Book review

Marchuk, G.I.: Mathematical Models in Immunology. Berlin, Heidelberg, New York, Tokyo: Springer 1984. 351 pp., 91 figs. Soft bound DM 128,–.

The subject matter of this monograph, modelling immunological processes, certainly deserves attention: the complexity of the system, i.e. the sheer number of participating entities (cells, molecules) and their interactions, is such that only by explicit modelling can we discover the consequences of experimentally acquired knowledge/hypotheses on particular processes.

However, the treatment of Marshuk is somewhat disappointing. In a so deeply studied area as immunology, it is inevitable that some new experimental observations become available before a book is translated (the original (Russian) version was published in 1980) and although the author realises this, he maintains (rightly so) that notwithstanding the datedness of the experimental knowledge on which the models are based, the exposition of the modelling approach should be worthwhile. It is, however, regrettable that the representation of the immune system is not consistent throughout the monograph. The study of "alternate designs" (see M. A. Savageau 1976: Biochemical Systems Analysis. A study of function and design in Molecular Biology. Addison-Wesly Publ. Comp., Reading Mass.) is an important tool for understanding biotic systems even if we know which structure is realised in them. However, Marshuk does not discuss his different assumptions as alternatives to be investigated but introduces all cases with: "it is well known that . . .".

The models studied in the monograph are in terms of differential equations. The treatment emphasizes the existence and the stability of equilibria using well-known mathematical techniques. Accordingly, the biological results emphasize the occurrence of chronic diseases. Alongside the analytical treatment, simulation results are presented as illustrations. For the larger models (which are immunologically the most interesting ones) the primarily analytical treatment becomes a burden: the more interesting properties of the models cannot be approached analytically and are therefore not discussed at all although they can be studied by well chosen simulation experiments. Finally, the author emphasizes the use of the models in medical practice. This is, I think, premature.

If one realises these shortcomings, the book can serve as an introduction to the possibilities of large scale modelling in immunology, as well as the Russian approach to this subject. The book does not, however, live up to the exaggerated claims in the preface: ". . . mathematicians are turning their attention to a hitherto narrow, specialised discipline (i.e. immunology), thus indicating its significance far beyond its confines."

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