.

[The first post neo-Bayesian revival effort to present an integrated Bayesian approach to statistical decision theory beginning with subjectivist axioms of probability and carrying up through conjugate theory, limiting posterior distributions, and sequential decision making and the sequential choice of experiments.]

[7] Good, I.J. (1950). *Probability and the Weighing of Evidence.* Charles Griffin, London.

[Good, who was a disciple of Alan Turing, presents an early exposition of subjective Bayesian approaches to inference including Bayes factors. Savage reviewed this book in *JASA*, 46 (1951), 383–384, and noted that, while the treatment of axioms was quite classical, the book provided a thorough exploration of the general principles and included "illuminating topics and examples."]

[8] Good, I.J. (1965). *The Estimation of Probabilities.* The M.I.T. Press, Cambridge, MA.

[The first historical description of the hierarchical Bayesian approach to statistical modeling (before the term "hierarchical model" was coined) with applications to contingency table problems. A slim volume chockful of interesting ideas.]

[*Savage: A recent and typical work of an extremely energetic and original author. Foundations and applications are here well mixed.*]

[9] Jeffreys, Harold (1939). *Theory of Probability.* Oxford University Press, London. (Third Edition, 1961; also available in paperback, 1998.)

[This book presents Jeffreys' integrated "objective Bayesian" perspective. It had a major influence on the work of leaders of the neo-Bayesian revival and especially those who sought an alternative to Savage's deeply personalistic approach to probability and statistics. Savage in the paperback edition of [15] notes that Jeffreys' book is an "ingenious and vigorous defense of a necessary view, similar to, but more sophisticated than, Laplace's." No brief annotation can do it justice.]

[*Savage: A recent edition of a masterpiece that all Bayesians should study, though the author is a nonpersonalistic Bayesian.*]

[10] Kyburg, H.E. and Smokler, H.E. editors (1964). *Studies in Subjective Probability*. Wiley, New York. (Second revised edition, Krieger, Garden City, 1980.)

[Two different but overlapping collections of classic papers. The 1st edition has several historical articles including Savage [27], whereas the 2nd edition replaced many of these by a different and more recent paper by Savage and papers by I.J. Good and Richard Jeffrey. Both editions include Ramsay [26] and de Finetti [18].]

[*Savage on the 1st Edition: This is an anthology that I hope we shall all read together.*]

[11] Laplace, Pierre-Simon (1825). *Essai Philosphique sur les Probabilités. Fifth Edition* Courcier, Paris. Translated by Andrew I. Dale (1995) as *Philosphical Essay on Probabilities*, Springer-Verlag, New York.

[Laplace is easier to read than Bayes, and this volume sets forth an accessible version of his views on the nature of probability and the method of inverse probability.]

[12] Lindley, Dennis V. (1965). *Introduction to Probability and Statistics from a Bayesian Viewpoint. Part 1: Probability. Part 2: Inference.* Cambridge University Press, Cambridge.

[This two-volume introductory text on probability and statistics emulates what was then the usual topics but using "non-informative" priors to produce standard distributional and other results but in the form of posterior inferences.]

[*Savage: Represents a certain formulation of Bayesian statistics not so thoroughly personalistic as that of (Raiffa and Schlaifer [14]).*]

[13] Mosteller, Frederick and Wallace, David L. (1964). *Inference and Disputed Authorship: The Federalist.* Addison-Wesley, Reading, MA. (The 2nd Edition appeared as *Applied Bayesian and Classical Inference–The Case of the Federalist Papers*. Springer-Verlag, New York, 1984.)

[The first large-scale statistical approach to text classification including their application to the disputed Federalist Papers, authored by Hamilton and Madison. The authors present a host of hitherto unknown tools and techniques (e.g., Laplace's method) and implement them in one of the first major computer-based statistical application. The 2nd edition includes a much updated bibliography. The study and methods weather the test of time and should be read by anyone analyzing text data.]

[14] Raiffa, Howard and Schlaifer, Robert (1961). *Applied Statistical Decision Theory.* Division of Research Graduate School of Business Administration, Harvard University, Boston. (Paperback edition, MIT Press, Cambridge, 1968).

[The authors develop a Bayesian theory for exponential families and provide the first integrated theory of conjugate prior distributions. They coin the term and provide a detailed implementation. The entire book seems to have been developed totally separately from Savage and others involved in the neo-Bayesian revival. When I was a student and a junior faculty member this was a "bible" for Bayesians.]

