Annual Review of Biophysics and Biomolecular Structure, Vol. 31. R. M. Stroud, W. K. Olson and M. P. Sheetz (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. 2002. 559 pp. Price not mentioned.

Biophysics covers a wide spectrum of activities within the broad realm of biology, so much so it defies a precise definition: biophysics means different things to different researchers. Elucidation of the three-dimensional structure of biomolecules, their assembly, interactions, dynamics and functional correlations continue to be the most visible areas of biophysical research. Considering the explosions of research output in these areas, an annual review can only focus on a few selected topics where significant progress has occurred. This volume contains 19 assorted, but well-structured articles relating to molecular assembly, membrane proteins, ribosome, protein–DNA interactions, and a few biophysical techniques and their applications.

Study of membranes, especially structure determination of membrane proteins has been a challenging task. Early efforts by Henderson's group to study bacteriorhodopsin using cryo-electron microscopy, its eventual crystal structure determination by Huber, Michel and Dissenhofer, and recent breakthroughs in determining the structure of cell membrane ion channels by MacKinnon have contributed immensely to the understanding of membrane biology. Crystal structure of chromophore-bound bovine rhodopsin described here, provides new insights into rhodopsin–chromophore interactions and offers clues as to how light-induced conformational changes can be transmitted to the cytoplasmic surface. It is surprising that even extracellular surface domain influences retinal-binding pocket. Future studies on the trapped intermediates of the photocycle reaction should provide a comprehensive understanding of the biophysical aspects of rhodopsin. In a closely-related NMR study of bacteriorhodopsin pump cycle, it is proposed that bacteriorhodopsin may well be considered as an inward-directed hydroxyl pump rather that an outward-directed proton pump. This is based on the observation that the Schiff base of the chromophore is hydrogen-bonded before, during and after deprotonation in the first half of the photocycle. Interestingly, these observations bear some analogy with the halide transport in halo-rhodopsin.

A personal account by eminent biophysicist George Feher, famous for his contributions in bacterial photosynthesis as well as in what he calls 'straight' physics, adds flavour to this volume and is an inspiration to all those who pursue research against odds.

Exquisite features of Pauling's α-helix to satisfy the hydrogen-bond potential in an apolar bilayer environment, enable it to be used as a workhorse in the organization of membrane proteins and gating transitions of channels. Data from 140 membrane-spanning α-helices from 15 crystal structures of channel and membrane proteins, reveal the specific orientation and packing of helix–helix structures that provide a scaffold for non-membrane spanning structures associated with channel activity and with gating transition between closed and open states. Similarly, distinctions in the tilt and span of α-helices correlate with the closed and open states of channels and pores. The significant role played by glycine residue at the interface of α-helices in enhancing their packing efficiency, and by salt bridges between them in stabilizing the coordinated structural rearrangements is recognized. NMR structures of apolipoproteins, CI, CII and AI identify bends in the α-helical regions that are always oriented towards the hydrophobic face, perhaps to facilitate its binding to lipid particles like HDL and VLDL.

The *E2* gene product from the papillomavirus genome plays a key role in the regulation of transcription and DNA regulation. This DNA tumour virus infects a variety of hosts, including several mammalian species. Crystal structures of E2 protein from several viral strains, DNA–E2 complexes and free DNA oligonucleotides of the consensus sequences, provide decisive clues on the nature and type of interactions that could be characterized as direct read-out and indirect read-out of DNA recognition. The data further lead to the understanding of the varied abilities of E2 proteins to discriminate among the binding sites that differ in the spacer sequence. DNA deformations, such as minor-groove compression and bending towards the major groove, are implicated as structural codes for protein recognition in this system too.

Continuing on the theme of protein–DNA interaction, emerging evidence suggests that the core histone tail domains participate in the chromatin dynamics. A related observation is that certain yeast silencing proteins, Sir3p and Tup1p, interact with N-terminal domains of H3 and H4 to facilitate the assembly of chromatin fibre into well-defined, higher order, supramolecular structures.

New developments in biophysical techniques open up new applications. It is claimed that distances as far as 100 Å can be measured with greater accuracy using luminescent lanthanides, as opposed to conventional flurophores, as donors in resonance energy transfer measurements (LRET). Recent advances in high frequency EPR and NMR spectroscopy as applied to paramagnetic metal centres in proteins, cryo EM as applied to single molecules, flow cytometry for analysis of molecular assemblies and ligand–receptor interactions, and microscopic methods to visualize and measure turgor pressure are other techniques that are discussed with examples of application.

Massive amount of information generated concerning cellular components, their structures, dynamics, interactions and assembly, has dared some enthusiasts to feed it back into a computer towards designing a *virtual cell* (can be accessed and run from www.nrcam.uchc.edu) capable of mimicking cellular responses. This challenging and emerging field of 'computational cell biology', although nascent, is attracting the attention of those working in interdisciplinary areas and who could effectively translate each other's thoughts. It will be exciting if in the near future such simulations could lead to predictions of a cellular phenomenon that provokes experimentalists.

