REFERENCE

Meyer, Bruce, D. (1995), Natural and quasi-experiments in economics, *Journal of Business and Economic Statistics* **13**, 151–61.

GORDON MILLS
The University of Sydney

Mathematical Statistics with Mathematica, by Colin Rose and Murray D. Smith (Springer-Verlag, New York, 2002) pp. xiii + 481.

This book is an accompaniment to the computer software package mathStatica (which runs as an add-on to Mathematica). The book comes with two CD-ROMS: mathStatica, and a 30-day trial version of Mathematica 4.1. The mathStatica CD-ROM includes an applications pack for doing mathematical statistics, custom Mathematica palettes and an electronic version of the book that is identical to the printed text, but can be used interactively to generate animations of some of the book's figures (e.g. as a parameter is varied). (I found this last feature particularly valuable.)

MathStatica has statistical operators for determining expectations (and hence characteristic functions, for example) and probabilities, for finding the distributions of transformations of random variables and generally for dealing with the kinds of problems and questions that arise in mathematical statistics. Applications include estimation, curve-fitting, asymptotics, decision theory and moment conversion formulae (e.g. central to cumulant). To give an idea of the coverage of the book: after an introductory chapter, there are three chapters on random variables, then chapters on systems of distributions (e.g. Pearson), multivariate distributions, moments, asymptotic theory, decision theory and then three chapters on estimation. There is an appendix, which deals with technical Mathematica details.

What distinguishes mathStatica from statistical packages such as S-PLUS, R, SPSS and SAS is its ability to deal with the algebraic/symbolic problems that are the main concern of mathematical statistics. This is, of course, because it is based on Mathematica, and this is also the reason that it has a note–book interface (which enables one to incorporate text, equations and pictures into a single line), and why arbitrary-precision calculations can be performed.

According to the authors, 'this book can be used as a course text in mathematical statistics or as an accompaniment to a more traditional text'. Assumed knowledge includes preliminary courses in statistics, probability and calculus. The emphasis is on problem solving. The material is supposedly pitched at the same level as Hogg and Craig (1995). However some topics are treated in much more depth than in Hogg and Craig (characteristic functions for instance, which rate less than one page in Hogg and Craig). Also, the coverage is far broader than that of Hogg and Craig; additional topics include for instance stable distributions, cumulants, Pearson families, Gram-Charlier expansions and copulae. Hogg and Craig can be used as a text-book for a third-year course in mathematical statistics in some Australian universities, whereas there is a lot of material in the present book which would not be covered until fourth year. The price of even the basic package (there is also an upgrade to a 'gold' version, which includes palettes of the most common continuous and discrete distributions and on-line help), and the need to purchase Mathematica as well, would make it difficult to justify basing a statistics course on this package, especially given the current parlous financial state of Australian universities.

The authors describe the central goals of mathStatica as follows: 'it sets out to be general, and it strives to be delightfully simple'. Let us consider these claims. Generality: it is certainly the case that any probability distribution can be entered, not just one from a set of special distributions. But whether or not Mathematica can do the integration to produce a recognisable marginal distribution, say, or just comes up with an obscure answer in terms of HypergeometricPFQ functions or worse, depends very much on the particular distribution chosen. I must emphasise that this is a Mathematica weakness, not a mathStatica one. Sometimes too, Mathematica can be coaxed into producing a useful answer by proceeding one step at a time; but this is not the claimed generality.

As for simplicity, there is one drawback: one has to develop some familiarity with Mathematica. I have been using Mathematica on and off for years but it always takes a while to recall its conventions: Capitals, square brackets: = versus =, etc. A student seeking the answer to a problem in distribution theory, say, would have to get over the Mathematica hurdle before being able to concentrate on the statistical concepts and letting the computer do the mathematics.

