THE ISBA BULLETIN

Vol. 7 No. 4 *December 2000*

The official bulletin of the International Society for Bayesian Analysis

A WORD FROM THE PRESIDENT

by Philip Dawid
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Radical Probabilism

Modern Bayesianism is doing a wonderful job in an enormous range of applied activities, supplying modelling, data analysis and inference procedures to nourish parts that other techniques cannot reach.

But Bayesianism is far more than a bag of tricks for helping other specialists out with their tricky problems – it is a totally original way of thinking about the world we live in. I was forcibly struck by this when I had to deliver some brief comments about de Finetti at the meeting of the International Society for Clinical Biostatistics in Trento last September, and prepared myself by reading or rereading as much of his work as I could get my hands on. I was particularly struck by his youthful work "Probabilismo", written when he was 23. An English translation of this ("Probabilism") appears in a special issue, entirely given over to papers on de Finetti's philosophy of probability, of the journal "Erkenntnis" (Volume 31, nos. 2 – 3, 1989), which also contains a valuable overview, "Reading Probabilismo", by Richard Jeffrey. In "Probabilismo" de Finetti already lays out all the elements of the philosophical position that he was to continue to develop and promote (to a largely uncomprehending audience) for the rest of his life.

He is utterly uncompromising in his rejection of the realist conception that Probability is somehow "out there in the world", and in his pragmatist emphasis on Subjective Probability as something that can be measured and regulated by suitable instruments (betting behaviour, or proper scoring rules).

What de Finetti constructed was, essentially, a whole new theory of logic – in the broad sense of principles for thinking and learning about how the world behaves. Its novelty lies in its recognition of the essential role of uncertainty in sound human thinking, and its provision of tools for correctly manipulating that uncertainty.

Such a logic should be vital importance over the whole range of human activity, not just the narrow confines of scientific research. However, even within the scientific community (dare I say, even within the ISBA community?!) there has been little enthusiasm to listen to this radical message, and it is even harder to put it across to a public trained from childhood to regard it as wimpish ever to admit to anything less than certainty, who can't believe that mere statisticians might have anything to say to them that could possibly be worth listening to. I recently acted as an expert witness for the defence in a murder appeal, which revolved around a variant of the "Prosecutor's Fallacy" (the confusion of $P(innocence|evidence)$ with $P(evidence|innocence)$).

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I had previously prepared a detailed written report, which was before the court. However, when counsel for the defence asked for me to be called to the stand to explain my report, the judge replied: "We don't really need to hear his testimony, do we? It's hardly rocket science, is it?". (Clearly, he had not read my article in the March 2000 issue of the ISBA Bulletin). The final judgement pooh-poohed the idea that anybody could ever be taken in by the prosecutor's fallacy, and went on to ignore completely the logical points made. The appeal was not granted.

It can be dispiriting, but we must continue to try to spread the good word with all our vigour. In Britain there has been much public concern recently about the way in which our government solicited, used and disseminated scientific advice over the BSE ("mad cow disease") epidemic, without taking into account any of the uncertainties involved. Slowly, perhaps, the ground may be becoming more receptive, and the radical probabilistic seed may yet take root and flourish. But it will need the concerted efforts of all those who feel proud to call themselves Bayesians.

A WORD FROM THE EDITOR

by Fabrizio Ruggeri
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My first thought is about the Associate and Corresponding Editors who are stepping down from their job with this issue: they have been the "engine" behind the success (after two years, we can say it ...) of the Bulletin. I wish to thank Antonio, Gabriel, Siva and Sujit (and Maria for the year she brilliantly served) for their deep contribution in shaping the "new" Newsletter. They deserve a hearty plause from all ISBA members. New Associate Editors (Maria Eugenia Castellanos and Javier Morales for the Students' Corner, Kate Cowles for Applications, Duncan Fong for Bibliography, Leo Knorr-Held for Software and Antonio Lijoi for News from the World) are warming up for the next issue: please get in touch with them (see their e-mail addresses at www.iami.mi.cnr.it/isba).

Arnold Zellner is back: his new contribution is about ISBA History and all of you are invited, as suggested by Arnold, to update his paper on the ISBA website, www.bayesian.org.

Last, but not least, a word of thanks to Dennis Lindley, and his interviewer (Karen Young): read the interview and you will understand why!

ISBA ELECTIONS

by Mike Evans
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This year ISBA held an online election for the positions of President-Elect, Executive Secretary and four new Board members. The option of mailing in the ballot was also available but the vast majority of members chose to vote online.

In this year's election 147 ISBA members participated by voting for one or more of the positions. This participation rate is about the same as in previous elections. Many thanks to all who participated and especially to those who stood as candidates. The following individuals were elected.

➤ **President-Elect**

David Draper

➤ **Executive Secretary**

Cindy Christiansen

➤ **Board Members**

Nicky Best
Eduardo Gutierrez-Peña
Tony O'Hagan
Raquel Prado

ISBA LOGO

by Mike Evans
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ISBA has now chosen a new logo; see it at www.bayesian.org. This logo was designed by Petros Dellaportas.

Congratulations to Petros and many thanks to all those who submitted entries! We received 21 additional entries designed by Concha Bielza, Nigel Cooper, Jorgen Hilden, Daphne Kounali, Brunero Liseo, Duncan Murdoch, J. Lynn Palmer, Jonathan Rougier, Juan Antonio Cano Sanchez, Bob Shaker and Alyson Wilson.

DENNIS LINDLEY

by Karen Young
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Dennis needs no introduction - without him Bayesian statistics would not be where it is today.

1. Dennis, you have been interviewed before by Adrian Smith (Statistical Science, 10, 305-319) and we don't want to cover the same ground again. One thing which I wanted to ask you about your influential 1972 RSS paper with Adrian. Can you tell us a bit about its genesis?

My memory about the past is not always reliable but I believe the following description about my paper with Adrian is correct. I was enormously impressed by Stein's proof that the sample mean was not an admissible estimate of the population mean of a normal distribution in dimensions 3 or more. (Incidentally, this result is still ignored by many statisticians today. Reflect, it means that least squares estimates are similarly inadmissible.) Part of the reason for my reaction to Stein's result was the fact that a Bayesian with a proper prior would not use the sample mean, so here was a result that supported this view. If you will look up the discussion of Stein's paper in the RSS you will find that I advocated a shift to the group mean in the case of one-way analysis of variance, and this idea was generalised in a paper at the London ISI meeting: *Bull. Inst. Internat. Statist.*, 43, 152-153 (1969) and again at a conference in Canada.

2. Are you aware that your procedure for estimation based on model estimates from that paper is now called ''Iterated Conditional Modes'' and I recently saw a paper which compared its results with Gibbs sampling? Have you any comments on this?

The idea of using the modes in place of the means was Adrian's and I can recall him coming into my room one day with this simple and effective observation. I had not heard of "iterated conditional modes" but would have expected them to be unnecessary these days when the whole distribution can often be calculated by MCMC.

3. I suggested that your 1972 paper is highly influential and I think that it should be on the reading list of any research student. Can you suggest some other papers which you would put on that list?

Savage did produce a reading list for a research student. It appeared in *American Statistician*, 24, 23-27 (1970). The two volumes by Johnson & Kotz *Breakthroughs in Statistics* could provide a good basis for a research student. What I do wish is that everyone, research students and professors, would read de Finetti. I once said that we should all take two years off research and read him, one year for each volume.

4. In a recent article on the Philosophy of Statistics (The Statistician 2000, 293-337) you say, about the Sixth Valencia Conference, that ''Although I was impressed by the overall quality of the papers and the substantial advances made, many participants did not seem to me fully to appreciate the Bayesian philosophy.'' Could you amplify a bit the sort of concerns you had?

What the people at Valencia did not realise is that Probability is the only sensible description of uncertainty. Almost everything we talk about has an element of uncertainty about it and therefore needs probability. I have just begun to read Sprott's recent book. He does not understand this for he admits that the value of a parameter is uncertain and yet will not admit that it has a probability distribution. My favourite example concerns multiple comparisons. Suppose that we have several means that we wish to compare. Then we are uncertain of them and therefore have a probability distribution for them. From this we can calculate any margin of the distribution that is of interest. For example, we can find that of the difference between any two of them. So multiple comparisons becomes an exercise in the determination of marginals. Yet you have whole books, for example by Hsu, which waffle away with most complicated calculations because they have not read de Finetti.

5. In that paper you advocate building models as

`large as possible. That entails specifying a big multivariate prior - do we really have any ideas how to do that properly?`

I don't know how to construct a big multivariate prior but consider the construction to be the most important problem in statistics today, and wish people would spend time researching it instead of working on reference priors. My view is that likelihood and prior together express the scientists' appreciation of the small world and the data about that world. It is necessary to form this large probability distribution before coherent inference and decision-making can proceed. One tool that has been used successfully goes under various names, with slight differences, but essentially directed, acyclic graphs. These work well if there is enough independence in the topic. A problem I have worked on, mostly without result, is a prior for the dispersion matrix of a multivariate, normal distribution. How should we estimate the dispersions from the data? Is there an equivalent of James-Stein with means that applies to the second moments? There is one tool in all this that may be important: coherence. Consider several binary quantities, x, y... One can think of $p(x = 1)$, $p(y = 1|x = 1)$, $p(y = 1|x = 0)$ etc.. But equally one could start with y, go to x, in reversal of that order. The joint distributions one reaches by these two routes must agree (cohere). There is one aspect to this problem that is not statistical. In devising techniques of probability assessment, account must be taken of the individual's psychology, so that the problem needs co-operation between statisticians and psychologists. For example, it may be easier to answer questions about quantiles than about moments.

`6. During your career what is it that you are most proud of and what is your most memorable moment?`

Pride is one of the seven deadly sins, so I will not admit to it. What I see myself as having done is to make people aware of the ideas of Ramsey, Jeffreys, Savage and, above all, de Finetti; to see that their concepts are fundamentally sound and the only way for statistics to proceed, then to observe some of the consequences. Rather than single out a most memorable moment, I'd prefer to identify a class of memorable moments, which I term Eureka occasions. You have been struggling with a problem, producing pages of notes that make little overall sense, and you find yourself so immersed in the work that the external world almost disappears; when, suddenly, all falls into place and, if not the solution, at least the road to the solution, is revealed. At the time it appears a gigantic step forward, even if later reflection shows that it is but a small step in our understanding, and the world reappears as a wonderful place. Artists sometimes think they have a near monopoly over imagination and insight. This is not so, for scientists do not proceed only by logic and experiment, they experience Eureka moments. Unfortunately Eureka moments are the privilege of youth; old age rarely experiences them.

`7. Are you planning to attend Valencia and ISBA conferences and take a role in the statistical community in future?`

I do not expect to attend any further statistical meetings. Stress affects me adversely, whether physical or mental (not another paper on likelihood!), so it is best to live quietly by the sea and rely on letters, e-mail and reading.

