Biomolecular Sensors. Electra Gizeli and Christopher R. Lowe (eds). Taylor and Francis Books Ltd., New Fetter Lane, London EC 4P 4EE. 2002. 322 pp. Price: £ 70.00.

A search for the word 'biosensor' on the net takes one to sites as diverse as medical telesensors, microcantilevers, bioreporters and miniaturized devices and to their applications such as in detecting cancer and health abnormalities, biosensors and DNA analysis and anthropometry. One of the scientists to take keenest of interests in anthropometry was Leonardo da Vinci, who drew the famous 'Proportions of the human figure' some 500 years ago. Now, one can do the same by using laser beams, mirrors and amplitude-modulated laser radars. A few years ago, one could draw clear distinctions between the various disciplines, namely physics, chemistry and biology. However, increasingly, the ideas of one are applied to the other and thus the emergence of fields such as the biosensors. To put it simply, biosensors is a field where complex rules of physics are applied to the study of biological systems.

In today's world of genomics and proteomics, new molecules are being identified each day. Genomics basically deals with sequencing of the complete genome of a particular organism. Proteomics on the other hand, can be defined as the study of all the proteins present in the genome of an organism. With new genomes and proteomes being identified at such a rate, the need would be to identify molecules that interact or to find various binding partners, which could give us deep insights into biological pathways. Now, with the whole human genome available for scrutiny to the biologists, there would be many new small molecules as potential drug candidates and hence a greater need to study interactions at the molecular level. All this leads one to realize the importance of more sophisticated and sensitive instruments that could help us in such endeavours. Thus, this book has been published at an appropriate time.

The field of biosensors is not old and has received a great impetus in the last decade due to the development of sensitive commercial instruments and user-friendly software. Biosensors have come a long way and now find applications in fields such as protein–protein interactions, determining rates of reactions, determining concentrations of molecules, identifying binding partners and thermodynamics of molecular interactions.

The book has been divided into four sections, namely biological recognition, immobilization of biomolecules, transducer technology and applications of biosensors. The book deals in detail about the various interactions that are biologically relevant like antigen–antibody, protein–protein and DNA interactions. This would help a user of biosensors to understand the kind of possible interactions. How molecules behave in solution could be very different from when one of the interacting molecules is immobilized on a surface. Under immobilization conditions factors such as orientation of groups, steric hindrance and matrix effects among others, come into play and can affect the results to a great extent. Thus, an in-depth knowledge of these factors would help in better designing of the experiments and also in judicious choice of models during the analyses of the results. This fact has been kept in mind during the production of the book and the section on immobilization deals first with the possible strategies available for immobilization and another chapter is devoted to the kinetics of such systems. The third section explains how a biological interaction can be converted into a signal by optical, acoustic and electrical approaches. Amongst all, optical transducers have received the greatest attention. This is so because UV–Vis absorption spectroscopy, fluorescence spectroscopy and Raman spectroscopy have demonstrated the extent to which optical analysis methods are established and the wide range of molecular structure, conformation and environment that they can give. The chapters describe in detail the physical principles involved and how they have been used in the development of various instruments. The last section deals with the applications of biosensors wherein it has been shown how the different physical principles have been commercialized into instruments which are now being used in both basic and applied research. Surface plasmon resonance (SPR), its development and use as BIACORE instruments forms the first of the four chapters in this section. The chapter on IAsys, a resonant mirror biosensor, describes its applications in analysis of whole eukaryotic and prokaryotic cells, viruses and liposomes. The last two chapters in the book deal with commercial quartz crystal microbalance (QCM) and QCM-D (with dissipation monitoring). QCM has found a wide range of applications in areas of food, environmental and clinical analysis due to its inherent ability to monitor analyses in real time. However, QCM still has not received the kind of success that SPR has seen, and the authors discuss this in some detail.

On the whole the book describes the fundamentals of physics in the development of new technology through to their applications. The book will be informative to both newcomers in the field of biosensors as well as to those who are already into it.

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Recombinant Protein Drugs. Milestones in Drug Therapy Series. (ed. Buckel, P.), Birkhauser Verlag AG, P.O. Box 133, CH-4010, Basel, Switzerland. 2001. 207 pp. Price sFr 158/DM 210.

One of the true success stories of the biotechnology and rDNA revolution emanating from the 1970s has been the availability of various recombinant protein drugs for different therapeutic applications. Some of these, particularly the growth hormones and an array of cellular growth factors would just have been unavailable to clinicians, if rDNA technologies had not been plugged into their production processes. These now number well over 30, with nearly ten times this number in various stages of pre-clinical trials. Thus, at least