Book Reviews

Lipid–Protein Interactions, Vols. 1 and 2

Edited by P.C. Jost and O. Hayes Griffith

John Wiley and Sons; New York, 1982
Vol. 1: 338 pages. £58.50; Vol. 2: 307 pages. £54.50

These two books, Vol. 1 and Vol. 2, are concerned with providing a series of review articles centred around the topic of Lipid–Protein Interactions. The first volume deals with water soluble lipid–protein systems whilst the second focuses on biomembrane systems.

The chapters in Vol. 1 deal with topics which include 'Lipid–protein interactions in a bacteriochlorophyll-containing protein' by B.W. Mathews, 'Serum albumen' by Brown and Shockley, 'Pancreatic phospholipase A_2', by Volwerk and de Haas, 'Phospholipid transfer proteins' by K.W.A. Wirtz, 'Lipovitellin and the yolk lipoprotein complex' by Banaszak, Ross and Wrenn, and 'Lipid–protein interactions in plasma lipoproteins' by Scanu, Edelstein and Shen.

Each of the chapters is well written and interesting in its right as a topic of research. The chapter on the bacteriochlorophyll protein is particularly interesting as it is the only high resolution X-ray diffraction structure which has been determined as a complex of lipids with protein. In this case, the lipids are completely enclosed within an envelope of protein and the lipids occupy well defined but quite irregular conformations. Matthews suggests that any type of secondary structure including helices, sheets and irregular protein structure may participate in lipid–protein interactions.

There has been considerable confusion and discussion relating to lipid–protein interactions within biomembranes and it is therefore interesting to examine Vol. 2.

In Vol. 2 there are a series of chapters ranging from 'Structural organisation of myelin' by J.M. Boggs, M.A. Moscarello and D. Papahadjopoulos, 'Spin-labelling and lipid–protein interactions in membranes' by D. Marsh and A. Watts, 'Nuclear magnetic resonance and lipid–protein interactions' by J. Seelig, A. Seelig and L. Tamm, 'Photochemical cross-linking in studies of lipid–protein interactions' by R.J. Robson, R. Radhakrishnan, A.H. Ross, Y. Takagaki and H.G. Khorana, 'Interactions between proteins and amphiphiles' by J.A. Reynolds, 'Equilibrium constants and number of binding sites for lipid–protein interactions in membranes' by O.H. Griffith, J.R. Brotherus and P.C. Jost, and finally 'Thermotropic phase transitions of pure lipids in model membranes and their modification by membrane proteins' by J.R. Silvius.

Each of these chapters is complete and well written. It is therefore interesting to compare and contrast some of the views on protein–lipid interactions in model and natural biomembranes.

The earlier view, based on ESR experiments, and expressed by a number of biochemists, that every intrinsic membrane protein has a rigid shell of tightly bound lipid, sometimes called the lipid annulus, is now modified in the light of more recent deuterium nmr experiments. The difference between the ESR

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experiments which indicate two components (see page 54) and the deuterium NMR experiments which show a single homogeneous lipid phase (page 140) for the same reconstituted protein–lipid systems, is related to the different time scales of the two techniques. Exchange between the boundary layer lipid and the remaining lipid is fast on the deuterium NMR time scale (exchange rate is faster than 10^{-4} s) whereas ESR spectroscopy corresponds to fast motions with rotational correlation times for immobilised lipid, about 10^{-8} s. The exchange frequency for lipid molecules within fluid lipid bilayers is about 10^{-7} s.

Marsh and Watts nevertheless state that the immobilised lipid component, as seen by spin labels, bears a *fixed* stoichiometry to the protein *independent* of the lipid to protein ratio (see page 106). However, even this view has recently been modified. In a more recent publication Marsh and co-workers accept, as suggested by other workers, that departures from fixed stoichiometric ratios can occur, arising from protein–protein contacts which are particularly probable at high protein to lipid ratios.

Boggs et al. in their chapter discuss lipothilin and suggest that this protein 'because of its very hydrophobic character and transmembrane location also has boundary lipid' (see page 19). They do accept that rapid exchange between the lipid next to the protein and the remaining lipid does occur, as indicated by the deuterium NMR experiments.

The chapter on photochemical crosslinking by Khorana and colleagues is a very useful one for summarising the various methods and the molecules used in such studies and examples are given of applications of the technique such as the identification of the lipid binding site of the phosphatidylcholine transfer protein.

The final chapter on thermotropic phase transitions is useful for its data but could have been more extensively discussed. In general I found these two edited volumes by Jost and Griffith worthy of careful reading.

D. Chapman

The Sarcoplasmic Reticulum (Transport and Energy Transduction)

by Leopoldo de Meis

John Wiley & Sons; New York, 1981
xv + 163 pages. £29.25

The calcium ATPase (or calcium pump) of skeletal muscle sarcoplasmic reticulum is one of the most studied of all membrane transport proteins. During the past 15 years a very large number of kinetic studies of the purified enzyme have been made. These have provided information for the construction of a detailed kinetic model of the mechanism of calcium transport by this protein. This book is a description of many of these experiments performed both by the author and other workers. It sets out to give in detail the results of steady-state and transient kinetic experiments that have led to the formulation of a model of the reaction sequence with eight intermediate states. The chapters are arranged so that generally each one describes experiments designed to elucidate one or two steps of the sequence. This leads to a certain amount of repetition although this is not excessive. The style is generally clear, and all the experiments are