`8. Is there anything in particular you would like to say to the ISBA membership?`

There is one sense in which I have always regretted the existence of ISBA, or the Valencia meetings, whilst recognising that they have been highly beneficial to the development of the Bayesian paradigm. Bayesian statistics is not a branch of statistics, in the way, say, that 'design' is. It is a way of looking at the whole of statistics: thus there is 'Bayesian design'. We aim to interfere everywhere. Therefore ISBA members' aim should be to abolish the section, by the section becoming statistics and all recognise the inevitability of that attitude. Don't just go to Bayesian meeting; go to meetings on design and heckle. "Why don't you express your prior opinions in the form of probability, for those opinions are all you have in design?" May I share with ISBA members

a quote? It comes from *A Monk and Two Peas* by Robin Marantz Henig. Weidenfeld & Nicolson: London. 2000 ISBN 0 297 643 657. Throughout, for Mendel, read Bayes. "Every new science needs a hero - someone on whose giant shoulders his disciples can stand - and Mendel was an easy man to lionise. Partly because so little was known about his actual biography, and because the little that was known was so admirable - solitary, devout, gentle, humourous, modest - the Moravian monk was an ideal tabula rasa on which latter-day Mendelians could etch a tale that it pleased them to think was true. He also was a good father figure because his approach to data collection and analysis was so thoroughly modern. Mendel was a twentieth-century scientist trapped in the nineteenth century, and the romance of his story was that he died unappreciated and embittered, mired in a dreadful silence that engulfed him and his reputation for thirty-five years. But none of this would have caused anyone to turn Mendel into the founding father of genetics if it were not for the much more critical point: Mendel had been right. The mythologizing that turned Mendel from monk to hero reflected a process that is central to the formation of almost any new science. Most researchers, even in Bateson's day, spend most of their time in laboratories that look and feel like factories. If they can keep in mind some brilliant, founding father, some scorned or unappreciated genius in whose footsteps they now loyally tread, they can more easily maintain their sense of mission through even the most routine, inconsequential chores." So now I know why it is called Bayesian statistics. Incidentally, the book is highly to be recommended.

TWO NEW PRIZES IN STATISTICAL SCIENCE

A consortium of statistical organisations has established two new professional prizes: the DeGroot Prize and the Lindley Prize, honouring the eminent statisticians Morris H. DeGroot and Dennis Lindley.

The DeGroot Prize will be awarded in recognition of a published book in statistical science. Candidates for the DeGroot Prize will be judged on the extent to which the book represents an important, timely, thorough and notably original contribution to the statistics literature, whether textbook or monograph. The DeGroot Prize may be awarded for a book addressing fundamental issues of statistical inference, decision theory and/or statistical applications, and including teaching texts at any level.

The Lindley Prize will be awarded for innovative research in Bayesian Statistics that is accepted for publication as a contributed paper in the refereed proceedings of the Valencia and ISBA international meetings. Award winning papers will present research in Bayesian statistics that is is judged important, timely and notably original; truly innovative work will be judged more highly than successful development of ideas previously exposed. The Lindley Prize may be awarded for work in foundations, theory, methodology and applications of Bayesian statistics.

Each of the prizes consists of an award of $1500 and a commemorative plaque and is awarded biennially. The first DeGroot Prize will be awarded following the competition in 2001. The first Lindley Prize will be awarded following the competition based on contributed papers in the proceedings of the 7th Valencia International Meeting on Bayesian Statistics, to be held in Spain in 2002.

The International Society for Bayesian Analysis (ISBA), one of the founder organisations, has assumed responsibility for the management and administration of the two awards.

Full details of the two prizes, including the governing charters and the list of founding organisations, can be found at the ISBA website `www.bayesian.org/awards/awards.html`

ISBA HISTORY AND MEETINGS

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The opening paragraph of the first issue of The ISBA Newsletter, Nov. 1992, edited by Thomas Leonard, reads: "Following worldwide enthusiasm, positive votes at Bayesian Conferences in Rio de Janeiro, St. Paul, Valencia and Cambridge, and letters of support from Brazil, the United Kingdom, Spain, Japan, China, Taiwan, Hong Kong, Switzerland, Poland, New Zealand, the United States, [and many other countries], the acting board announces the formation of ISBA. This world organization seeks to benefit international society by the advancement of Bayesian statistics, science and analysis in the natural, biological and social sciences, engineering, industry, medicine, law, government and education, and by the development and interface of inferential and decision making procedures in all areas...The current acting members of the temporary board are Arnold Zellner (U. of Chicago) and Jose Bernardo (Generalidad Valencia Presidencia), Co-presidents; Michel Mouchart (U. Catholique de Louvain), Secretary; Gordon Kaufman (MIT), Treasurer; Thomas Leonard (U. of Wisconsin), Newsletter Editor and Constitutional Advisor; James Press (UC Riverside), Intersocietal Representative; Dennis Lindley (Somerset, England), Hajime Wago (U. of Toyama), Duncan Fong (Penn State U.), Jacques Dreze (U. of Louvain), Yoel Haitovsky (U. of Jerusalem), John Hsu (UC Santa Barbara), Dale Poirier (U. of Toronto), Herman van Dijk (Erasmus U. Rotterdam), Enrique de Alba (ITAM, Mexico City), Luis Pericchi (Univ. Simon Bolivar, Caracas) and J.K. Ghosh (Indian Statistical Institute), International Advisors; Seymour Geisser (U. of Minnesota), Chairman of the Council of Sciences. A permanent board will be elected by postal ballot prior to the first annual meeting." On Nov. 10, 1992, ISBA was incorporated as a not for profit corporation in the state of Illinois by Gordon Kaufman, Tom Leonard and Arnold Zellner. See `www.bayesian.org`, ISBA Archives, Service to the ISBA, for more information on those who have served ISBA over the years.

The First World Meeting of ISBA was held in San Francisco, August 6-7, 1993 jointly with the NBER-NSF Seminar on Bayesian Inference in Econometrics and Statistics just before the annual Joint Statistical Meetings. The Oct. 1993 ISBA Newsletter, edited by Jeff Dorfman, U. of Georgia, and Tom Leonard, U. of Wisconsin commented as follows on the meeting: "Our first world meeting was a great success, with nearly 200 participants packing into the Hotel Nikko in San Francisco. Congratulations to organizer Rob McCulloch, on a wonderful meeting. Thanks to Chase-Manhattan Bank [Jose Quintana], Electric Power Research Institute [Stephen Peck] and H.G.B. Alexander Research Foundation for their financial support." (p.2) In a December 1992 letter to the ISBA Board Members, Arnold Zellner wrote: "I am writing to invite all Board members to serve on the Program Committee for the 1993 ISBA meeting in San Francisco... Robert McCulloch has agreed to serve as Program Chair and John Geweke as a member of the Program Committee...As regards invited paper sessions, a group of us, including Shanti Gupta, met with Seymour Geisser, Chair of the ISBA Council of Sciences at the recent wonderful Workshop of the Americas on Bayesian Statistics and Econometrics in Caracas, Venezuela to plan about eight invited paper sessions dealing with Bayesian analysis in various sciences and areas of application...Also, a cocktail party on Friday and a dinner on Saturday are being arranged...J. Stuart Hunter, then President of ASA wrote that he would address the dinner in the following words: "You asked for a "title for my presentation". I do not plan to do more than confess my Bayesianism and to say a few words of greetings as the president of the ASA." There was a Board meeting at which a Nominating Committee (J. Bernardo, D. Fong, S. Geisser, M. Mouchart, Chair and S.J.Press) was appointed to organize the first ISBA election of a President, Vice-President, Treasurer, Secretary and 12 International Advisors. Also, other weighty matters were discussed. At the Open Business Meeting reports were made and all were encouraged to follow

the 11th Commandment, "Make the pie bigger for all!"

Many of the papers presented at the meeting were included in a 1993 proceedings volume produced jointly with the ASA Section on Bayesian Statistical Science. The invited paper sessions included talks on Bayesian analysis on Wall Street, in engineering, psychology, environmental science, physics, astronomy, geology, econometrics, and Bayesian education. Contributed paper and poster sessions dealt with a wide range of theoretical and applied topics. Wes Johnson, U. of California at Davis, Chair of the Local Arrangements Committee and the committee members, Richard Barlow, Garth Hollaway, William Jewell and Dale Poirier did a great job in all respects. The parties, dinners, etc. were outstanding. Last, but not least, Pam Eckert, my secretary, played a key role in making the '93 and later ISBA meetings very successful.

The Second World Meeting of ISBA was held in Alicante, Spain, June 10-11, 1994, just after a Valencia Meeting with 151 official participants in attendance. The meeting was held in the Hotel Melia, located between the beach and the yacht harbor. Michel Mouchart, U. of Louvain, was Program Chair and M. J. (Susie) Bayarri, U. of Valencia was in charge of local arrangements. Also, S. James Press, U. of California at Riverside announced the first Mitchell Award of $1,000 for a "paper describing how a Bayesian analysis has solved a truly applied problem." At the ISBA Board meeting, after financial, membership, and local arrangements reports by Gordon Kaufman, Susie Bayarri and Michel Mouchart, the Board heard a report of the results of the first ISBA election of a Board and International Advisors. Jay Kadane, ISBA's Thomas Jefferson, was given the responsibility for preparing a draft of an ISBA constitution. It was unanimously agreed that the next world meeting of ISBA would be held in 1995 in Oaxaca, Mexico followed by a 1996 meeting in South Africa to help celebrate the peaceful transition from apartheid to freedom. Friends from South Africa sponsored a lively cocktail party for the participants, a brief introduction to the warm hospitality that we were to experience in our 1996 meeting in Cape Town.

As reported in the ISBA Newsletter, Dec. 1995, "The Third World Meeting of ISBA held in Oaxaca, Mexico, was very successful with about 174 in attendance. There were three parallel sessions on Friday and Saturday, September 29-30 as well as an extensive Friday evening poster session and two banquets. Edward George and his Program Committee arranged the full and worthwhile program. They did an excellent job of selecting and grouping the talks. Enrique de Alba, President of the Organizing Committee and his colleagues made arrangements for the meeting that were excellent...The Governor of the State of Oaxaca, Mr. Diodoro Carrasco generously provided the opening dinner as well as logistic support and the group of "hostesses", those beautiful girls dressed in typical local costumes who accompanied the participants during registration and providing coffee and drinks between the sessions. The Rector of ITAM (Mexico City), Dr. Arturo Fernandez, was also very supportive of the event, both financially as well as with personnel and physical resources...After the dinner a Folkloric local group presented typical dances from each of the seven regions of the State of Oaxaca. The event was extremely colorful and provided foreign guests a taste of Oaxaca.

