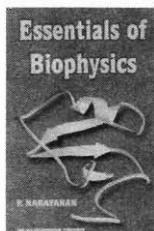


bluethroat. It comes out pure and straight from a total void as it were. On the other hand, the call of common crane and its echo in space so true to field realities is very well captured. The collective symphonics of the calls of the entire flock taking to wings is ethereal. (I have a nagging doubt here though whether this call is of the Damoiselle crane?). But for a crisp, reverberating and lingering effect the recording of the lesser golden-backed woodpecker is in a class by itself. Whether by design or accident this call is replayed as envoi with excellent effect.

All kudos to *Nature Club, Surat* (81, Sarjan Society, Surat 395 007) for this excellent offering at just Rs 125/-. I have no doubt, given wider publicity of its existence the cassette will run into several reprints. And I wish that *Nature Club, Surat* would be encouraged, cajoled, need be even bullied by nature lovers to get on with the compilation of Volume-II of the series, promptly.

Lt General Baljit Singh, House 219, Sector 16-A, Chandigarh 160 016, India.

## Essentials of Biophysics



*Essentials of Biophysics*  
P Narayanan  
New Age Publications  
2000, pp.499.

Biological sciences at the university level, is still compartmentalized in this country into subjects such as zoology and botany, which are to a major extent descriptive. Biochemistry, molecular biology, biotechnology or life sciences are relatively newer subjects which are being taught at select universities or institutions in the country. It is also a sad reality that in some universities the newer subjects are enthusiastically included in the syllabi, with inadequate teachers, laboratory

facilities and textbooks. These things come out in the open when one talks to the fresh students being churned out of the universities, which is a different matter. Biophysics as a subject in itself is taught in very few universities, and in some instances is part of the M Phil course. In most cases it is included as one of the subjects in the different courses offered in the biological sciences and in physics course of some universities, and does not receive the attention that it deserves. This is ironic, since research in biophysics in laboratories and institutions in India is picking up at a fast pace. The majority of entrants in biophysics, and this is true in the Indian academic scene as well, are people trained in physics or chemistry i.e., people who have had these subjects at the masters level. They have the definite advantage in that they are able to add a quantitative aspect to understand biological phenomena with relative ease, and they are doing it very

effectively and successfully. What the history of science tells us however, is that there are clear examples where scientists trained in biology or medicine have made fundamentally important contributions to the physical sciences as well, asserting the fact that science really does not have clear borders. Modern biological research requires rigorous application of physical techniques to understand the structure and function of biological systems.

In the last decade one can really see the emphasis in encouraging application of newer physical techniques in biological research in the country, going by the funding patterns and the increasing trend of non-biologists getting interested in biological problems. It is not unusual to find biological problems being pursued in an organic chemistry laboratory for instance or a new unit being named as a chemical biology unit. In the future, the laboratories in the country where biophysical research is conducted, will require students who have been taught modern biophysics at the masters level. How well are we training students in biophysics at the masters level? If we are to give them training how is it best done? In India as elsewhere, this is effectively done by teachers who can teach the subjects, and textbooks that are affordable and well written. Although not formally trained in biophysics myself in the sense of attending formal courses, etc., I am not aware of a course book in biophysics in India written by an Indian author, where all or a majority of the topics in biophysics are

put together in a single book. A textbook becomes important in formal teaching, to grasp the essential principles and have a firm background. It definitely gives a direction to the course structure.

The book *Essentials of Biophysics* by P Narayanan, has come out more or less at the right time, and in my opinion will serve as an important guideline for future textbooks on biophysics in the country. It is a detailed book, but with the essential principles and formalisms explained. The book is divided into 4 sections, Section 1 is on bio-molecular structures. The first chapter on atoms, bonds and molecules is concise. The other chapters are on proteins, nucleic acids, carbohydrates, lipids and membranes. The second section is on physical techniques in structure determination. In this section there are chapters on spectroscopy, nuclear magnetic resonance, microscopy, X-ray diffraction, lasers and holography. The subject matters are well covered. The author has used some of these techniques extensively in his research. The 3rd section is on bioenergetics. The 4th section is on biological systems, where topics on neurobiophysics, biomechanics and radiation biophysics are covered. The recent techniques in neurobiophysics viz. electrophysiology, patch-clamp and the associated capacitance measurement technique, and techniques related to measurements of calcium dynamics inside cells, have not been covered.

