

Bayesian ^{14}C Calibration: A Brief Bibliography

Thomas S. Dye

November 15, 2004

The Bayesian approach to probability and statistics is in the midst of a tremendous surge in interest and popularity due, in part, to the widespread availability and low cost of computing power. You should be aware, however, that the Bayesian approach was, for nearly two centuries, routinely discredited by most within the mainstream statistical community. Debates about the utility of the approach beginning in the middle decades of the twentieth century were often acrimonious and, in my opinion, generated more heat than light. An extremely interesting early history of the Bayesian and competing frequentist approaches to probability is Hacking (1975), a book that requires some knowledge of both probability theory and philosophy. Hacking (2001) is a delightful and thought-provoking introductory textbook that provides the necessary background material. Readers of this book will come away with a very clear understanding of the issues central to the tension between the frequentist and Bayesian approaches.

It is almost certainly a fair generalization that archaeologists don't like statistics, a subject that seems mysterious and opaque. It might come as a consolation to know that many other scientists share this attitude. The disjunction that I felt as an undergraduate between probability, which made sense but was just a game, and statistics, which was important but seemed to have no underlying rhyme or reason, was the impetus for Sivia (1996). The Bayesian approach provides the rhyme and reason behind statistics and this book is designed to provide these for the scientist with a strong background in probability and mathematics. Archaeologists might use this book for insight into the possibilities of a Bayesian statistical approach, but leave the details to a collaborator with a strong mathematical and statistical background.

A thorough and complete introduction to Bayesian statistics in archaeology is provided by Buck et al. (1996). A product of collaboration among an archaeologist, a mathematician, and a statistician, this book is intended for undergraduate and post-graduate students of archaeology and for professional archaeologists. It includes several chapters on the principles underlying the Bayesian approach, including three on model building, one on the principles of Bayesian inference, and one on the practical issues of implementing the approach. The core of the book is a series of worked examples in ^{14}C dating, spatial analysis, sourcing and provenancing, seriation, tree-ring dating, and wiggle-matching. These provide an invaluable guide not only to the solution of particular archaeological problems, but how to think about them in a more general sense. The nine page bibliography is complete through the mid-1990s.

^{14}C calibration that incorporates prior information, the heart of the Bayesian approach, can be accomplished on the computer with at least two software packages. Per-

haps the most popular of these is OxCal (Ramsey 1995), which runs on personal computers using the Windows operating system. The software, which is distributed free of charge, is available at <http://www.rlaha.ox.ac.uk/orau/oxcal.html>. I much prefer the user interface developed by the BCal software package (Buck et al. 1999), which gathers the prior information used in the analysis in a series of logical steps. The terminology adopted by BCal is very similar to Buck et al. (1996), so this book can easily be used in conjunction with the software. I also find it handy to have my calibrations stored on the BCal server at Sheffield, rather than on one or another of the personal computers I use at home or work.

Although I haven't performed strict comparisons, my impression is that OxCal and BCal are capable of handling the same range of models used as prior information in the Bayesian approach. That is, for any given chronological model, the choice of OxCal or BCal is not important. Neither of these software packages is fully capable of selecting among competing chronological models. This is a facility promised by the DateLab software package (Jones and Nicholls 2003), whose web site <http://www.datelab.org> now appears to be off-line.

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