At the closing banquet on Saturday night, awards were presented to Edward George and Enrique de Alba in recognition of their fine work in arranging the meeting. Also, Edward George joined John Deely to make the famous Deely Awards to some who participated in the meeting [A Deely rose was given to my wife Agnes for putting up with me for so many years!]. Thanks were also expressed to the Governor and Rector for funding the banquet and their other contributions, and to Dr. Jose Quintana and Dr. Stephen C. Peck for obtaining funds to help meet participants' travel and other expenses." Many of the papers presented at the meeting were published in the third joint ISBA/SBSS Proceedings Volume. Enrique de Alba wrote in the ISBA Newsletter that, "Of the participants 52 were students, 48 Mexican and 4 American...Thus overall, the meeting was a big success in terms of attracting students

so that they can be introduced to the Bayesian approach to Statistics."

The new Chair of the Council of Sciences (COS), Don Berry of Duke U. met with a group to plan future activities of the COS. In 1995, Jeffrey Dorfman announced the appointment of an Editorial Board for The ISBA Newsletter. The Associate Editors appointed were: Robert Kohn, U. of New South Wales, Jack Lee, National Chiao Tung U., Udi Makov, U. of Haifa, Ludovico Piccinato, U. of Rome, Mark Schervish, Carnegie Mellon U., Hiroki Tsurumi, Rutgers U., and Alyson Wilson, Duke U. Further, in 1995, Carlos Rodriguez, State U. of New York in Albany and Richard Silver, Los Alamos National Laboratory established a Web site for ISBA and a Bayesian Analysis E-Print Archive. These developments were a forerunner to the work of Mike Evans, U. of Toronto in creating the wonderful, current ISBA website, `www.bayesian.org`. Go to it and enjoy learning about current and past developments.

The Fourth World Meeting of ISBA with over 100 in attendance was held in Cape Town, South Africa, Dec. 17-20, 1996, preceded by an Education and Research Workshop in Bayesian Analysis, Dec. 14-16. As reported in the May 1997 ISBA Newsletter, produced by the new editor, Frank R. Kleibergen, Erasmus U., Rotterdam, "Escaping winterly climates all around the world many Bayesians visited the ISBA 1996 World Meeting in Cape Town...The broad range of topics and the quality of the presented papers made the meeting a "Wonderful Moment of Bayesianism". Dan De Waal was Program Chair for the meeting and many outstanding statisticians, including Abrie van der Merwe, Paul Fatti and Piet Groenewald from South Africa participated. Besides tours organized by the outstanding conference organizer Tim Dunne (U. of Cape Town), many of us took the opportunity for a longer stay in South Africa. Many from South Africa made presentations and/or chaired sessions at this ISBA meeting and impressed participants with their deep knowledge of modern Bayesian principles and techniques. The 28-page report of the meeting contains a listing of sessions, papers and abstracts of presented papers.

As mentioned above, an Education and Research Workshop in Bayesian Analysis (ERWBA) was held just before the ISBA meeting. In a report, Tim Dunne describes this workshop meeting, financed by grants from the U. of Cape Town and the U.S. National Science Foundation, as follows: "The programme was devised by Arnold Zellner...He invited Professors S. James Press (Riverside), Stephen Fienberg (Carnegie-Mellon), John Geweke (Minnesota), Alicia Carriquiry (Iowa State), Theo Stewart (Cape Town), and Balisyar Bhat (Botswana), and PhD candidate Andrew Ainslie (Chicago) to lead various sessions of the workshop.

Two documents were produced for participants: a 280 page bound collection of the workshop papers and notes, and a 140 page provisional text in Contemporary Bayesian Econometrics by John Geweke. Software was also made available by Arnold Zellner. Software offered by John Geweke required higher levels of hardware than are currently available in Africa, but as hardware improves there would be access to his package. The workshop events involved introductory presentations and educational views, but some research issues were also discussed. There were 20 participants (other than the leading speakers) of whom 10 were from South Africa, 4 from Zimbabwe, 3 from Uganda, 2 from Botswana and 1 from Ethiopia. Participants from all the African countries recorded their delight at the initiative taken by ISBA. They were particularly grateful for the printed material and program diskettes...Specific thanks were extended by participants to all persons involved in the generation of the NSF part sponsorship of the workshop...This enthusiasm resulted in the formation of an African chapter of ISBA a few days later during the 4th World meeting of ISBA. All the participants stayed over to be at that event. Participants were of the view that many persons in areas of the globe similarly disadvantaged by national poverty and constrained higher education infrastructures might benefit from similar ERWBA events...Accordingly, the participants recorded their suggestions that ISBA and NSF offer similar workshops in

regions such as South America and the fringes of the Pacific rims of progress... [Prof. Dunne].

Needless to say, foreign attendees at the meeting joined South Africans at the Monday Cocktail Evening and the Wednesday trip to Groot Constantia in many toasts in honor of those who made possible the peaceful transition to freedom and democracy. Given the intense "strains" of such meetings, etc., it was decided in Cape Town that ISBA would hold World meetings every four years beginning in 2000. (See Newsletter, May 1997 for details of the Program Committee Report).

The Fifth World Meeting of ISBA was held in Istanbul, Turkey, August 16-18, 1997 as a satellite meeting of the 51st Session of the International Statistical Institute (ISI) in Istanbul and took place in the Istanbul Polat Renaissance Hotel. A very fine program was produced by Hamparsum Bozdogan (U. of Tennessee) and Refik Soyer (George Washington U.), Co-Program Chairs and their committee. Ulku Gurler (Bilkent U., Turkey) and his Organizing Committee made local arrangements that were exceptionally fine. The 45 page Scientific Program for the meeting contained much useful information including acknowledgements of financial and technical support from the Turkish Scientific & Technical Research Council, U. of Tennessee, George Washington U., U.S. NSF, and OTARI TOURS, Istanbul (where East meets West). According to the ISBA Newsletter of Sept. 1997, "Ninety three participants from 16 countries attended...The program consisted of 14 invited sessions, including two panels, 3 contributed sessions and a poster session. The presentations provided an up-to-date overview of theoretical and applied research in Bayesian statistics.

Applications covered a wide range of disciplines, such as engineering, biological sciences, economics, law, medicine, and social sciences." As Mark Steel, ISBA Vice-Program Chair, noted, papers presented in Istanbul and in Cape Town are eligible for inclusion in the 1997 Proceedings volume of the ASA's Section on Bayesian Statistical Science. Also, this very successful and productive meeting included a Gala Dinner and Cruise on the Bosphorus from 6:00-12 midnight on Sunday, Aug. 17 following a Saturday dinner at Le Chateau Restaurant. And, of course, there was the famous or infamous Deely Award ceremony with John Deely presiding, assisted and abetted by Steve Fienberg, 1997 President of ISBA. Also, David R. Cox (Oxford U.), President of ISI, shared his thoughts on Bayesian analysis with us at a session involving deep and insightful presentations by Jim Berger, Jayanta Ghosh, and Jose Bernardo. Overall, the meeting was a memorable event that we shall long remember.

The Sixth World Meeting of ISBA, ISBA2000 was held in Hersonissos-Heraklion, Crete, May 28-June 1, 2000. As Ed George, ISBA Program Chair wrote in the ISBA Bulletin, June 2000, "...Our Sixth World Meeting...was a tremendous success. Ideally situated at glorious luxury hotels, an impressive scientific program of 126 talks and 108 posters was presented. The Bayesian spirit of hard work and hard play was ever present, and a productive and fun time was had by all.

The bulk of the planning and implementation of ISBA 2000 was carried out by three committees—the Program Committee (Mike West, Chair), the Finance Committee (Alicia Carriquiry and Stephen Fienberg, Co-Chairs and the Local Organizing Committee (George Kokolakis, Chair). These committees, especially the chairs, did a superb job, and their tireless efforts are most gratefully acknowledged. A refereed proceedings volume is in the works, and will be published and distributed by Eurostat, who co-sponsored the meeting. In addition to all this generous support, Eurostat will also distribute a complimentary copy to all current ISBA members."

As regards fun, those attending were treated to one of the most unusual after dinner performances ever presented in the history of the human race. Strange human beings, said to be a wild clan of Bayesians, clad in most outlandish garb danced and sang to amuse an attentive audience under a clear night sky. It was awesome. Another night, it was Greek food for dinner followed by village dances with the audience going native and participating in the wonderful Greek frolics until all hours of the night. Oh yes, we did work hard, as Ed George

mentioned above. Indeed many of the sessions were jointly sponsored with Eurostat, an interaction that will undoubtedly result in many Bayesian improvements in the production and use of official government statistics worldwide.

In addition to the above World Meetings, there have been three lively regional meetings in Toronto, Canada, 1994, Taipei, Taiwan, 1994 and Chicago, U.S., 1996. Mike Evans and his colleagues at the U. of Toronto played a key role in arranging the outstanding Toronto meeting. Jack Lee, Wes Johnson and Arnold Zellner, with help from many others, organized the Taiwan meeting and Robin Carter, U. of W. Ontario, then visiting the U. of Chicago, was a key person in organizing the Chicago 1996 meeting. ISBA has also co-sponsored four meetings, namely, The 1995 Second International Workshop on Bayesian Robustness, Rimini, Italy, The 1997 17th Maximum Entropy and Bayesian Methods Workshop, Boise, Idaho, U.S.A, the 1998 Sixth Valencia International Meeting on Bayesian Statistics, and the 1998 Workshop on Bayesian Inference and Stochastic Processes, Madrid, Spain. Further, the ISBA Chapters in India, South Africa, and Chile have sponsored very effective workshop meetings.

With all this past and current activity, we conclude that a Bayesian Era has arrived! For further evidence, see Jim Berger's December 2000 *JASA* article, especially Section 2, Bayesian Activity.

Congratulations to all ISBA members for the important role that they have played in creating the Bayesian Era.

P.S. ISBA was (re)incorporated in the State of Iowa, by Alicia Carriquiry, on March 16, 2000.

A Case Study That Makes the Case for Teaching Bayesian Methods to Undergraduates

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For the last 5 years, I have been advocating teaching Bayesian methods in undergraduate service courses, i.e. courses designed for non-statistics majors. At Duke, we've learned that you can't teach primarily the Bayesian paradigm without upsetting other departments. What you can do is present both frequentist and Bayesian paradigms with equal emphasis, and encourage students to ponder the differences. My strategy follows.

The first half of the course looks like many other introductory statistics classes. We use *Statistics* by Freedman, Pisani, and Purves (1998). Students learn the differences between observational studies and controlled experiments, how to describe the distribution of a single variable and the relationship between two variables using graphical and numerical techniques, and how to use the basics of probability. The probability section of the book is supplemented with my own segments on conditional probability and Bayes theorem.

The second half of the semester does not look like other introductory statistics classes. First, we cover frequentist inference, seeing confidence intervals, (Observed-Expected)/Standard Error, and hypothesis testing in a half-dozen different contexts. Then we start over with Bayesian inference. We define subjective probability and review Bayes theorem. This segment borrows heavily from $Statistics$: $ABayesianPerspective$ by Berry (1996) and a supplement to the Freedman et al. text written by Michael Lavine and myself. The students see binomial and normal data examples. In the binomial-data examples we use both discrete and continuous parameter spaces. Conjugate beta priors are used for the latter. Then we look at normal-data examples with a continuous parameter space for the mean. Again we use a conjugate prior. Students learn to calculate the posterior and predictive distributions.

