bernetic point of view, some imperfections can be detected in the human organism, imperfections which have a specific role in human pathology. In the second half of the book the author introduces a new concept—the cybernosis, which is disease affectiving the control systems.

The last part of the book is devoted to the cybernetic pathologies and pathogenesis of many diseases: metabolic, endocrine, immunologic, inflammatory, cardiovascular, neurological, psychical, psychosomatic. Shock, cancer and aging are also considered from a cybernetic point of view. There are over 700 references.

In 358 pages Adrian Restian succeeds in presenting the basic problems of this new science. By means of carefully selected examples, each chapter succintly introduced to these new points of view.

The mathematical level is college level, so that it is accessible even to the classical biology oriented reader.

We must stress that the book is based mainly on the original research done by A. Restian—out of 700 references, 102 are due to the author.

The book is stimulating and provocative. One can hardly imagine further research on cybernetical medicine that would ignore Restian's contributions.

Cybernetical Medicine constitutes a very valuable treatise and can be warmly recommended to anyone interested in the field—for practical purposes as well as for further development.

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The Computer Modelling of Mathematical Reasoning. Alan Bundy. Academic Press, Inc. London, New York. (1983) 322 pp.

The aim of this book is to provide the reader with an insight into the applications of artificial intelligence techniques and theorem proving to mathematics. The book is clear and well-written, with an introduction to mathematical logic, since it aims to be self-contained. Non-technical readers should have no difficulty in understanding the presentation of elementary predicate logic in Chapter 1. This is followed by a discussion of propositional logic in Chapter 2, including the truth functional connectives, the use of semantic trees, and the internal structure of propositions. Readers familiar with mathematical logic can proceed directly to Part II, although Part I is interesting by itself, as it is attractively presented.

In Part II, uniform proof procedures are discussed with particular emphasis on two rules of inference: the resolution and paramodulation; this section becomes more technical but the lengthier arguments are postponed until Chapter 16 where the Herbrand proof procedures are defined.

Searching for refutation by using resolution and paramodulation is discussed in Chapter 6, along with various search strategies, Lush resolution and loop prevention. Chapter 7 reviews and evaluates the contribution of resolution type proof procedures to mathematical reasoning; among the cases considered is a group theory example illustrating the combinatorial explosion. Various uniform techniques are described for avoiding or overcoming the combinatorial explosion.

A new methodology for mathematical reasoning modelling is then proposed: to "seek guidance techniques in actual proofs and then to generalize these." This methodology is proposed to replace uniform proof procedures that are inadequate for proving non-trivial theorems; the analysis of human generated proofs would thus lead to proof procedures that are adequate for proving non-trivial mathematical theorems.

Part III is essentially a pursuit of such an analysis that is used to guide the search for the more interesting proof procedures. Chapter 8 contains an analysis of some human proofs of inequality theorems and describes the Sup-Inf decision procedure that can be extended to a decision procedure for Bledsoe Real Arithmetic with variables, by a technique of variable elimination. The Bledsoe

and Presburger Arithmetics play an important part in many mathematical areas; examples arise in: Number Theory, Algebra and Program Verification. Rewrite rules are the subject of Chapter 9, along with strategies for applying rewrite rules. The use of semantic information to guide proofs is illustrated in Chapter 10 by the formalization of Euclidean geometry as a set of Horn clauses, and generalizes semantic checking. Chapter 11 becomes progressively more involved in proof techniques: symbolic evaluation, induction, generalization, Boyer-Moore technique in Peano arithmetic, and the use of a programming language, LISP.

The technique of meta-level inference and formalizing control information is discussed in Chapter 12 together with the PRESS program for solving symbolic, transcendental equations.

Part IV is dedicated to mathematical invention and begins with a description of how a computer can form definitions and conjectures, modelling the concept formation by humans. In Chapter 13, the program AM—which is based on such ideas—is rationally reconstructed, and its performance is evaluated. Among the interesting conjectures made by AM are: de Morgan's Law, the Prime Unique Factorization theorem and Goldbach's Conjecture. Chapter 14 describes how mathematical problems can be solved if they are translated into equations, and also presents a program, MECHO, that produces an algebraic representation of a problem presented in English; MECHO also uses the meta-level inference technique.

Part V presents technical issues such as: investigations of the clausal form (Chapter 15), the Herbrand Proof Procedures, pattern modelling and unification procedures, and concludes with a chapter on applications of "Artificial Mathematicians" (Chapter 18). This last chapter may prove to be also of interest to engineers, teachers of mathematics, physicists, and other scientists that are not mathematicians or logicians. Algebraic Manipulation Systems are classic applications of mathematics to physics and engineering: the real systems are modelled with algebraic expressions that need then to be solved. Such a process can be very time consuming for humans. Automatic solving of such expressions can be much faster than solving by humans, and can be now carried out by a range of algebraic manipulation programs such as: MACSYMA and REDUCE. The program MACSYMA is briefly presented and evaluated in Chapter 18, and an example of its application is given. Computer Assisted Instruction (with the program SHRDLU) and logic programming (with PROLOG) are also discussed, and computer programs capable of such sophisticated operations are specified (BUGGY, SHRLDU and PROLOG). An example of a PROLOG program is given in Appendix I. Solutions to the exercises suggested throughout the book are collected in Appendix IV, and a Bibliography, as well as a helpful Subject Index are included.

The readers interested in logic, mathematics, computers, computer modelling and artificial intelligence will find this book to be both enjoyable and useful.

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Biotechnology Studies and Research: Modeling in Bioengineering and Biotechnology Nr 17/ 1985. M. D. Nicu (ed.). Polytechnic Institute, Bucharest. 1985. 177 pages.

Biotechnology Studies and Research is a nonperiodical scientific journal, published by the Biotechnology group of the Polytechnic Institute of Bucharest. Each volume is devoted to a scientific workshop organized by this group: for instance the present volume is, in one sense, the Proceedings of the workshop "Models in Bioengineering and Biotechnology," Bucharest, May 17, 1985.

This volume contains a forword by Prof. Radu Voinea, President of the Romanian Academy, and an Introductory speech by Prof. Enescu, the Dean of the Faculty to which the Biotechnology group belongs.

The contents lists the following papers: Modeling of biosystems and the basic biomedical research (R. Voinea, M. Nicu); A general model of bioengineering considered as a scientific technical interdisciplinary field (E. Niculescu-Mizil); HSO ! The human operating system—the computer par-