

Lecture Notes
on
Biomathematics
and
Bioinformatics '95

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From BIOMATH-95 Program Committee Members

The last twenty years has seen an enormous growth in the subject area of mathematical biology, which incorporates the application of mathematics to problems in ecology, medicine and evolution, as well as biology. This growth has occurred, in part, in response to major technological advances in the life sciences. For example, advances in molecular and cellular biology have resulted in the rapid development of experimental research into the biochemical mechanisms underlying tissue disorders and diseases; large scale studies are being carried out to chart the dynamics of disease spread; data on pollution and environmental hazards is accumulating as more sophisticated measuring techniques are developed.

Mathematical modelling can play a crucial role in the life sciences by providing a theoretical framework within which this mass of experimental information can be analysed. In turn, the life sciences are the source of a great number of very interesting and challenging mathematical modelling problems. As the complexity of the modelling increases, our analytical tools and computational skills are stretched beyond their limits, resulting in exciting new developments. However, for theoretical models to be relevant and useful, it is vital that models are developed in collaboration with experimentalists and that predictions resulting from the analyses of models are experimentally testable. This experimental feedback enhances our understanding of the phenomenon being modelled, which leads to more accurate hypotheses on which models can be built, resulting in more detailed model predictions. Only by this close interaction between theory and experiment can mathematics genuinely help to elucidate the underlying mechanisms that govern the phenomenon being modelled.

Mathematical biology is now a well established subject, as can be seen by the increasing number of centres for mathematical biology that are arising in universities throughout the world. The number of international conferences in the area is increasing, as are the number of young researchers, attracted into the field by the excitement of a new and growing subject.

This conference, the first international conference in biomathematics to be held in Bulgaria, brings together researchers from many different countries working on a diverse number of applications, ranging from medical applications, such as in physiology, immunology, neuroscience and biomedicine, to population dynamics and ecological and environmental modelling; from neural networks to evolutionary biology and genetics. On

the more theoretical side, the advanced methodological and computational tools being developed to analyse models are also presented.

The breadth of interests of the participants at this meeting provides an excellent opportunity for the cross-fertilization of ideas which, it is hoped, will have an impact on the field.

Philip K. Maini

Centre for Mathematical Biology, Oxford

The scientific program is very interesting and very attractive — I wish I could go. Wish you big success for the conference.

Jia Li

Huntsville, USA

I am very impressed by the number and wide of views of contributions of your (Bulgarian) colleagues. Unfortunately, for serious reasons I will be not able to participate at the meeting. I believe that the meeting will be successful.

Jaroslav Milota

Charls University, Prague

Foreword

The BIOMATH-95 Conference is the first international biomathematical conference in Bulgaria. The main organizers are the Institute of Biophysics at the Bulgarian Academy of Sciences and the Institute of Informatics of the University of Basel. Many of the members of the Organizing Committee are present or former members of the Research Group for Mathematical Modeling in Biology (RG for MMB) at the Bulgarian Academy of Sciences (now within the Institute of Biophysics). The conference has been preceded by eight biomathematical seminars organized at national level by the RG for MMB. The BIOMATH-95 international conference is organized in combination with a school for young scientists. The two previous international conferences organized by the RG for MMB, were also combined with schools for young scientists: the SCAN-90 Symposium + School in Albena, 24-28 September 1990, and the MMSC-93 Symposium + School in Sozopol, 14-17 September 1993. The combination between International Symposium and School proved to be very useful for the promotion of new interdisciplinary sciences in Bulgaria. Some of the participants have been invited to held lectures that are of interest for a wider audience. Such lectures, called tutorial lectures, did not necessarily involve new scientific results. On the other side, the organizers encouraged young scientists to attend the tutorial lectures, the plenary lectures and the lectures or posters presented by young scientists. The set of all these three types of lectures constituted the school for young scientists. This volume contains the materials for the School which were available before the conference. We are grateful to the Foundation "Evrika" for the provided support, which allowed the publishing of this volume. We thank M. Candev for the editing and pre-processing of this volume. The abstracts of the BIOMATH-95 conference are published in a separate volume: BIOMATH-95, E. Popova, S. Markov, Ch. Ullrich (Eds.), DATECS Publ., Sofia, 1995.

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