Throughout, the emphasis is on thinking through Bayes theorem, updating beliefs, and making predictions about future observations.

Time allows 4 formal lectures on Bayesian inference followed by 2 lecture periods that cover a case study. The case involves the GUSTO clinical trial, a trial comparing tissue plasminogen activator (t-PA) and streptokinase (SK) for the treatment

of myocardial infarction.

The results of the trial were first presented in the *New England Journal of Medicine* (1993) and were subsequently reanalyzed by Brophy and Joseph in the *Journal of the American Medical Association* (1995). The statistical argument in the *NEJM* paper uses confidence intervals and tests of significance. Finding an increased survival of 1% and rejecting the null hypothesis of no difference between treatments, the GUSTO investigators conclude that t-PA is clinically superior. In the *JAMA* paper, Brophy and Joseph use Bayesian statistical arguments to argue that the jury is still out. They find that the posterior probability that survival on t-PA is greater than survival on SK by at least 1% ranges from 0% to 36% depending on how much weight is placed on previous trials. A third source for the case is an article, "The Mathematics of Making up Your Mind", by W. Hively. The article appeared in the popular science magazine *Discover* in May, 1996. It covers the differences between inferential paradigms and highlights the controversies that can arise between them. The article uses the GUSTO trial as their primary example.

After introducing and discussing the case, there are two student exercises both based on role-playing. One is a written exercise, the other a mock legal trial. Students are expected to use the information from the three articles. In the written role-playing exercise students are asked to role-play 3 individuals: 1) a government policy maker deciding whether Medicare will pay for t-PA, the more expensive treatment, 2) an insurance company executive deciding whether their company will pay for the more expensive drug, and 3) a son/daughter whose parent was given the more expensive drug, and the insurance company is refusing to pay. They must present a written statistical argument (Bayesian or Frequentist) to defend each position.

In the second role-playing exercise, a mock legal trial, students are given roles of plaintiff, defendant, prosecuting attorney, defense attorney, or expert statistics witness (one for each side). The case they must enact is a malpractice suit against a doctor who prescribes the SK, cheaper drug, and the patient dies.

Both the written exercise and the mock trial have worked well. The trial works best when you have pre-law and pre-med students in the class. It can be hilarious when you have students with acting experience. Regardless, it is wonderful to see the wheels churn as students sift through the inference issues while presenting their arguments.

What does this case study teach the students? Students love what George Cobb calls "authentic play". That is, they love to imitate what they will actually be doing as professionals. This case is an excellent example of authentic play. At the same time it brings to light the advantages and disadvantages of each paradigm. Students learn to make persuasive statistical arguments and are better able to critique others' statistical arguments. Students learn that there are alternative ways of thinking and publishing, and it is their choice. Students learn that statistics are a tool for decision making. Students learn that statistics will be useful for most everything they do and read for the rest of their lives.

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BAYESIANS IN BRAZIL

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" Let us suppose that an individual, I , is provided with a certain set, C , of knowledge and that I ought to behave dependently on the occurrence or not of a given event, E ."

" ... the subjective notion of probability aims exactly to measure this degree ... of belief... "

These are excerpts (translated from Portuguese) from the "Introduction to Probability Calculus" class notes used during the Fifties at ENCE (Escola Nacional de Ciencias Estatisticas - National School of Statistical Sciences) in Rio de Janeiro. The notes were written by Professor Rio Nogueira and constitute the earliest reference to subjective probability we have found in Brazilian writings. In fact, it is a nice surprise to find a Brazilian relative I of de Finetti's character You ! [ENCE still exists and is an undergraduate school of Statistics maintained by IBGE , the Brazilian Census Institute. A few of the people mentioned below graduated from ENCE].

Let us now move to the Sixties at Berkeley, where Caio Dantas, a probabilist from Sao Paulo, attended the seminars held by David Blackwell and Lester Dubins. Dantas brought back a Bayesian seed (and also Blackwell's *Basic Statistics* book) to USP (Universidade de Sao Paulo) where Carlos Pereira wrote up a Bayesian MA dissertation. A few years later, Carlos went to Florida to get his PhD from Debabrata Basu. Upon his return to USP in the late Seventies, Bayesian activities in Brazilian academia finally unfolded in a strong and regular fashion. The multiple - but always Bayesian - interests of Carlos Pereira influenced many researchers at Sao Paulo. Among his early PhD students we find the geneticist Andre Rogatko. Josemar Rodrigues was at USP faculty and wrote several papers jointly with Carlos Pereira on linear models and finite populations. Another faculty member, Heleno Bolfarine, returned from Berkeley in 1982 to start a brilliant career on Bayesian theoretical statistics.

At that time in Rio Basilio Pereira, a student of Sir David Cox, started to supervise some Bayesian students and hosted a first visit of Adrian Smith of three months in 1980. Basilio (Carlos' brother) proceeded and created the Bayesian atmosphere at UFRJ (Federal University of Rio de Janeiro) where Marlos Viana, Helio Migon and Dani Gamerman would later appear to make the department an excellence center on Bayesian research with sound contributions in econometrics, dynamical models, time series, epidemiology, survival analysis, stochastic simulation.

We are by now in the Eighties and our story becomes way less linear as the branches of the Brazilian Bayesian tree start to become many. At Sao Paulo, Carlos Pereira, Josemar Rodrigues, Heleno Bolfarine and Jorge Achcar established a firm research activity and influenced many young people to follow Bayesian careers. Jose Galvao Leite wrote his PhD dissertation on Bayesian capture-recapture sampling under Carlos Pereira supervision. His MA students Telba Irony and Angela Mariotto went to get their doctoral degrees from Dick Barlow on Bayesian industrial engineering and Sir Cox, respectively. In Rio de Janeiro, Helio Migon and Dani Gamerman had returned from Warwick, having obtained their PhD degrees under the supervision of Jeff Harrison and Mike West, respectively. Helio and Dani have been supervising Bayesian dissertations since 1987 at COPPE/UFRJ (Graduate School of Engineering/UFRJ) and from now on at their home department, DME (Statistical Methods Department), which has just started to offer a regular PhD program in Bayesian Statistics.

During the Nineties, Bayesian activities in Brazil started to make good impact in other countries as foreign students returned to them. From USP Daniel Paulino returned to Portugal after getting a PhD from Carlos Pereira. Victor Salinas Torres and Pilar Iglesias, both from Chile and both Pereira's PhD students returned. Back in Chile, Pilar Iglesias has been provoking good Bayesian earthquakes since then. Luis Eduardo Montoya Delgado is back in Colombia after a superb PhD on DNA profiling for paternity investigation.

Veronica Gonzalez-Lopez in Argentina is the most recent member of this impressive list of Carlos' PhD students. Paulino worked on identifiability, Torres on Bayesian non-parametrics and Dirichlet process, Pilar on predictivistic representations, and Lopez on Bayesian concepts of dependence. At the same department, Heleno Bolfarine supervised students like Reynaldo Arellano Valle whose PhD dissertation won a first prize award at the Bernoulli Society Clapem contest. Valle is back in Chile and worked on external predictivistic representations of elliptical families. Loretta Gasco at Peru and Patricia Gimenez at Mar del Plata were also Bolfarine's doctoral students. Heleno Bolfarine and Pilar Iglesias were PhD advisers to Marcia Branco and Rosangela Loschi. All this people have very strong and active scientific collaboration. We have recent papers by Gonzalez-Lopez and Nelson Tanaka, Bolfarine and Valle and so on, not to mention Pilar Iglesias whose admirable drive puts almost everyone to work.

The brand new generation of Brazilian Bayesians includes Lurdes Inoue who after a PhD from Donald Berry at Duke is now at the MD Anderson Cancer Center at Houston and Hedibert Lopes who also graduated from Duke and is now at UFRJ faculty. Both got MA degrees in Brazil formerly, Lurdes from Sergio Wechsler and Hedibert from Helio Migon. A list of several almost-PhD Brazilian Bayesian students at USP, UFRJ, Duke, Sheffield, Cambridge .... could be given but we prefer to hurry them up (not to mention that we intend to write the Second part of this story ten years from now).

Before getting too close to year 2000, we should remember the series of bi-annual Bayesian Brazilian Seminars held since 1991. The first one was at Sao Carlos and chaired by Josemar Rodrigues and Sergio Wechsler. In 1993, the Seminar was held jointly with the International Bayesian Hierarchical Meeting of Rio de Janeiro organized by Dani Gamerman and Helio Migon and attended by Bayesians like Jose Bernardo, Adrian Smith and Phil Dawid (who would return for the third Brazilian Bayesian two years later). Before that , in 1992, we had in Rio a joint Brazil-US Meeting on Bayesian Econometrics chaired by Ruben Klein and attended by Arnold Zellner and Jay Kadane among many others. [Omissions are unavoidable at this point and we apologize for this. Jim Berger, Susie Bayarri, Ed George, Dale Poirier, Seymour Geisser, Alicia Carriquiry, Tony O'Hagan, Steven Fienberg, Jim Press, Alan Gelfand and Luis Pericchi among again many others were also in Brazil a couple of times. The department at USP was visited by Dev Basu, Dennis Lindley, Dick Barlow amd S. Zacks. Adrian Smith and Tony O'Hagan visited UFRJ more than once]. During the 1992 Meeting a vote was taken for the creation of ISBA.

Also during the Nineties a diffusion of Bayesian ideas and methods occurred among researchers from other areas and statisticians and probabilists who would not consider themselves exclusively "Bayesians": we find outstanding contributions from Pablo Ferrari on Image Restoration, Antonio Galves on Linguistics, both at USP, Renato Assuncao at UFMG (Federal University at Minas Gerais) on Spatial Statistics and Disease Control, Pedro Morettin (USP) on Time Series. The work by Fabio Cozman, a Carnegie Mellon Ph.D in Robotics recipient, is illustrated in the software section of this issue.

We should also list the bibliographical contributions of Brazilian Bayesian authors: to mention books only, Heleno Bolfarine is co-author of S. Zacks' book on Finite Population Estimation, Dani Gamerman wrote *Monte Carlo Markov Chain: Stochastic Simulation for Bayesian Inference* and, jointly with Helio Migon, *Statistical Inference: an Integrated Approach* . Going back to the beginning, we find translations to Portuguese of Blackwell's *Basic Statistics* and Raiffa's *Decision Analysis* already in the early Seventies. Carlos Pereira and Marlos Viana wrote a book in 1982 on *Introductory Bayesian Statistics* which was never translated from Portuguese.

Bayesian research activities are now very active in Brazilian universities with strong interaction with universities abroad. Last year the Brazilian Bayesians decided to create a Brazilian Chapter of ISBA. The new Chapter made the decision to host the First "Latin American Bayesian Meeting" (I COBAL) to be held very probably on January 2002 in Brazil.

