Discovering Mathematics with Maple: An Interactive Exploration for Mathematicians, Engineers and Econometricians. Reolof J. Stroeker and Johan F. Kashoek. Birkhauser Verlag AG, P.O. Box 133, CH-4010, Basel, Switzerland. 1999. 248 pp. (Softcover + CD). Price: SFr 58/DM 68.

It would perhaps be in order to recount an anecdote to stress the importance of symbolic computing, which is the main theme of the book under review. During the mid-sixties and seventies, the numerical electromagnetic techniques based on the grid based methods required extensive computational resources. The US had the advantage of the best possible supercomputers, and its computational algorithms often relied on brute force number crunching. It was very intriguing to note that their Russian counterparts were still at par with them, although the Russian computers were known to lag behind by at least 15 years. The trick was to attempt analytical, or at least quasi-analytical solutions for the electromagnetics problems, so that the computational resources required were kept to a bare minimum! This, then, is the power of closed form analytical solutions.

Although the computers today have encroached every desk top, and most of the research workers, students and scientists are familiar with their capacity to spew out numbers at an awesome pace, very few are aware that computers can also be used to generate closed form solutions. Coaxing the computers to yield analytical solutions is the business of symbolic processing.

Besides providing the closed form solutions, the symbolic processing package can also simulate the numerical computations. Thus, these packages are potent tools for understanding the 'physics of the problem' compared to the numerical packages where one is often forced to accept the numerical result at its face value.

Maple, Mathematica, Macsyma, and *Reduce* are some of the popularly known symbolic processing packages. Besides serving as a good starting material for the beginners of *Maple*, the book under review also provides an excellent overview of the essence of symbolic processing. As the authors profess, this book has emerged from the course material developed over the years for the students of econometrics.

The first chapter of the book is devoted to explaining the symbolic processing and numerical simulation capabilities of *Maple*. Although the excitement of interactive session of symbolic processing is due to the command line interpreter capabilities of such packages, it is wise to develop the programs separately. Emphasis is therefore also laid on development of user-developed procedures and saving the programs onto files for future applications.

The next chapter deals with the real analysis including polynomials, rational and periodic functions. This chapter also provides the unique opportunity to refresh one's basics, i.e. learning mathematics through *Maple*. Finally, ample help and encouragement is provided to the reader to write user-defined procedures through recursion. It may be recalled here that the artificial intelligence (AI) languages are highly efficient in using recursion.

Chapter 3 begins with the basics of matrix algebra which is followed by the systematic instruction set of *Maple* for the matrix and vector manipulations. The reader is further introduced to the concept of filtering out the noise from a data set so that one perceives the plots correctly rather than getting carried away by the noise modulating over the curve. Symbolic matrix manipulation nonetheless appears to be underemphasized, and it is would have been nice to give specific examples for the benefit of the interested mathematicians, scientists, and engineers.

The authors have taken sufficient care to introduce the application of *Maple* to discrete mathematics which is extensively employed by the so-called *soft sciences*. Thus the researchers in life sciences and econometrics may find symbolic summation directly relevant to the modelling of various phenomena of interest to them.

Chapter 5 shows the application of *Maple* to the determination of derivatives and integrals. It would be rather presumptuous however, to expect a software package, howsoever intelligent, to reel out answers for integrations of all types. Perhaps an average reader would have found it more instructive if she were guided through the capabilities of *Maple* in solving integrals through a step-by-step approach, from simple to difficult, and finally those beyond the existing capabilities. Integrals are one niche area where an expert (person) still has the edge over the system (AI symbolic processing software). However, packages such as *Maple*, can still provide a useful check to the hand-derived solution, by differentiating it back to the original expression.

Chapter 6 deals with the linear algebra concepts such as vector space and linear mapping. This is essentially about diagonalization and Gram–Schimdt orthogonalization.

A significant aspect of this book is the ample exercises, given at regular intervals, for the benefit of serious readers. Helpful suggestions and hints have been provided at the end of the book for the same. A list of *Maple* expressions and commands stressed in each chapter, is given at the end of each chapter. Thus the reader can build up her set of commands systematically. A more comprehensive, structured list is presented at the end of the book, which a reader might find useful after going through the chapters. The book is accompanied by a CD-ROM disk, consisting of demo, *Maple V* trial and the assignment worksheets corresponding to the book chapters.

Although symbolic computing is about 50 years old, it found its way in engineering applications only in the 1970s. For example, typical applications in FEM were in the areas of elasticity and the nonlinear element generation. On the other hand, physicists have been enthusiastically employing it in the areas of relativity, celestial mechanics, high-energy physics and quantum mechanics since early 1960s.

The symbolic processing packages have a compatibility with the higher computer languages such as Pascal, C and Fortran. Futuristic though it may sound to the uninitiated, such packages are also routinely employed to develop the *computer-generated codes* as required by the user. Symbolic computing ought to be seen as complementary to the numerical methods of computation. Further, the capabilities of the symbolic packages have improved radically. It is now within the ambit of possibility to generate the entire FEM codes automatically.