[*Savage: Two books in one. A small but profound textbook on Bayesian statistics and a rather large manual of formulas for Bayesian statistics. The notation may induce nystagmus and splitting headaches, but it is not really difficult to learn to read.*]

[15] Savage, Leonard J. (1954). *The Foundations of Statistics.* Wiley, New York. (Second revised paperback edition, Dover, New York, 1972.)

[This was the book that set off the neo-Bayesian revival and led to the coining of the term "Bayesian," although the word does not appear in the book. The first half presents a readable and highly original discussion of the axioms of probability and utility developed from first principles. The second half of the book tries to address some classical statistical problems from the perspective of this axiomatic foundation, unsuccessfully. Following its publication in 1954, Savage became a committed subjectivist and helped to convert many to the Bayesian camp. The paperback edition which remains in print includes some updated footnotes and bibliographic materials. Every Bayesian should own a copy.]

[*Savage: Consists in part of an axiomatic study of personal probability and utility merging ideas of de Finetti and of von Neumann and Morgenstern. A not very successful attempt is made to discuss the minimax principle and other devices of the Neymann-Pearson school. The treatments of sufficiency and point estimation are relatively successful.*

Few of you will want to read this book through, but since it represents an important part of my preparation for the course, you may want to take a look at it. The author of this book, though interested in personal probability, was not yet a personalistic Bayesian, and he was unaware of the likelihood principle. The bibliography is useful, and this present bibliography is well regarded as an extension of it.]

Classic Bayesian Papers

[16] Bayes, Thomas (1763). "An Essay Towards Solving a Problem in the Doctrine of Chances." *Philosophical Transactions of the Royal Society of London* **53**, 370–418. [Published in 1764; reprinted, with an introduction in Barnard, George A. (1958). "Stud-

ies in the History of Probability and Statistics: IX. Thomas Bayes' Essay Towards Solving a Problem in the Doctrine of Chances." *Biometrika*, **45**, 293–315.]

[Bayes's posthumously publish paper is the earliest exposition of Bayes' theorem and an interesting application of a priori thinking. Some have argued that it owes more to Richard Price (who edited it) than to Bayes. This is not an easy read.]

[17] Birnbaum, Allan (1962). "On the Foundations of Statistical Inference (with discussion)." *Journal of the American Statistical Association,* **57**, No. 298, 269-326. [Discussion by L. J. Savage; George Barnard; Jerome Cornfield; Irwin Bross; George E. P. Box; I. J. Good; D. V. Lindley; C. W. Clunies-Ross; John W. Pratt; Howard Levene; Thomas Goldman; A. P. Dempster; Oscar Kempthorne; and a response by Allan Birnbaum.]

[In his discussion of this paper and in later writings, Savage stressed the importance of Birnbaum's work and the likelihood principle for completing the Bayesian framework for inference.]

[*Savage: An important analysis and defense of the likelihood principle.*]

[18] de Finetti, Bruno (1937). "La prévision: ses lois logiques, ses sources subjectives," *Annales de l'Institut Henri Poincaré*, **7**, 1–68. Translated as "Foresight: Its Logical Laws, Its Subjective Sources," in H. E. Kyburg, H.E. and Smokler, H.E. eds., (1964). *Studies in Subjective Probability*. Wiley, New York, 91–158.

[An overview of subjective probability and exchangeability based on 4 lectures given in Paris, that summarizes de Finetti's basic ideas on the topic. A difficult read, but worth the effort. de Finetti stresses different implications of his representation theorem that those usually emphasized by modern Bayesians.]

[19] Edwards, Ward, Lindeman, H. and Savage, Leonard J. (1963). "Bayesian Statistical Inference for Psychological Research." *Psychological Review*, **70**, 193–242.

[This paper is perhaps the most readable exposition of the Bayesian position in the early post neo-Bayedsian revival literature, including a discussion of the robustness of posterior inferences to prior specification.]

[*Savage: A fairly complete but relatively amathematical discussion of Bayesian Statistics.*]

[20] Fisher, R. A. (1922). "On the Mathematical Foundations of Theoretical Statistics." *Philosophical Transactions of the Royal Society of London, Series A*, **222**, 309–368.