BAYESIAN INFERENCE FOR FOSSIL RECORD DATA

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We describe a fundamental framework for Bayesian inference from fossil record data.

Fossil data are commonly collected by Paleontologists to answer questions about the history of life and may be used to estimate a taxon's (i.e. species) time of origin and its time of extinction. Values of these parameters are important for testing hypotheses about origination and extinction, for evaluating phylogenetic hypotheses and for calculating species turnover rates, among others. However, the fossil record is typically incomplete. There are generally gaps within the observed stratigraphic range and more importantly, there may also be gaps between the endpoint of the observed range and the true end points. These gaps may result either from failure of nature's preservation processes or failure of paleontologist's collection practices. The true end points are the end points that would have been observed if the fossil record and human data collection provided a flawless record of species presence.

There are several ways of sampling a stratigraphic section. We assume discrete sampling, where samples are taken at particular locations along the stratigraphic section and the number of specimens y_{ij} found is recorded for each taxon j. Locations t_i are measured in meters of rock above an arbitrary baseline. The distance between samples may be uniform, or may be based on where samples can be readily collected. The total number of specimens identified at each location is n_i. In many data sets, presence, $y_{ij} = 1$, and absence $y_{ij} = 0$ out of a nominal $n_i = 1$ is all that is recorded.

Maximum likelihood estimates of the true end-points of a taxon's stratigraphic range are the observed beginning and end points in the data set. This is equivalent to a literal reading of the fossil record. In the absence of better methods, paleontologists may use the observed range as an estimate of the true range and ignore uncertainty in the end point estimation.

The goal of our research has been to develop Bayesian inference for fossil record data. Weiss and Marshall (1999) analyzed data taken from 36 unevenly spaced samples of 100 grams of rock collected from three cliff faces of Cenomanian-Turonian outcrop, deposited some 95-90 million years ago in Eastbourne, Sussex, U.K (Vaziri, 1997). The 36 samples were taken at heights of 0, 1.4, 1.6, 2.3,3.9, ... 31.4 meters from bottom. Sixty seven species were identified; all are assumed to have been present at the bottom $t_1 = 0.0$. We mention two species as illustration; species 20, *Gavelinella cenomanica* was present ($y_{ij} = 1$) at the first 9 locations. It was last observed at location 5.4 meters, and was never observed again; the first two non-occurrences were at 5.9 and 6.1 meters. Since this species was always observed until it disappeared, we might suspect that the species became locally extinct between 5.4 and 5.9 meters. In contrast, species 27, *Bathysiphon sp.*, was present in 5 locations and absent at 12 locations inside its observed range. It was last observed at height 9.2, then absent at 9.9, 10.2 meters and on through the top of the section. Because omissions are more common than not for species 27, we anticipate that the first few absences above the last presence are more likely omissions from the fossil record rather than evidence of its extinction just above its last presence.

Our goal is to make these qualitative arguments more precise through use of a statistical model. We begin with a setup already described (Weiss and Marshall, 1999) (WM), where origination occurred before $t_1 = 0.0$. Thus we need only model the extinction time. The data y_{ij} are the observed presence or absence of species j at height i and where $y_{ij} = 0$ may simply be due to a false absence or omission rather than due to extinction. WM modeled the y_{ij}'s as Bernoulli(π_{ij}), separately for each species where π_{ij} denotes the probability of observing the species in a sample prior to extinction. The parameter of interest is E_j, the extinction time of species j. WM assumes that the probability $\pi_{ij} = \pi_j$ is a constant before extinction ($t_j \leq E_j$) and

π_{ij} is of course $= 0$ after extinction ($t_j > E_j$). The resulting likelihood for species j is non-standard. It depends on the total number presences and absences between 0 and the time of extinction E_j. The likelihood of extinction is a step function which is zero below/beneath the highest height $t_{\max}$ which has $y_{ij} = 1$. At $t_{\max}$, the likelihood jumps immediately to a maximum. The likelihood is constant in between sampling locations t_j and drops at each height $t_j > t_{\max}$. At the top of the section there are no more samples, and the likelihood then is perfectly flat and greater than zero out to plus infinity. The likelihood never drops to zero for $E_j > t_{\max}$.

The prior for the extinction time E_j was specified as exponential with a mean longevity of 21 million years. This was converted to a mean of 800 meters in the scale of stratigraphic distance, utilizing prevailing knowledge of the sediment deposition rate in the Eastbourne section.

For prior specification of the probability π_j, we borrow strength by using data from other species. Data y_{ik} from species k with similar extinction times and similar fossil record recovery rates were pooled to create a Beta prior for π_j.

Our Bayesian analysis estimates that species 20 became extinct within .5 meters after it was last observed in the fossil record. In contrast, species 27 was only intermittently observed and the results are strikingly different. The posterior mean and median extinction time are many hundreds of meters past the last observed presence. The posterior variance of E_{27} is large reflecting the uncertainty of the results. If we change the prior mean extinction time from 800 meters to 40 meters or 2 meters, the posterior mean for species 27 changes by similar orders of magnitude. In contrast, the result for species 20 is insensitive to these changes to the prior.

Our ongoing project is to develop a fundamental framework for Bayesian analysis of fossil record data. These analyses will utilize actual specimen counts for each species out of total fossils sampled at each location rather than the presence-absence information described above. We plan to include multiple species in the analysis. The counts of the different species at a fixed height are modeled as a multinomial. When species j is not extant, the multinomial cell probability for species j is zero. This dynamically changes the probabilities of observing the other extant species since these probabilities add to 1. We wish to simultaneously estimate the birth and extinction times of all species under analysis.

Motivation for this development is provided by Upper Cambrian trilobite data collected at 13 different sites in the western US (Thomas, 1993). The Thomas data has 34 different varieties of trilobite. In addition to estimating the time of origin and extinction of each genus, paleontologists are interested in knowing whether different species originated or became extinct at the same time, whether one species became extinct at the same times at different sites, and how the distribution among the species changes over time.

In summary, fossil record analysis involves interesting statistical modeling. Simple maximum likelihood analysis is often equivalent to literal reading of the fossil record. Bayesian methods provide more useful tools and are able to highlight hidden characteristics of the data. In general, paleontological interest focuses on temporal and spatial relative diversity, and statistical models for these data and issues are currently under development.

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THE JAVABAYES SYSTEM

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➤ Introduction

The goal of this brief paper is to describe the JavaBayes system, a software package that manipulates graphical statistical models known as Bayesian networks (also known as Probabilistic networks, Belief networks, Causal networks). The software package is freely distributed at `www.cs.cmu.edu/~javabayes` and has been adopted in several teaching and research institutions as a vehicle for understanding, building and manipulating large statistical models with categorical variables. The web site contains more information about JavaBayes, including a user manual in HTML and postscript formats, downloadable files in ZIP and TAR formats, and a description of the statistical inference algorithm implemented in the system.

➤ A quick tour on Bayesian networks and JavaBayes

A Bayesian network is a graphical representation for a multivariate statistical model. The idea is to use *directed acyclic graphs* as the basis for model construction. A directed graph is a collection of nodes and directed edges between nodes. If an edge goes from node X to node Y, then X is the *parent* of Y and Y is the *child* of X. The parents of X are denoted by $\text{pa}(X)$, and the children or X are denoted by $\text{ch}(X)$. Bayesian networks are constructed using directed graphs that are *acyclic* — graphs where it is impossible to start at a node and reach the same node following directed edges. Given a node X in a directed acyclic graph, we can easily find the *descendants* of the node (all nodes that can be reached from X).

Suppose we have a multivariate statistical model with N variables. We can represent this model by a directed acyclic graph with N nodes. We start by associating each variable with a node. We then define a conditional distribution $p(X_i|\text{pa}(X_i))$ for each variable X_i (the distribution of X_i given the parents of X_i). The parents of a variable X_i are selected so that the following property is satisfied: X_i is independent of its nondescendants nonparents given its parents. The result is a graphical structure where each node "contains" a variable X_i and a distribution $p(X_i|\text{pa}(X_i))$. The joint distribution is (Pearl, 1988):

$$p(X_1, \ldots, X_N) = \prod_{i=1}^{N} p(X_i|\text{pa}(X_i)) .$$

Such graphical models have been put to use in a variety of contexts (Jensen, 1996, and Whittaker, 1990), most notably in the BUGS system for generic Bayesian analysis (`www.mrc-bsu.cam.ac.uk/bugs/`). Several examples that illustrate uses of Bayesian networks can be found at the JavaBayes web site.

JavaBayes is a system for creating and manipulating Bayesian networks containing categorical variables. The system contains facilities for creating nodes, specifying variables and probability values, saving and loading networks. Networks can be loaded either from files or from the internet. The system is coded in the Java language, inheriting the portability aspects of this language and benefiting from the language facilities for operation with the internet and user interface construction. The fact that world-wide-web browsers support the Java language makes it possible to use JavaBayes directly in a web browser.

Once a Bayesian network is created or imported into the system, variables can be *observed*; that is, a variable can be fixed at a value. The collection of all observed variables and their observed values is the evidence E in the network (note that E may be empty). Two types of statistical inferences can be performed by JavaBayes:

- Computation of marginal probabilities for a variable X_q conditional on the evidence in the network. The objective is to compute $p(X_q|E)$.
- Computation of a maximum a posteriori configuration of variables X_q (where X_q can be a set of variables). The objective is to compute $\arg\max_{X_q} p(X_q|E)$.

The inferences are performed by the *variable elimination* algorithm (Dechter, 1999, and Zhang and Poole, 1996). This algorithm (also known as bucket elimination) is quite similar to the peeling algorithm used in genetics for pedigree analysis

(Cannings and Thompson, 1981). The first step in any such algorithm is to discard distributions that are not needed in the computation — such distributions can be detected by efficient algorithms, thus saving considerable computational effort (Geiger, Verma and Pearl, 1990).

Note that we only need to compute $p(X_q, E)$, because the conditional $p(X_q|E)$ can be easily obtained by normalizing $p(X_q, E)$. We are then interested in computing the following expression:

$$p(X_q, E) = \sum_{\mathbf{X}_R \setminus \{\mathbf{X}_q, E\}} \left(\prod_{X_i \in \mathbf{X}_R} p(X_i|\text{pa}(X_i)) \right), \quad (1)$$

where $\mathbf{X}_R$ indicates the set of variables that are effectively needed in the computation (after discarding unnecessary distributions). Now, think of the various distributions in (**??**) as living in a "pool" of distributions. Suppose we collect the distributions that contain variable X_1, take them off of the pool, and construct the (unnormalized but positive) function

$$\sum_{X_1} \left(\prod_{X_1, \text{ch}(X_1)} p(X_j|\text{pa}(X_j)) \right).$$

Now we put this function into the distribution pool. What we have done is equivalent to "summing out" X_1; that is, we have eliminated variable X_1 from the problem. Following the same procedure, we can eliminate X_2, X_3, and so on. Eventually we obtain an unnormalized function of X_q. By normalizing this function, we obtain $p(X_q|E)$. JavaBayes uses exactly this procedure to compute posterior probability values, relying on heuristics to generate an elimination order for variables (Jensen, 1996).