Nevertheless, given a basic familiarity with Mathematica, the formerly tedious calculation and checking of complicated moment formulae becomes routine. (It is of interest that some formulae from statistics bibles such as Stuart & Ord (1994) and Johnson *et al*. (1994) are shown to be incorrect.) Problems involving multivariate distributions, generating functions, inversion theorems, symbolic maximum likelihood estimation and unbiased estimation will all be made simpler. This is what I see as the main strength of mathStatica: its potential use as a research tool by workers in a wide range of disciplines involving mathematical statistics, from econometrics and engineering to biometrics and the social sciences.

In summary, this is a carefully written book covering a wide range of topics. Its associated software will be of potential use to anyone confronted with problems in mathematical statistics.

REFERENCES

Hogg, R.V. and Craig, A.T. (1995), *Introduction to Mathematical Statistics*, 5th Edition, Macmillan, New York.

Johnson, N.L., Kotz, S. and Balakrishnan, N. (1994), *Continuous Univariate Distributions*, Vol. 1, 2nd edn. Wiley, New York.

Stuart, A. and Ord, J.K. (1994), *Kendall's Advanced Theory of Statistics*, Vol. 2, 5th edn. Edward Arnold, London.

MALCOLM QUINE
University of Sydney

Machine Dreams: Economics becomes a Cyborg Science, by Philip Mirowski (Cambridge University Press, Cambridge, 2002), pp. xiv + 655.

History is most valuable when it enables us to learn from our mistakes. It is not necessary for it to be right in its conclusions; being obviously wrong can even draw attention to the relevant facts. A historian can be entertaining, insightful, exciting and witty with an asperity that can irritate intensely. These are the paradoxes of Philip Mirowski's *Machine Dreams*, a pioneering study of the influence of information science on post-World War II economics, which provides a highly significant agenda for education, reflection and discussion.

It was Donna Hathaway who in 1991 invented an ugly new name, 'cyborg sciences', for the cluster of sciences which even 20 years earlier had still been thought of as information science. Mirowski indicates his inspiration by quoting her (pp. 5–7): 'A cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as fiction' (1991). But not '*all* kinds of artifactual, machinic relationships with human beings. . . . [specifically] those kinds of entities which became historically possible around World War II and just after. The cyborg is intimately involved in histories of militarisation, of specific research projects with ties to psychiatry and communications theory, behavioural research and psychopharmacological research, theories of information and information processing' (2000).

The relevant article in Encyclopaedia Britannica explains how information science never became an established discipline but was absorbed, half-digested, by its applications. The revolutionary science of Claude Shannon, Norbert Wiener and John von Neumann has continued to develop in concrete form in information technology, first shrouded in military and commercial secrecy, then buried in obsolescence and integrated technology, taken for granted or ignored as 'specialist', forgotten, no longer recognised as live science. This reviewer watched the first computers and transistors successfully develop into today's multiprogrammed integrated marvels from their source in a military research establishment. What has been left for Mirowski's 'sciences' is an unsatisfactory residue, which has followed John von Neumann's early ideas about games and automata into the blind alley of computational complexity.

History, too, has been sidelined over this period. Thomas S Kuhn (1996, pp. 167, 165), describing the training of scientists as 'history rewritten by the powers that be', asked rhetorically: 'Why, after all, should the student of physics, for example, read the works of Newton, Faraday, Einstein or Schrödinger, when everything he needs to know about these works is recapitulated in a far briefer, more precise and systematic form in a number of up-to-date text-books?'. Economics was described by J.H. Sargent as 'the would-be, may-be science'. Paul Samuelson cut its history from his undergraduate curriculum in 1946.

Mirowski's period, then, is highly significant. From the perspective of economic history, and within the terms of reference he set himself on p. 19: 'to provide detailed evidence for this scenario of rupture and transformation between early neoclassicism and the orthodoxy after the incursion of the cyborgs', he has made great use of his material. From the standpoint of an information scientist, however, he appears to have picked up all the clues, recognised the key players, even understood in principle one of the key conclusions, yet beyond these very real achievements,