[As Stigler recently noted in *Statistical Science* 20 (2005), 3249: "Ronald A. Fishers 1921 article on mathematical statistics (submitted and read in 1921; published in 1922) was arguably the most influential article on that subject in the twentieth century..." The article introduces most of modern statistical concepts such as sufficiency, efficiency, estimation, likelihood, and consistency, as well as the word "parameter" and the notion of parametric families. In one fell swoop, Fisher presented a new and almost mature theory of estimation on which Bayesians and non-Bayesians have since built.]

[21] Laplace, Pierre-Simon (1774). "Mémoire sur la Probabilité des Causes par les événements," *Mémoires de mathématique et de physique presentés á l'Académie royale des sciences, par divers savans, & lûs dans ses assemblées*, **6**, 621–656. Reprinted in Laplace's*Oeuvres complétes*, **8**, 27–65. (English translation and commentary by Stephen M. Stigler in *Statistical Science*, **1**, (1986), 359–378).

[Laplace reinvented Bayes' theorem here, in a more general form than Bayes. His approach later became known as the method of inverse probability. The English translation of Laplace's paper is well worth reading, in part because of the commentary by Stigler.]

[22] Lindley, Dennis V. (1957). "A Statistical Paradox." *Biometrika*, **44**, 187–192.

[In this brief paper, Lindley demonstrates the possible contradiction between the results of a test of significance and an assessment of the posterior probability of a null hypothesis. He also relates these ideas to the frequentist problem of optimal stopping when the likelihood function does not depend on the stopping rule. Many Bayesian and non-Bayesian observers returned to this paradox in subsequent papers and commentaries.]

[23] Lindley, Dennis V. and Smith, Adrian F.M. (1972). "Bayes Estimates for the Linear Model (with discussion)." *Journal of the Royal Statistical Society, Series B*, **34**, 1–44.

[This classic paper is the one that most modern Bayesians cite as the origin of hierarchical Bayesian modeling, although the discussion

makes clear that the ideas had been developed by many others over an extended period of time. The paper give an integrated treated of the hierarchical approach to normal theory problems. While the paper had many precursors, especially in the work of I.J. Good, few were able to so elegantly lay out a path for others to follow.]

[24] Neyman, Jerzy (1934). "On the Two Different Aspects of the Representative Method: The Method of Stratified Sampling and the Method of Purposive Selection (with discussion)." *Journal of the Royal Statistical Society*, **97** , 558–606.

[Neyman's classic paper on sampling describes the methods of stratification, clustering, and optimal allocation. Bayesians need to read the arguments carefully to identify Neyman's repeated sampling perspective and to understand the design versus model-based divide that is so prominent in the field of sampling. But as important as the paper was for sampling, it may well be even more important because it was here that Neyman introduced the concept of confidence intervals, a notion referred to in the discussion by Fisher as "a confidence trick."]

[25] Pratt, John W. (1965). "Bayesian Interpretation of Standard Inference Statements." *Journal of the Royal Statistical Society. Series B*, **27**, 169–203.

[A Bayesian looks ingeniously for points of reconciliation between Bayesian theory and non-Bayesian procedures. Pratt sums up by observing that "a Bayesian can make considerable use of some standard methods. A non-Bayesian, if he feels there is some element of sense in some Bayesian point of view in some circumstances, may expect a Bayesian lamp to throw some light on his methods."]

[26] Ramsey, Frank Plumpton (1926). "Truth and Probability" written 1926. Published in 1931 as *Foundations of Mathematics and Other Logical Essays*, Ch. VII, pp. 156–198. Edited by R.B. Braithwaite. Kegan, Paul, Trench, Trubner & Co., London. (Reprinted in Kyburg, H.E. and Smokler, H.E. eds. (1964). *Studies in Subjective Probability*. Wiley, New York, 61–92.) [Electronic edition available at: `homepage.newschool.edu/het/texts/ramsey/ramsess.pdf`]

[This is a relatively brief paper that argues for the subjective approach to probability, labelled as degree of belief, from a simple notion of "value" or utility. Starting from some basic axioms on values, Ramsey derives several of the elementary axioms of probability. Savage in the paperback edition of [15] describes it as being a "Penetrating development of a personalistic view of probability and utility."]