JavaBayes also contains a generalization of the original variable elimination algorithm in which intermediate results are "cached" in a tree structure, so that a sequence of inferences can be done with increased efficiency. The resulting scheme is similar to a junction tree algorithm (Jensen, 1996). The extended algorithm is described in a paper that can be downloaded from the JavaBayes web site (Cozman, 2000).

➤ The evolution of JavaBayes

The first version of JavaBayes was coded in September 1996, shortly after the XII Conference on Uncertainty in Artificial Intelligence. JavaBayes was first coded as a small library and distributed in the internet with a rudimentary user interface. The response to the first version was quite positive. Several contributions were made by users of the system; the most notable was the user interface produced by Sreekanth Nagarajan and Bruce D'Ambrosio at University of Oregon. Their graphical user interface was integrated to the inference engine and formed JavaBayes version 0.2. Eventually, the whole inference engine *and* the graphical user interface were rewritten from scratch, to become version 0.3. The basic functionality of JavaBayes has not changed since then.

The coming version 0.4 will contain a new, much improved inference engine. The new engine is substantially faster, better designed and more extensible, and it takes much less memory to run than the current engine. All the code is released with the executable, as the whole distribution is given under the Gnu-license. Consequently, everyone is welcome to contribute — you are welcome to test and to try the system, and hopefully to contribute to the evolution of JavaBayes.

➤ The future?

JavaBayes focuses on categorical models, as these models have received great attention in artificial intelligence research. There is great room for improvement and extension. I see two areas in which JavaBayes can make a difference in an interesting way.

First, teaching Bayesian analysis is still a difficult task. There are notable teaching tools, perhaps the most interesting being the FirstBayes system developed by A. O'Hagan (`www.shef.ac.uk/~st1ao/1b.html`). JavaBayes can be an interesting tool for teaching Bayesian analysis, because Bayesian networks are easy to visualize and the system can be smoothly used through the internet. But to be a complete teaching tool, the system must be enlarged, as teaching requires the ability to display histograms, charts and other statistical niceties, and the ability to handle continuous variables.

A second contribution of JavaBayes is taking Bayesian analysis to the realm of

embedded systems — devices that work inside machines, utilities or vehicles. The economic value of embedded system has been growing exponentially; predictions indicate that these systems will soon be an important part of our everyday lives. We can imagine air conditioning devices that do weather forecast, or cars that predict traffic conditions. JavaBayes is well-positioned to satisfy those needs, as it has been coded in Java (a language with some special features for embedded systems) and as it has been coded from the start to be lean and understandable.

To conclude, JavaBayes can be used now, and there are plans to keep improving it so as to support the needs of the Bayesian community and to expand the reach of Bayesian analysis.

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Note: Parts of this paper have been based on an invited paper sent to the Workshop on Software Support for Bayesian Analysis Systems, Colorado, 2000.

A FINAL COMMENT

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In the past year I have published articles about the job market, and many recent Ph.D.'s have contributed with their personal experiences and advice. In this last issue we present an article by Dr. D. Higdon on "Statistical Consulting" and we conclude the Student's Corner with the abstract of the thesis of Dr. D. Conesa. My main goal was to present different topics which are interesting for all students, and I hope I have, at least partially, fulfilled it. Still I believe that a lot of work has to be done to transform the Student's corner into a place to exchange ideas and hold constructive discussions about research and our problems of common interests and to involve more and more students. I hope that the new associate editors will continue in this direction and that it is going to be for them a fruitful and challenging experience as it has been for me. Finally I want to thank Fabrizio Ruggeri for many useful suggestions and for all the support he has offered me and all the recent Ph.D.'s who have helped me with their articles and thesis' abstracts.

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Thoughts on Statistical Consulting

I remember taking a course on statistical consulting as a graduate student. I also remember sitting in consulting sessions with a client, and a very knowledgeable faculty member. I remember thinking I'll never be able to do this. I can't even turn in an assignment in my applied statistics course without at least a couple of fatal errors in my analysis. Somewhere between that time and now, I've become the Director of the Statistical

Consulting Center at Duke University.

It turns out that working as a statistical consultant is nothing like carrying out data analyses in a virtual vacuum as I did when I was in graduate school. Your success as a consultant more often depends on how well you can pry ideas out of others. The job has a lot of perks. First, you get to be part of interesting research in a range of different disciplines. Better yet, you get to be part of the action as an equal with the researchers. Of course we all know the top perk is that as a statistical consultant, you impress at parties. Unlike the dreaded words "I'm a statistician" which repel with the strength of mild body odor, saying "I'm a statistical consultant" can often entice people to speak to you. That classic pickup line started off a couple of consulting relationships for me.

So, if you think you might be interested in consulting, I've listed some tips for those in grad school, or just starting out. Don't worry, most of the points below aren't mine. I've collected them from others while in grad school and while working at ISDS. This first list is a collection of rather general info.

• *Take on some consulting while you're still a student.* It looks great on the cv and it will give you some experience. If you get stuck, you're surrounded by students and faculty who can help out.

• *Get help from brains around you.* Get their advice. Consulting is unlike coursework. Don't isolate yourself and do your own original work. This is the absolute worst thing you can do as a consultant. Use your smart colleagues. Buy them a coffee and pick their brains. Nothing beats discussing the problem and getting a clearer idea of what should be done. Be sure not to wear out your best resources by bugging them too much.

• *Be fun to talk to.* If consulting with you is a painful experience, even great advice and analysis may not be enough to get them to pay for your services again.

• *Know lots of methods.* You'll be less likely to fit the problem to an inappropriate method. But don't worry that you don't know it all. You never will, but you probably know enough.

• *Stay in contact with the faculty and your fellow students.* They're possibly your most valuable resource as a consulting statistician.

• *Be one with the computer.* Learn to deal with data in all forms. Many interesting jobs I've had began with a somewhat painful data formatting and cleansing stage. Had I not been willing to mess with the original ugly data, I never would have gotten these jobs.

Generally, my first meeting with a client is devoted to trying to understand the client's problem and what sort of data they have to address it. Very rarely do I actually think about methods this first time meeting. After the initial meeting, I'll typically ponder such questions as: Do I want to get involved in this? Can I actually make progress on the problem? How much work will it take? How much should I charge? Can it be done in time? Should I try to get a grad student to do it? Nothing beats experience for deciding on the above questions. Below are some items I try to keep in mind when dealing with a client. Many of these items are taken from Brian Joiner's article on statistical consulting.

• Listen a lot

• Never (almost never) interrupt the client

• Always (almost always) allow the client to interrupt you

• Ask lots of questions that begin "Let me see if I understand this,. . . ."

• Try not to meet right as you're getting back from your afternoon jog. Alternatively, look good, and smell good.

• Take good notes.

• Try to avoid statistical jargon. Use common, simple words whenever possible.

• At the end of the meeting, put down in writing what is to be done next.

• Interact frequently with the client. Don't go off and do a lot of work at the client's expense (or worse, yours) without discussing approaches and intermediate results.

• Make realistic cost estimates (in currency and/or time) and discuss them.

• Be timely. An approximate answer in a few days is almost always preferable to an "exact" answer months (or years, in one of my jobs) later.

• If it's possible, try to meet at the client's office. He or she will feel more at ease. Also, you may be able to get a better idea of the project you are about to undertake.

Finally, consulting gives you a healthy perspective about the place of statistics in science. As a statistician, you're unlikely to ever be in a position to make discoveries that change the way people see the world. However, through consulting, you can be a very important contributor to important scientific research. Of course the cynics out there might put it another way: You won't discover life on other planets; you'll help shed light on whether or not all aspirin is really alike. Whichever way you see it, being a part of such collaborations should keep us statisticians humble. For the finale, I leave you with the cynical consultant's tips of the trade.

• If your particular consulting project is becoming drudgery, try doubling your consulting rate.

• If a client would like you to do a sample size calculation, they must be working on a grant proposal. Hold out until they agree to write in a nice chunk of change in the grant budget for you.

• Once in a while, someone will drop in merely wanting their results sanctified by having you sprinkle the holy water of statistical significance levels over them. Be sure to charge a lot, or they won't feel their results are truly sanctified.

• A good answer to the question "How much is this going to cost?" is "How much do you have?"

• If you can't answer the clients question with the data they provided, then find something you can answer with the data and convince the client that you actually answered the question of interest.

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Inference and prediction in bulk arrival queues and bulk service queues.

Advisor: Dr. Carmen Armero

In this thesis we analyze, from a Bayesian point of view, the two most standard bulk queueing systems. We begin reviewing the use of statistics in queues. Then, we study a system in which customers arrive in bulks of variable size, usually represented in Queueing Theory by $M^X/M/1$. Our focus is on prediction of the usual measures of performance of this system in equilibrium. We obtain the posterior predictive distribution of the number of customers in the system through its probability generating function, and the posterior distribution of the waiting time, in the queue and in the system, of the first customer of an arriving group in terms of their Laplace and Laplace-Stieltjes transform. Discussion of numerical inversion of these transforms is addressed.

Next, we use a Hierarchical Bayesian model to study the general situation of the congestion of a system formed by K $M/M(a,b)/1$ bulk service queues working in equilibrium and independently between them. In this case, in order to make inference on the parameters governing all this system, and in order to evaluate the posterior predictive distribution of the most relevant measures of performance, we use procedures based on Markov Chain Monte Carlo integration jointly with algorithms for numerical inversion of transforms.

Finally, we include two appendixes. In the first one, we review the most basic properties of the queueing systems we work with in the memory, while in the second one, we describe in detail the algorithms used for numerical inversion of transforms.

ECONOMETRICS: AN ANNOTATED BIBLIOGRAPHY

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We focus on Applications using MCMC, BVARs, Unit Root Debate, Bayesian Foundations, and Examples and Applications

Arnold Zellner is, without doubt, the Father of Bayesian econometrics. If one were to construct a family tree of Bayesian econometrics papers and books, there would be at least several offspring from each generation, but they all would originate from Zellner's 1970 seminal text. In Bayesian econometrics, it is safe to say that all roads lead to Arnold Zellner! It is also accurate to state that by now, almost all quantitative problems in economics and econometrics have been analyzed from the Bayesian point of view, and results compared to those provided by non-Bayesian procedures. Therefore this survey can, at best, only be a perfunctory one. Our goal has been to try and provide enough clues that, by starting with this brief review, the reader should be able to track down the current literature on any Bayesian econometrics topic with a minimal amount of effort. Recent issues of *Journal of Econometrics, Journal of Business and Economic Statistics, Econometrica, Journal of Applied Econometrics*, and *Econometric Reviews* are also a good place to look for recent developments and survey articles.

➤ *Bayesian Foundations*

• A. ZELLNER (1971). **An Introduction to Bayesian Inference in Econometrics**. *J. Wiley and Sons, Inc., New York.* Reprinted in Wiley Classics, 1996.