At the end, the book carries 4 appendices,

each on formulas and formalisms relevant to topics in the text, statistics, tables and conversions and important elements in biology.

The author mentions in the introduction that conscious effort has been made to avoid over emphasis on overtly physics or overtly biology topics, and I have found this to be very true in the book.

It is my suggestion that in the next edition, the author includes a section on 'Methods for evaluation of biological function' where methods used to study function of single molecules in a cell as the biological processes go on actively inside a live cell are discussed. Going by the number of crystal structures of proteins being deposited with the protein data bank and at the rate at which this is being done, it becomes imperative to ask, what these different protein structures are doing inside a live cell. Analysis of function of a biomolecule and its precise role in a cell, and functionally different cell types, is severely lagging behind, and this is true in the Indian biophysics research scene too, where the gap is even more. Single molecule biophysics, its dynamics and analysis of function is the direction in which experimental biophysical research will go in the future.

The major emphasis of this book on biophysics has been the elucidation of physical principles underlying biological organization ranging from structure of molecules to radiation biology. What the author has put forth in the book very closely represents the Indian

biophysics research scenario today and the strengths in structural biophysics and spectroscopy, which has been built over decades. The emerging techniques in biophysics which focus on function of biological molecules, for instance the patch-clamp technique, which is proving to be a very powerful technique to understand how a single molecule or a population of protein molecules function in tandem, while within the membrane in a live cell, or the fluorescence imaging techniques like the confocal microscopy, has been grossly overshadowed by spectroscopy, NMR and X-ray crystallography. Computational modeling and molecular dynamics are again subjects that could have been covered in some detail in the text. These do not require very expensive experimental setups, and could be the research topics, which are not so well funded Indian university department could engage in effectively.

The book could have been proof-read more thoroughly before reaching the printing press. There are quite a few typographical errors in the text. The figures need a lot of attention in terms of presentation, and are drab. This is understandable however, since any fancy figures, and good graphics would push up the overall cost of the book, which would then become unaffordable to an Indian student who often has to depend on financial support from home to complete his masters degree at the university. Putting together a book of the kind that Narayanan has done, with diverse topics is not an easy task, and as far as I am aware has not been attempted in this country

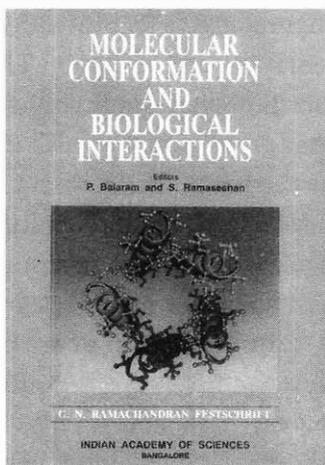
before. The author has taken a definite and much commendable lead in putting together this book covering a wide range of techniques and applications and must be congratulated for this effort. I hope that the book will be read by people who matter in Indian biophysics, who are concerned about biophysics teaching, and whose voices are heard in the Indian academic circles, who will in turn muster funds for producing a second edition of the book with better graphics, or a different book altogether with Narayanan as the editor. This could be in the lines of a 'biophysics-source book', which could have sections written by people who are actively engaged in research implementing the different physical techniques. The advantage of this approach is that it exposes the Indian student to the areas of biophysical research carried out in the country. It also leaves a comforting thought in the formative mind of a MSc student pursuing his/her studies in a remote university, that some of the experiments and

research methodologies described in the textbook are actually carried out in the country. Attempting such a thing would undoubtedly require a huge effort and some sort of commitment from the different contributors.

Apart from what I have written above, the book *Essentials of Biophysics* by Narayanan, would be useful not only to those teaching or studying biophysics, but also to those taking the courses on biochemistry and biotechnology in the different universities and institutions in the country, where they will find descriptions of physical techniques useful. This book will also be useful to the students pursuing their PhD research particularly in areas related to structural biology. The cost is not mentioned on the book, but I feel would not be expensive to possess at the individual level nor by the libraries.

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