[27] Savage, Leonard J. (1961). "The Foundations of Statistical Inference Reconsidered." *Proceedings of the Fourth Berkeley Symposium on Mathematical Statistics and Probability,* University of California Press, Berkeley, **1**, 575–586. [Reprinted in Kyburg, H.E. and Smokler, H.E. eds. (1964). *Studies in Subjective Probability*. Wiley, New York, 173–188, and in Savage, Leonard J. (1981). *The Writings of Leonard Jimmie Savage: A Memorial Selection.* American Statistical Association and Institute of Mathematical Statistics, Washington, DC, 296–307.]

[This paper and a closely related discussion paper read to the Royal Statistical Society at about the same time signaled the maturation of Savage's views on the foundations and the importance of such key ideas as the role of the likelihood principle.]

[*Savage: Presents some criticism of (Savage 1954) and gives a concise account of Bayesian statistics.*]

[28] Savage, Leonard J. (1976). "On Rereading R. A. Fisher (with discussion)(J.W. Pratt, ed.)." *Annals of Statistics*, **4**, 441—500). [Reprinted in Savage, Leonard J. (1981). *The Writings of Leonard Jimmie Savage: A Memorial Selection.* American Statistical Association and Institute of Mathematical Statistics, Washington, DC, 678–720.]

[This was Savage's 1970 Fisher Lecture at the American Statistical Association Annual Meeting at which he held an overflowing room spellbound for almost two hours. Lovingly edited by John Pratt with discussion by Churchill Eisenhart, D.A.S. Fraser, V.P. Godambe, I.J. Good, Oscar Kempthorne, and Stephen Stigler, and most especially Bruno de Finetti. Savage examines Fisher's great ideas here lovingly, but not uncritically. Pratt's abstract summarizes Savage's perspective: "Fisher is at once very near to and very far from modern statistical thought generally."]

[29] Tukey, John W. (1962). "The future of data analysis." *Annals of Mathematical Statistics*, **33**, 1–67. (corrections, p. 812.)

[An *areligious* paper that is not specifically on foundations but one which signaled a new focus on data analysis instead of mathematical statistics, and spawned many implementations in the decades to follow. In many ways this is one of Tukey's more accessible papers.]

[*Savage: Words fail me. Difficult, important, slippery. We should all tackle it together.*]

THE 2006 MITCHELL PRIZE

The Mitchell Prize committee invites nominations for the 2006 Mitchell Prize. The Prize is currently awarded every other year in recognition of an outstanding paper that describes how a Bayesian analysis has solved an important applied problem. The Prize is jointly sponsored by the ASA Section on Bayesian Statistical Science (SBSS), the International Society for Bayesian Analysis (ISBA), and the Mitchell Prize Founders' Committee, and consists for 2006 of an award of $1000 and a commemorative plaque. The 2006 Prize selection committee members are Tony O'Hagan (chair), Dave Higdon and Marina Vannucci. This information is reproduced from `http://www.bayesian.org/awards/mitchell.html`, where more details may be found.

A primary feature of the Student Corner section is the publication of dissertation abstracts. If you have recently defended your Ph.D. thesis, please email the abstract to `rbgramacy@ams.ucsc.edu`. For the september issue we have one abstract.

INEQUALITY CONSTRAINED NORMAL LINEAR MODELS

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Dissertation Abstract

This dissertation deals with normal linear models with inequality constraints among model parameters. Scientists often have one or more theories or expectations with respect to the outcome of their empirical research. To evaluate these theories they have to be translated into statistical models. When scientists talk about the expected relations between variables if a certain theory is correct, their statements are often in terms of one or more parameters expected to be larger or smaller than some of the others. In other words, their statements are often formulated using inequality constraints. Frequentist null hypothesis testing with inequality constrained alternatives are investigated. Test for univariate normal models are available, in the literature, but the possibilities for multivariate constrained testing are limited. A computational method to sample the null distribution of any test statistic in the context of both univariate and multivariate constrained alternative hypotheses is presented.

The brunt of the thesis discusses Bayesian estimation and model selection in the context of (competing) inequality constrained normal linear models. It is natural to encode the inequality constraints in the prior distribution of the model parameters. Each theory constitutes its own prior knowledge and therefore the appropriate prior is defined for each model. A motivation for Bayesian model selection is provided in preference to null hypothesis testing.