Thirty years later and we are still begging for a second edition, but how could he improve it?! An absolute must read.

• E. E. LEAMER (1978). **Specification Searches: Ad Hoc Inference with Nonexperimental Data.** *Wiley, New York.*

The "other" classic. Also a must read. There is still much gold to be mined from this one too.

The following article provides an introduction to the subjective Bayesian approach intended for novices, with discussion by a believer and two heathens.

• D. J. POIRIER (1988). **Frequentist and Subjectivist Perspectives on the Problems of Model Building in Economics (with discussion).** *Journal of Economic Perspectives*, 2 (Winter), 121-170.

• A. ZELLNER (1988). **Bayesian Analysis in Econometrics.** *Journal of Econometrics.* 37, 27-50.

Arnold throws down the gauntlet and issues specific challenges to non-Bayesians. As far as we know, as yet no one has been willing to step out of the saloon and try to shoot holes in his argument (is Clint Eastwood a Bayesian we wonder?).

• A. ZELLNER (1984). **Basic Issues in Econometrics**. *University of Chicago Press, Chicago.* Reprinted in 1987.

• M. PERLMAN AND M. BLAUG (EDS.), (1997). **Bayesian Analysis in Econometrics and Statistics: The Zellner View and Papers.** *Economists of the Twentieth Century*, Edward Elgar Publishing.

Given above are two collections of Zellner's papers in nice tidy books. Saves you all the time and effort you would have to spend individually hunting down these masterpieces in dusty libraries. How much is Arnold paying us you say? Not a cent (and we've lost a lot of money betting on him for a Nobel over the years too)! Buy these books, read them, put them under your pillow at night and hope that somnolent osmosis works. You can find more recent papers by Zellner at his homepage: gsb.uchicago.edu/fac/arnold.zellner/

• D. J. POIRIER (1995). **Intermediate Statistics and Econometrics: A Comparative Approach.** *MIT Press*, Cambridge.

In the author's own words: "The above text is an introduction to mathematical statistics and the linear regression model for students pursuing research careers in economics. Its distinguishing feature is its broad perspective that develops in parallel both classical and Bayesian treatments of topics. The primary intended reader of this text is a first-year Ph.D. student in economics. It is important that a text is immediately accessible to its primary intended audience. This text assumes the minimal mathematical background demanded for admittance to most graduate programs in economics."

➤ *MCMC and Monte Carlo Integration Methods*

• S. CHIB AND E. GREENBERG (1996).**Markov Chain Monte Carlo Simulation Methods in Econometrics.** *Econometric Theory,* 12, 409-431.

• J. GEWEKE (1997). **Posterior Simulators in Econometrics.** *Advances in Economics and Econometrics: Theory and Applications. Seventh World Congress, volume III*. D.M. Kreps and K.F. Wallis (eds.), 128-165.

The above two papers provide an excellent review of the literature in this area.

• S. CHIB (1992). **Bayes Inference in the Tobit Censored Regression Model.** *Journal of Econometrics,* 51, 79-99.

A MCMC method for fitting the Tobit model under both Gaussian and student-t assumptions is given. Proposed approach is compared with alternative Bayesian estimation techniques.

• S. CHIB (1996). **Calculating Posterior Distributions and Modal Estimates in Markov Mixture Models.** *Journal of Econometrics*, 75, 79-97.

A new analysis of hidden Markov models using MCMC methods is presented. Also includes a discussion of modal estimation. Applications to Poisson data, mixtures of multivariate normal distributions, and autoregressive time series are given.

• S. CHIB, E. GREENBERG AND R. WINKELMANN (1998). **Posterior Simulation and Bayes Factors in Panel Count Data Models.** *Journal of Econometrics*, 86, 33-54.

Tailored MCMC algorithms are given for posterior simulation in longitudinal Poisson data models with multiple random effects. Chib's (1995) approach is adapted to find the model marginal likelihood and Bayes factors.

• J. GEWEKE (1989). **Bayesian Inference in Econometric Models Using Monte Carlo Integration.** *Econometrica*, 57, 1317-1339.

• T. KLOEK AND H. K. VAN DIJK (1978). **Bayesian Estimates of Equation System Parameters: An Application of Integration by Monte Carlo.** *Econometrica*, 46, 1-19.

The above two papers are the classics on Monte Carlo integration methods in econometrics.

➤ *Time Series Methods*

The Bayesian approach to time series in econometrics has become increasingly popular in recent years. See, for example, the two recent themed issues of the *Journal of Applied Econometrics* (1991) and *Econometric Theory* (1994).

• S. CHIB AND E. GREENBERG (1994). **Bayes Inference in Regression Models with ARMA (p,q) Errors.** *Journal of Econometrics*, 64, 183-206.

An approach for fitting time series models using tuned MCMC methods is developed. The paper also shows how the main algorithm can be specialized for special cases of the model. Several examples of the methods in action are presented.

• P.C.B. PHILLIPS AND W. PLOBERGER (1996). **An Asymptotic Theory of Bayesian Inference for Time Series.** *Econometrica*, 64, 381-412.

This paper develops a general asymptotic theory of Bayesian inference for time series.

• J. ALBERT AND S. CHIB (1993). **Bayesian Analysis via Gibbs Sampling of Autoregressive Time Series Subject to MarkovMean and Variance Shifts.** *Journal of Business and Economic Statistics*, 11, 1-15.

In this paper, analysis of hidden Markov time series from a Bayesian perspective is presented. A MCMC approach is developed and used to find the posterior distribution of the hidden states, future observations and residuals.

• J. WANG AND E. ZIVOT (2000). **A Bayesian Time Series Model of Multiple Structural Changes in Level, Trend, and Variance.** *Journal of Business and Economic Statistics*, 18, 374-386.

The above paper addresses the effects of structural breaks on inference in time series.

• G. KOOP AND S.M. POTTER (1999). **Bayes Factors and Nonlinearity: Evidence From Economic Time Series.** *Journal of Econometrics*, 88, 251-281.

This paper considers the Bayesian approach to evaluating nonlinearity in time series, and contains a nice survey of recent literature.

• M. BILLIO, A. MONFORT A., AND C.P. ROBERT (1999). **Bayesian estimation of switching ARMA models.** *Journal of Econometrics*, (93)2, 229-255.

This paper gives a Bayesian MCMC approach for switching ARMA models with a non-informative prior distribution.

• T.S. SHIVELY AND R. KOHN (1997). **A Bayesian approach to model selection in stochastic coefficient regression models and structural time series models.** *J. Econometrics*, (76)1-2, 39-52.

A Bayesian model selection procedure is presented for a stochastic coefficient regression model to determine which coefficients are fixed and which are time-varying.

➤ *Bayesian Vector Autoregressions (BVARs)*

• T. DOAN, R. LITTERMAN AND C. A. SIMS (1984). **Forecasting and Conditional Projection using Realistic Prior Distributions.** *Econometric Reviews*, 3, 1-100.

• K. R. KADIYALA AND S. KARLSSON (1997). **Numerical Methods for Estimation and Inference in Bayesian VAR Models.** *Journal of Applied Econometrics*, 12, 99-132.

• H. UHLIG (1997). **Bayesian Vector Autoregressions with Stochastic Volatility.** *Econometrica*, 65, 59-73.

There are also numerous articles in the Minnesota Federal Reserve Review relating to BVARs.

➤ *The Unit Root Debate*

• C.A. SIMS AND H. UHLIG (1991). **Understanding Unit Rooters: A Helicopter Tour.** *Econometrica*, 59, 1591-1600.

• P.C.B. PHILLIPS (1991). **To Criticize the Critics: An Objective Bayesian Analysis of Stochastic Trends.** *Journal of Applied Econometrics*, 6, 333-364.

• H. UHLIG (1994). **What Macroeconomists Should Know About Unit Roots: A Bayesian Perspective.** *Econometric Theory*, 10, 645-671.

• D.N. DEJONG AND C.H. WHITEMAN (1993). **Estimating Moving Average Parameters: Classical Pileups and Bayesian Posteriors.** *Journal of Business and Economic Statistics*, 11, 311-317.

• J. KADANE, N.H. CHAN AND L.J. WOLFSON (1996). **Priors for unit root models.** *Journal of Econometrics*, (75)1, 99-111.

This paper presents a method of assessing the subjective prior for a unit root model based on a family of piecewise conjugate prior distributions.

➤ *Econometrics Software*

• G. KOOP (1999). **Bayesian Analysis, Computation and Communication Software.** *Journal of Applied Econometrics*, 14, 677-689.

This paper focuses mainly on a review of BACC, a new Bayesian software package which is linked to GAUSS and takes the form of a set of GAUSS commands.

GAUSS currently appears to be the most popular software for Bayesian econometric analysis. Though one should take note of the following review:

• H.D. VINOD (2000). **Review of GAUSS for Windows, Including its Numerical Accuracy.** *Journal of Applied Econometrics*, 15, 211-220.

➤ *A Small Sampling of Other Bayesian Econometrics Topics*

• D. BERRY, K. CHALONER AND J. GEWEKE(EDS.), (1996). bf Bayesian Analysis in Statistics and Econometrics: Essays in Honor of Arnold Zellner. *Wiley, New York.*

This book is a collection of recent papers on a variety of topics.

• B. M. HILL (1986) **Some Subjective Bayesian Considerations in the Selection of Models (with discussion).** *Econometric Reviews*, 4, 191-288.

• D.N. DEJONG, B.F. INGRAM AND C.H. WHITEMAN (1996). **A Bayesian Approach to Calibration.** *Journal of Business and Economic Statistics*, 14, 1-9.

The above article gives a Bayesian approach to "calibrating" macroeconomic models.

• J. H. DREZE AND J.-F. RICHARD (1983). **Bayesian Analysis of Simultaneous Equations Systems.** In: *Handbook of Econometrics*, Z. Griliches and M. D. Intriligator, eds., Vol. 1 (North-Holland), 517-598.

This is an excellent reference source for the state of Bayesian analysis of simultaneous equation models as of the early 1980s, pre-MCMC.

• J.A. MILLS (1992). **Bayesian Prediction Tests for Structural Stability.** *Journal of Econometrics*, 52, 381-388.

A paper worth reading or just shameless self-promotion? The second author thinks it is the former. Read and decide for yourself!

• T. FOMBY AND R. CARTER HILL(EDS.) (1996). **Advances in Econometrics, Volume 10 A and B.** JAI Press, Greenwich.

These two books contain a number of papers on methods and applications by authors such as J. Albert, J-F. Angers, L.

Bauwens, S. Chib, P. Cook, D. K. Dey, A.E. Gelfand, W.E. Griffiths,

A. Gelman, J. Kadane, M. Lubrano, A. Pole and H. Tsurumi.

➤ *Empirical Applications of Bayesian Methods*

• S.E. PAMMER, D.K.H. FONG, S.F. ARNOLD (2000). **Forecasting the Penetration of a New Product - A Bayesian Approach.** *Journal of Business and Economic Statistics,* 18, 428-435.