It is a dream come true for those involved in the daunting task of determining the molecular structure of ribosome, when it was made possible to trace the complete structure of 30S subunit by Venki Ramakrishnan's group and part of 50S subunit by Peter Moore's and Tom Steitz's groups during mid-1999 to a good level of confidence. The fruits of arduous labour, spanning over decades by several gifted individuals who have made seminal contributions, eventually culminated in a situation of happy ending. Structural details of ribosome at a holistic level have led to a clear definition of the proteins and RNA neighbourhood. These have facilitated correlation of molecular interactions responsible for several functions of ribosome, including the structural basis for antibiotic action. It is indeed a molecular feast for those who can dissect and visualize on a computer screen, regions of the ribosome structure involved in many different acts. Yonath, who pioneered through decades of perseverance in obtaining X-ray diffraction pattern from crystals, narrates structure–function details as revealed from crystal structures of ribosomal subunits.

It has been an education for me to read the articles in this volume. In my opinion it contains some new information of interest to all those engaged in biophysical research. It is therefore to be read by researchers at all levels and should find place in a library catering to researchers in life sciences.

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Smart Fibres, Fabrics and Clothing. Xiaoming Tao (ed.). The Textile Institute, CRC Press, Woodhead Publishing Limited, Cambridge. 2001. 316 pp.

'*Smart' is the art to attract attention in the mart of material world* and this buzzword has pervaded almost all space of our society. Therefore, smart textile cannot be an unusual term and naturally a book on the subject matter is quite expected in modern times. This title intends to mean mainly functionally active textile and allied items. Textile seems to be a remote item in the realm of smart system, yet the concept is applied nicely in most of the chapters.

The human body is an auto-controlled, thermo-regulated organism which regulates body temperature, but body cannot always sustain if there are sudden temperature changes to the extremes. To cope with this situation, newer concepts of smart clothing based on heat-storage and thermo-regulated textiles are being explored worldwide to keep the user warm when it is cool and vice versa to ensure comfort temperature. Such clothing items are nothing but a form of functionally graded material (FGM) based on 'intelligent textile' which has been discussed in this book.

Generally, the technical meaning of the term smart items is quite broad and includes thermal, electronic, optical or even many bio-related systems which this book has covered to different degrees. In the introductory part of the book, smart materials were categorized as passive smart, active smart, very smart and intelligent material in accord with their mode and level of function. In fact, the first five and the last two chapters are particularly worth reading for easy understanding of the scientific aspects of the constituent items and their functional roles.

A considerable portion of the book is engaged on the thermal events involving phase change materials (PCM) which absorb, store or release heat according to the change of temperature during phase change process and is most frequently used in the manufacture of smart textiles. For the purpose of designing smart clothing, the approach of PCM in conjunction with other energy transfer technologies to convert NIR rays of the sun into heat is quite innovative indeed. The technique of fabrication of smart fibre by filling PCM into the fibre of different shapes-round, square and triangular is really unique and the brief information on thermochromic textiles, thermal anisotropy and its implications on the effects of fibre orientation within the web are especially interesting. However, it is understood that most smart fabrics are still being upgraded to make them more resistant to laundering.

A chapter on thermally sensitive textile materials provided more information than description on the necessity and technicalities of 'extreme cold-weather protective clothing' (ECPC) based on breathable membranes in conjunction with reflective materials. This is particularly important as personnel posted at Antarctica of high altitude area badly need ECPC to combat harsh weather conditions where wind velocity may reach 150 miles per h and temperature falls to – 46°C, in which case layered clothing system can continually adjust to conserve and manage body heat. The harshness of wind chill on the human body is assessed from the 'wind chill factor' which is well presented by mathematical equations involving wind velocity and temperature. The technology of breathable fabric with adequate flexibility is quite unique, in the sense that it is waterproof and at the same time it avoids the condensation of perspiration in a garment during wear. Therefore, inclusion of a chapter on membranology with special emphasis on the material aspects for gas separation is appreciable.

In systems involving optoelectronics, changes in refractive index induced by radiation led to the development of fibre bragg grating (FBG)-based sensors for smart structure. Besides mechanism and fabrication of FBG optical fibre, discussions on the optical responses of FBG under different modes of deformation were made in consecutive three chapters (8, 9 and 10). FBG sensors have achieved significant applications for monitoring the mechanical or temperature response in smart textile composite system.

The other area of smart system discussed involves bio-related events where medical textiles for healing and construction of human tissue are particularly important in view of their growing market. Tissue engineering to regenerate or grow new tissues and organs on porous biodegradable scaffolds or templates based on polymeric textile material is very useful. A list of synthetic non-living type biomaterials as implantable textiles can be known from the text. Interestingly, biodegradable shape memory polymers as promising implant material in the medical field have also been discussed adequately. It also reported certain interesting aspects of the gels under the influence of pH, light and/or heat to response is extremely fast which may be intended for use as photo-responsive artificial muscles, switches and memory devices for future applications. Few chapters report some research work on interpenetrating polymer network and graft copolymer to prepare representative stimuli responsive gel systems. Some extremely interesting information on materials showing crawling movement under the influence of external force to mimic the situation of living cell amoeba will help understand the interface of living and non-living objects. This demonstration provides scope for development of actuator, artificial muscle or micro-, nano-machine of the future generation.

The book is no doubt excellent for conceptual understanding of the overall subject but it is unnecessarily burdened with