Learning AI symbolic processing packages such as *Maple* has its own

rewards. It is possible to leave the drudgery of closed form analytical derivations, etc. to the computer. One has to, of course, get efficient with writing the codes and instructing the package to carry out the same. This is not as daunting as it sounds. This book would be an ideal starting point for all the *mathematicians, engineers and econometricians* willing to get acquainted with *Maple* and symbolic computing in general.

Finally, the reader should not be mystified by seeing *econometricians* in the august company of mathematicians and engineers (subtitle of the book). In the context of symbolic processing, it is perhaps only justified. One should recall that Prof. Herbert A. Simon (Nobel Laureate, Economic Sciences, 1978), with the study of problem-solving with computer programs, was among the pioneers of computer simulation of human cognition, which later on emerged as the field of AI.

As mentioned at the outset, symbolic processing packages enable asking 'what if', and constructing vibrant models. Perhaps the econometricians would now answer one of the interesting riddles. In the 1970s, the famous 'Club of Rome' report employed a multivariate implicit model which invariably led to the doomsday prediction of the global economic senescence. Notwithstanding these models of normative economics, the last quarter century has seen amazing regional recoveries and supply-side driven prosperity. The econometricians can now look forward to building a closer to reality global economic model, more effortlessly.

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Green Politics: Global Environmental Negotiations 1. Anil Agarwal, Sunita Narain and Anju Sharma (eds). Centre for Science and Environment, 41 Tughlakabad Institutional Area, New Delhi 110 062. 1999. 409 pp. Price not stated.

The battle between science and politics is nowhere more evident than in the realm of environmental negotiations. The world we live in is unequal and divided – unequal in terms of resource endowments, geographic and demographic patterns and the historical paths nations have charted; divided due to the nature of economic and political power nations wield today on account of such inequities. If such a world has to sustain itself, it has to frame for itself sets of governing principles which would recognize these inequities but embody a pervading belief that every actor in the global playfield has an equal right to fulfil his/her aspirations while pledging for the common good. These principles need to be embedded in sound science but equally in sound ethics. This is the real challenge of environmental negotiations, taking place in a battlefield of unequals in terms of power, but equals in terms of sharing aspirations for a better life. The present volume – the result of a massive collaborative effort between more than 120 individuals and institutions all over the world – is a bold attempt at helping the weaker players live up to the challenge of facing this battle in an informed and organized way. The Centre for Science and Environment (CSE), New Delhi deserves to be commended for organizing a network of this magnitude and bringing out such a fact-rich and well-designed publication as a decentralized network output.

Post 1972, the year of the United Nations Conference on the Human Environment at Stockholm, the world has seen a plethora of environmental agreements which have been largely a result of a number of alarmist scenarios painted by scientists. These relate to perceived threats faced by the global community due to a host of intermingling factors like climate change, biodiversity loss, ozone layer depletion and production of Persistent Organic Pollutants (POPs). All of these have become subjects of prolonged and acrimonious international debate, often culminating in major international agreements.

Unfortunately, a majority of these debates has remained restricted to a small minority of the scientific community. There is a need to mobilize the wider scientific community as well as representatives of the wider civil society, especially of the developing countries, if the outputs are to accurately reflect the varying perspectives of all possible stakeholders in the negotiation process, particularly those whose very survival is contingent upon the use of goods and services from their immediate environment. There have been very few attempts to demystify the complex pipeline of global environmental decision-making for these potential participants. It is this gap that the book begins to fulfil.

The first three chapters of the volume take a close look at three major environmental agreements – the United Nations Framework Convention on Climate Change (UNFCCC) in force from 1994, the Convention on Biological Diversity (CBD) in force from 1993 and the United Nations Convention to Combat Desertification (UNCCD) in force from 1996. These chapters take the reader on a guided tour of these conventions, unravelling in intricate detail the political nuances that marked the negotiation processes and the post-Convention meetings of the Conference of Parties. They also summarize the state of scientific knowledge which provoked the negotiations; but simultaneously bring out the subtle value positions inherent in such knowledge. At places, the volume goes even further to challenge a 'mainstream' scientific paradigm, suggesting alternative perspectives. In pages 22–23, for example, it contests a World Resources Institute study on greenhouse gas emissions where the earth's ecological sinks are apportioned on the basis of a country's share in global emissions, suggesting instead an apportioning on the basis of a country's population. The results following from the two approaches are indeed strikingly different in terms of the relative share of industrialized and developing countries in causing the global warming problem. Similarly, throughout the discussion on the CBD in Chapter 2, it builds up a critique of the Northern position that biodiversity resources predominantly located in the South are 'a common heritage' while commercial products developed through