• P.J. DESCHAMPS (2000). **Exact Small-Sample Inference in Stationary, Fully Regular, Dynamic Demand Models.** *Journal of Econometrics*, 97, 51-91.

• G.M. ALLENBY AND P.E. ROSSI (1999). **Marketing Models of Consumer Heterogeneity.** *Journal of Econometrics*, 89, 57-78.

• D.N. DEJONG, B.F. INGRAM, AND C.H. WHITEMAN (2000). **Keynesian Impulses Versus Solow Residuals: Identifying Sources of Business Cycle Fluctuations.** *Journal of Applied Econometrics*, 15, 311-329.

• D. J. POIRIER ED. (1991). **Bayesian Empirical Studies in Economics and Finance.** *Annals of the Journal of Econometrics,* 49, Nos. 1-2 (July/August).

The above is a collection of serious Bayesian empirical papers at a time when such things were relatively scarce in the econometrics literature.

• D. J. POIRIER (1991). **A Bayesian View of Nominal Money and Real Output Through a New Classical Macroeconomic Window (with discussion).** JBES invited paper for the 1990 ASA Meetings. *Journal of Business & Economic Statistics,* 9 (April), 125-148.

This study investigates the empirical evidence on the effects of unanticipated changes in nominal money on real output in 47 countries when viewed through a window (i.e., likelihood function) that assumes the neutrality of anticipated changes. Using a Bayesian predictivist approach, it provides a pedagogical Bayesian analysis of generated regressor models in the face of specification uncertainty involving, among other things, multiple unit roots and trend stationary alternatives.

• G. KOOP, AND D. J. POIRIER (1995). **An Empirical Investigation of Wagner's Hypothesis by Using a Model Occurrence Framework** *Journal of the Royal Statistical Society*, Series A, 158, 123-141.

Based on data from eighty-six countries, this study employs a model occurrence framework to obtain empirical applicability conditions that generically determine the prior probability of Wagner's Hypothesis, given individual country characteristics, for five out-of-sample countries.

• M. WEST (1996). **Inference in successive sampling discovery models.** *Journal of Econometrics*, (75)1, 217-238.

A super-population Bayesian framework is preented for the analysis of successive sampling discovery problems that arise in finite population sampling subject to 'size-biased' selection mechanisms.

• J. GEWEKE AND M. KEANE (2000). **An empirical analysis of earnings dynamics among men in the PSID: 1968–1989.** *Journal of Econometrics*, (96)2, 293-356.

This article uses data from the Panel Survey of Income Dynamics (PSID) to address a number of questions about life cycle earnings mobility from a Bayesian dynamic reduced form model of earnings and marital status.

• D. J. POIRIER, ED. (1991). **Bayesian Empirical Studies in Economics and Finance.** *Annals of the Journal of Econometrics*, 49, 1-2 (July/August).

This is a collection of serious Bayesian empirical papers at a time when such things were relatively scarce in the econometrics literature.

More recently, work by J. Quintana, B. Putnam, M. West and their colleagues on Bayesian optimal portfolio analyses that have appeared in the ASA's SBSS Proceedings volumes since the early 1990s give a good account of how Bayesian analysis is being used on Wall Street by certain investment companies.

Special thanks to Dale Poirier and Arnold Zellner for many helpful suggestions. Our apologies to the authors of the many serious ommissions that were either forced upon us in the interest of brevity, or were a result of our own ignorance.

The second author would also like to express his deep gratitude to Wolfgang Polasek for his valuable help with the Bibliography on Finance that appeared in the previous edition of the ISBA Bulletin. Wolfgang Polasek provided most of the references in that issue, where he should have appeared as an author.

NEWS FROM THE WORLD

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✻ *denotes an ISBA activity*

➤ Events

Gordon Research Conference on Statistics in Chemistry and Chemical Engineering. *July 22-27, 2001, Williamstown, MA, USA*.

This conference focuses on new research directions in applied statistics and the analysis of chemical phenomena; it has met annually for half a century. Typically, readers of the Journal of Chemometrics, Chemometrics and Intelligent Laboratory Systems, and Applied Spectroscopy are a part of the audience. Web page: www.asaspes.org/GRC2001.htm.

23rd European Meeting of Statisticians. *August 13-19, 2001, Funchal, Madeira*.

The Programme Committee has prepared invited papers sessions on many topics of current interest in statistics and probability. The keynote lectures are on "Some statistical challenges in modern genetics", on "Polymer chains" and on "Information theory in probability and statistics". There will be invited paper sessions on asymptotic statistics, Bayesian nonparametrics, bioinformatics, causal inference, concentration of measure, disease mapping, environmetrics, finance, perfect simulation, probability approximations for rare events, quantum probability and statistics, statistical mechanics, statistics of extremes, telecommunications, and time series. Submit your papers by March 1, 2001. Web page: www.fc.ul.pt/cea/ems2001.

Summer School on Spatial Statistics and Computational Methods. *August 19-22, 2001, Aalborg University, Denmark*.

The purpose of this summer school is to train young postdocs and Ph.D. students in recent advances in spatial statistics and computational methods. The programme features four courses: Theory and practice of MCMC; Model-based geostatistics; Simulation based inference for spatial point processes; Image analysis. Apply before April 1, 2001. Web page: www.math.auc.dk/~mbh/SS-and-CM2001/.

ECAS course on Bayesian Statistics and Financial Econometrics. *October 7-13, 2001, Lugano, Switzerland*.

ECAS (European Courses in Advanced Statistics) is a programme supported by the main statistical societies of Europe. So far, the programme has organized seven courses in as many European countries. This ECAS course will give an introduction into recent advances of estimation techniques for complex models and will demonstrate financial modelling strategies that have become important in recent years. The following topics will be treated: Bayesian Statistics with MCMC, Bayesian Financial Modelling using BACC, Bayesian financial data mining, Portfolio Selection with GARCH Forecasts, Robust Modelling in Finance, Value at Risk, and Introduction to Financial Econometrics. Web page of the course: www.unibas.ch/iso/ECAS2001.

➤ Research Opportunities

Open positions in New Zealand.

∗ *Academic Biostatistician University of Otago*. This is a full-time confirmation path (tenure track) position in the Department of Preventive and Social Medicine. Applicants should have a doctoral degree in biostatistics, statistics, or a closely related discipline, and appropriate experience. The salary range for a Lecturer is NZ$46,350 to NZ$57,165 per annum. Please contact Dr. John Kittelson (kitt@lorien.otago.ac.nz).

∗ *Dynamic Sports Enthusiasts Massey University*. In conjunction with industry the Institute of Information and Mathematical Sciences (IIMS) at Massey University's Auckland campus is developing a post-graduate program for Statistics graduates who are interested in analysing and presenting information relating to sports. Submit your CV's to Denny Meyer (D.H.Meyer@massey.ac.nz).

∗ *Senior Analyst New Zealand Ministry of Agriculture and Forestry*. The position involves overseeing the collection, analysis and publication of a broad range of primary production statistics and includes the ongoing management of the collection of Agricultural Statistics. The ideal

candidate would have a relevant post graduate qualification and must have practical experience in the following areas: application of quantitative information to policy advice and development; primary production statistical inventories, trade statistics and national accounts; statistical collection systems; quality management of quantitative outputs; publication of quantitative information. For a job description please contact Kim Mulu, MAF Policy, `muluk@maf.govt.nz`; For further details about the position please contact Paul Lane, MAF Policy, `lanep@maf.govt.nz`.

∗ *PhD Student University of Canterbury*. Phenomenological data collection methods, structural equation modeling and multivariate analysis will be used to understand how wood products, used for interior and environmental design, can impact both physical and emotional wellbeing. The position will also involve significant interaction with Forest Research (New Zealand Forest Research Institute), who are an internationally recognised supplier of research and technological development to the forestry and forest products sector. Funding is available for three years. Applicants should be presented by three referees. For further information contact Dr. Irene Hudson (`i.hudson@math.canterbury.ac.nz`) or Dr. Brad Ridoutt (`brad.ridoutt@forestresearch.co.nz`).

➤ Awards and Prizes

✻ **The 2001 Mitchell Prize**.

The Mitchell Prize committee would like to invite nominations for this year's Mitchell Prize. The Prize is awarded in recognition of an outstanding paper that describes how a Bayesian analysis has solved an important applied problem. The Prize includes an award of $1000 and a commemorative plaque. The 2001 Prize selection committee members are Gary Koop (chair), Henry Wynn and Rod Little.

Eligible papers must be published (or forthcoming) in a refereed journal or conference proceedings no earlier than January 1, 1999. Entries must be received by February 1, 2001.

Complete details about the Prize and the nomination process are provided in the Mitchell Prize Charter (`www.bayesian.org/awards/mitchellcharter.html`). A complete entry consists of the following:

∗ four copies of the manuscript or reprint being nominated;

∗ a brief statement by the nominator describing the impact of the work (authors may nominate themselves);

∗ names of two evaluators, not the nominator or coauthors, who are willing and able to credibly evaluate the usefulness of the work from the perspective of the applied field addressed in the paper as distinct from providing comments on its statistical merit;

∗ contact information for nominee, nominator (if different) and evaluators noted above.

➤ Miscellanea

ICSC/NAISO.

International Computer Science Conventions (ICSC) is a non-profit making multinational association interested in development of science and technology. The objects of Natural and Artificial Intelligence Systems Organization (NAISO) are the encouragement of efficient communication between scientists, researchers, engineers and practitioners in the field of natural and artificial intelligence systems. ICSC/NAISO organizes many conferences on topics related to Computer Science. Those Bayesians who work on subjects that border it (such as Image Analysis) might want to look at ICSC/NAISO web page: `www.icsc.ab.ca`.

BayStat.

Recently established in Italy, BayStat promotes the application of statistical methodology, especially Bayesian, in business and economics. This task is accomplished through the organisation of meetings, workshops and, more generally, research and teaching, scientific publications, collaborations with national and international companies and institutions. The first conference was entitled "Statistical Models for Data Mining"; the second one, "Statistics for Telecommunications", is planned for July 2001. Web page: `www.baystat.it`.

JOINING AND REJOINING ISBA

As laid down in Section G of the by-laws (viewable on the ISBA web site at `http://www.bayesian.org`), the ISBA membership subscription for 2001 falls due on 1 January 2001. The fee can be paid through the web site, or by completing this form and returning it to:

Professor Valen Johnson, ISBA Treasurer
Institute of Statistics & Decision Sciences
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Box 90251
Duke University
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web: `http://www.isds.duke.edu/~valen/`

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(*) The reduced rate of $10 for 2001 is payable by full-time students (up to 4 consecutive years, proof of status required) and permanent residents of countries whose GNP per capita, as given by World Bank data for 1996, is no greater than $6000. This includes those countries (Brazil, Chile, India and South Africa) currently having ISBA local chapters. Local chapter members must pay the ISBA subscription in addition to any local fees (see ISBA Provisional Policy for Chapters on web site).

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