BAYESIAN STATISTICS 9

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PREFACE

The Ninth Valencia International Meeting on Bayesian Statistics was held in Benidorm (Alicante, Spain), 150 kilometres south of Valencia, from June 3rd to June 8th 2010, in conjunction with the Tenth World Meeting of the International Society for Bayesian Analysis (ISBA). Valencia 9/ISBA 10 continued the tradition of this premier conference series—established in 1979 with the First Valencia International Meeting—as the forum for a definitive overview of current concerns and activities in Bayesian statistics. In this tradition, Valencia 9/ISBA 10 encompassed an enormous range of theoretical and applied research, highlighting the breadth, vitality and impact of Bayesian thinking in interdisciplinary research across many fields as well as the corresponding growth and vitality of core theory and methodology.

The Valencia organising committee invited experts in Bayesian statistics to present papers, each of which was followed by discussion led by an invited discussant. These *Proceedings*[*] contain the 23 written versions of the invited papers together with their discussions. A further 40 talks, 3 tutorials and over 300 posters were presented in additional sessions organised by ISBA; a number of the resulting papers will be published, following a rigorous refereeing process, in the flagship journal of ISBA, *Bayesian Analysis*.

The Valencia 9 invited papers cover a broad range of topics.

Foundational and core theoretical issues in statistics are addressed by several authors. **Bernardo** describes and overviews the use of reference priors and information-based loss functions in a general and comprehensive approach to objective Bayesian estimation and testing, representing the major growth in the *O-Bayes* literature in the last several years. **Goldstein** addresses fundamental conceptual and theoretical issues surrounding the interpretation of multiple sources and forms of uncertainty in the analysis of computer simulation, a critical and fast-growing area of applied Bayesian statistics. **Meng** explores Bayesian-frequentist interfaces, identifying Bayesian themes in new methods of adjusted profile likelihood while concluding that such approaches are generally invalid and incoherent, while **Richardson, Evans and Robins** discuss prior specification and reparametrisation issues in causal inference.

The continued development of new and refined computational methods for complex Bayesian modelling is reflected in several papers. **Chopin and**

[*]The *Proceedings* of previous meetings have been published: the first by the University Press, Valencia (1980), the second by North-Holland, Amsterdam (1985), and the third, fourth, fifth, sixth, seventh and eighth by The Clarendon Press, Oxford (1988, 1992, 1996, 1999, 2003, 2007). The editors in each case were the members of the organising committee.

Jacob introduce new methods of sequential Monte Carlo simulation based on free energy methods in physics, **Huber and Schott** describe novel adaptive Monte Carlo methods for marginal likelihood computations, while **Lopes, Carvalho, Johannes and Polson** describe and exemplify refined sequential simulation methods based on particle learning concepts. Linking computational innovation with novel applied Bayesian decision theory, **Gramacy and Lee** discuss advances in optimisation of broad interest in statistics and allied fields.

Methodology and substantive applications of flexible Bayesian modelling approaches are represented in several papers. **Dunson and Bhattacharya** discuss advances in non-parametric Bayesian modelling for regression and classification, while **Schmidt and Rodríguez** develop non-stationary spatial models for multivariate count data.

The concept of sparsity modelling using structured priors in increasingly large and complex models is a pervasive theme in modern multivariate analysis. **Frühwirth-Schnatter and Wagner** discuss shrinkage and variable selection in random effects models, **Polson and Scott** present detailed theoretical development of Bayesian regularisation and shrinkage under new classes of priors, while both **Richardson, Bottolo and Rosenthal** and **Vannucci and Stingo** study sparsity modelling in multivariate regression and related models with substantive applications in genomics.

The theory and methodology of graphical modelling has represented a substantial growth area in Bayesian statistics and allied fields, and is represented in several papers. **Consonni and La Rocca** discuss the development and specification of prior distributions and model assessment in directed graphical models, **Ickstadt, Bornkamp, Grzegorczyk, Wieczorek, Sheriff, Grecco and Zamir** develop approaches to non-parametric Bayesian network modelling, and **Meek and Wexler** develop new computational methods for approximate Bayesian inference in a wide class of graphical models.

While interdisciplinary applications are evident in many of the papers, several focus on advances in methodology for a specific applied field. Among these, **Carvalho, Lopes and Aguilar** describe structured and dynamic Bayesian factor models and their rôles and uses in financial econometrics and portfolio decision making, while public policy related applications for drug surveillance are discussed by **Madigan, Ryan, Simpson and Zorych** in the context of pharmacovigilance. Studies in the physical and environmental sciences are represented by **Loredo**, who discusses advances in Bayesian analysis in astronomy and astrophysics, and by **Tebaldi, Sansó and Smith**, who discuss the rôles and relevance of hierarchical Bayesian modelling in climate change studies. Detailed applications in the molecular biosciences include the papers by **Louis, Carvalho, Fallin, Irizarry, Li and Ruczinski**, concern-

ing Bayesian methods for statistical genetics using high-throughput sequence data, and by **Wilkinson**, who develops modelling and parameter estimation for stochastic dynamic networks in systems biology.

Valencia 9 represents the final meeting in the series. From 2012 on, the biennial ISBA World Meetings will carry the flag forward. For over 30 years, the Valencia meetings have marked the tremendous growth of Bayesian statistics, and the corresponding broad adoption of Bayesian methods in applications in many fields. The meetings have also, from the first in 1979, helped to define and engender a professional collegiality that permeates the currently vibrant international intellectual community. Over these three decades, Bayesian methods have moved centrally into statistical work in many applied fields. Promoted and enabled by computational advances, the increasing adoption of Bayesian models and methods by non-statisticians and applied statistical researchers from many fields has now moved to a level where the relevance and applicability of structured, model-based probabilistic reasoning is widely understood and accepted. As this continues, we are also experiencing progressive breakdown of the historical prejudice against Bayesian thinking that was—in the late 1970s—a key reason for the establishment of the Valencia meetings. This change in statistical science at a fundamental level is a reason to celebrate the increasing success of Bayesian thinking, and to recognise the rôle played by the Valencia meetings over these three decades.

Valencia 9 would not have been successful without the collaboration with ISBA and much appreciated financial support from the Universitat de València, the Section on Bayesian Statistical Science (SBSS) of the American Statistical Association, and the US National Science Foundation (NSF), National Institutes of Health (NIH), and Office of Naval Research Global (ONRG).

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