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PREFACE

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The conference "*Mathematical Population Dynamics*", was held in the Department of Mathematics of the University of Mississippi, from 20 to 22 November 1986 (co-sponsored by the Cell Kinetics Society). It was designed as a forum for an exchange of views and experiences between populationists working on "real life" data and those analyzing model equations. Presentations included papers on model building, parameter estimation and numerical studies as well as purely analytic investigations of the qualitative behavior of abstract models. A wide range of subjects were represented, from aquatic ecosystems, demography and epidemiology, to cell proliferation. The majority of presentations revolved, however, around problems of cancer research (including cancer screening, kinetics of tumor cell growth and the epidemiology of AIDS) and related topics of basic biological nature (heterogeneity of cell populations, cell cycle models, etc.). This distribution of subjects is reflected by the papers published in the present issue.

Papers are arranged in the alphabetical order of their authors' names. The following is a brief review of their contents, without any attempt to categorize or classify. The first paper, by Medhat Antonios from AT&T Bell Laboratories is a review of models of aquatic ecosystems, from the viewpoint of the control of water quality. David Axelrod and Tom Kuczek from Rutgers and Purdue Universities discuss the clonal heterogeneity in cell populations. This paper is an overview of biological assays and statistical analyses developed by the authors, in an attempt to interpret results of colony growth experiments. Stavros Busenberg from Harvey Mudd College and Joe Mahaffy from San Diego State University employ a system of partial differential equations to model how the DNA synthesis is triggered in cells. Their model includes diffusion of a species of messenger RNA and a biochemical repressor between the nucleus and the cytoplasm. Istvan Györi from the University of Szeged (Hungary) discusses the qualitative behavior of the solutions of the delay logistic equation and considers a possible model for many population processes. Marek Kimmel from Memorial Sloan–Kettering Cancer Center and Ovide Arino from the University of Pau (France) analyze a model of the G_1 phase of the cell cycle. The model is a chain of interconnected chemical reactions, described by a system of nonlinear differential equations. Michael Kohn from Duke University reviews technical tools available for computer modeling of biological processes. M. R. S. Kulenović from the University of Sarajevo (Yugoslavia), Gerry Ladas from the University of Rhode Island and Y. G. Sficas from the University of Ioannina (Greece) establish a global attractivity condition for a model of red-blood cells production. Similarly as in the paper by Györi, the analysis is based on the theory of functional differential equations. Frank Schultz, J. J. M. van Dongen, K. Hählen and A. Hagenbeek, from four different cancer research institutions in Rotterdam (The Netherlands), analyze the fates of a leukemic population in patient's blood. Data presented illustrate successes and failures of chemotherapy. Rakesh Shukla, J. A. Deddens and Ralph Buncher from the University of Cincinnati, consider the efficacy of screening for lung cancer. An analysis of the influences of various biases on the results of the screening program is included. Hal Smith from Arizona State University proves that time delays introduced into a model of competing subcommunities of mutualists, do not deteriorate the stability of the community. Again, delay differential equations are employed. Another paper on the analysis of growth of cell colonies is provided by Terry Therneau, Larry Solberg and Robert Jenkins from the Mayo Clinic. The early stage development of the bone marrow precursors of

blood platelets, is treated by a probabilistic analysis involving the generating functions of a Galton–Watson process. James Thompson from Rice University presents a study of the AIDS epidemic, concentrating on discussion of the existing and lost possibilities of sociological control of its spread. A simple mathematical model demonstrates the importance of small subgroups of highly promiscuous individuals for the dynamics of this epidemic. Glen Webb from Vanderbilt University is pursuing the long recognized problem of distributions and correlations of cell cycle times, from the viewpoint of a general model of cell kinetics. His model is an example of the structured population approach.

About ten more talks were delivered during the conference. Their abstracts are available in a booklet published by the Department of Mathematics of the University of Mississippi.

We would like to use this opportunity to thank everybody engaged in the organization of the meeting.