Next, the idea of encompassing priors is introduced and examined. Since inequality constrained models are all nested in one unconstrained, encompassing model, just one prior needs to be specified. The prior distributions for the constrained models are derived by a truncation of the parameter space. Sensitivity analysis can provide information about the fit of each of the models, that is, of each of the theories. Sensitivity analysis of encompassing priors can also show that for specific classes of models the selection is virtually objective, that is, independent of the encompassing prior. The encompassing prior also leads to a nice interpretation of Bayes factors. The Bayes factor for any constrained model with the encompassing model reduces to the ratio of two proportions, namely the proportion of the

encompassing prior and posterior, in agreement with the constraints. This enables efficient estimation of the Bayes factor and its standard error since with only one sample from the encompassing prior and one sample from the encompassing posterior, Bayes factors for all pairs of models are obtained.

The thesis closes by illustrating the potential of posterior model probabilities and model selection as an alternative to the use of p-values in traditional hypothesis testing.

NEWS FROM THE WORLD

by Alexandra M. Schmidt
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I would like to encourage those who are organizing any event around the World, to get in touch with me to announce it here.

Events

Evidence Synthesis for Decision Modelling, Burwalls, Bristol, UK. December 5th - 9th, 2005.

This course is a 5-day course intended for: (a) Anyone undertaking health technology assessments, including cost-effectiveness analyses, (b) Statisticians, with or without experience in meta-analysis, who wish to learn about Bayesian methods for evidence synthesis particularly in the context of cost-effectiveness analysis.

Course Organizers: Prof Keith Abrams (Univ of Leicester), Prof Tony Ades (MRC HSRC, Bristol), Dr Nicola Cooper (Univ of Leicester), Dr Alex Sutton (Univ of Leicester) and Dr Nicky Welton (MRC HSRC, Bristol)

Further details including online booking can be found at the course website `http://www.hsrc.ac.uk/EvidenceSynthesis2005/evsynth_main.htm` and from the Course Administrator Sarah Garbutt (Email Sarah.Garbutt@bristol.ac.uk or Tel +44 (0)117 928 7262).

Eighth Brazilian Meeting on Bayesian Statistics in Honor of Helio Migon. March 26-29, 2006. Colonna Park Hotel, Buzios, Rio de Janeiro, Brazil.

The meeting celebrates the 60th anniversary of Professor Helio S. Migon. Helio has been one of the main forces behind the Bayesian Brazilian surge over the last 15 years and, in particular, one of the leaders of the Graduate Program in Statistics at Universidade Federal do Rio de Janeiro where he advised some 30 master and Ph.D. students.

The invited speakers for the conference are:

- Márcia Branco (USP)
- Ricardo Ehlers (UFPR)
- Edward George (University of Pennsylvania)
- Pilar Iglesias (PUC, Chile)
- José Galvão Leite (UFSCar)
- Helio Migon (UFRJ)
- Ajax Moreira (IPEA)
- Marina Paez (UFRJ)
- Fabrizio Ruggeri (CNR-IMATI, Italy)
- Nicholas Polson (University of Chicago)
- Alexandra M. Schmidt (UFRJ)
- Mark Steel (University of Warwick)
- Mike West, (Duke University)

The Chair of the conference is Professor Marco A. R. Ferreira (marco@im.ufrj.br). Information about the program, travel, accommodations, and registration will be available on the conference website shortly.

The Meeting will feature invited talks, contributed talks and posters. If you would like to contributed with a talk or poster, please submit a title and abstract to marco@im.ufrj.br.

For more information, please contact one of the members of the Scientific Committee: Marco A. R. Ferreira (marco@im.ufrj.br), Dani Gamerman (dani@im.ufrj.br), Hedibert F. Lopes (hlopes@ChicagoGSB.edu), Rosangela H. Loschi (loschi@est.ufmg.br), Josemar Rodrigues (vjosemar@power.ufscar.br).

International Conference on Inverse Problems: Modeling and Simulation Fethiye, Turkey. May 29-June 2, 2006.

This conference might be of interest to the Bayesian Statistical Community in Inverse or Ill-Posed Bayesian Problems.

The main aim of the Conference is to combine presentations in the theory and applications of inverse problems from groups all over the world. It will bring together all classical and new inverse problems from international scientific schools. The focus will be on new challenges of inverse problems in current interdisciplinary science and future directions. The proposed International Conference will be under the auspices of the leading international journals Inverse Problems, Inverse Problems in Science and Engineering and Inverse and Ill-Posed Problems. More details can be found at `http://umm.kou.edu.tr/kongre/`.