MEMBRANES

# New Models Needed for Structure and Function

from our Photosynthesis Correspondent

PAPERS on a wide spectrum of subjects were presented at the first European biophysical congress held at Baden near Vienna from September 14 to 17. The meeting was split into nineteen separate symposia, one of which was entitled "Biophysics of Transport Processes". Although most papers presented in this symposium dealt with studies on animal tissue there was a surprisingly large number of contributions from workers investigating the properties of plant cell membranes. In an introductory lecture, Professor J. F. Danielli (Amherst, New York) emphasized the need to subject any hypothesis of membrane phenomena, whether associated with plant or animal cells, to certain tests. He stated that hypotheses should be plausible in terms of free energy considerations as well as making some sense in evolutionary terms. He is convinced that no substantial progress in this field can be made until detailed structural analyses have been performed for at least one membrane protein. In fact, very few papers presented in this membrane symposium were concerned with the measurement of molecular parameters but more with kinetic and thermodynamic models.

From several papers reporting experiments on sugar transport in erythrocytes it became clear that the conventional carrier model, originally proposed by Wilbrandt and others, is not entirely satisfactory. In particular, Dr W. D. Stein (Hebrew University, Jerusalem) rejected the carrier hypothesis and replaced it by a molecular model involving a protein tetramer embedded in the membrane. This new model predicts that the maximal rate of unidirectional efflux of sugar, when it is at a saturating concentration on both sides of the red cell membrane, should be twice that found when the sugar is present on one side of the membrane only and, indeed, Stein has experimental support for this idea.

The role of divalent cations such as $Ca^{2+}$ as factors in regulating membrane transport came up in several papers. According to Dr H. H. Ussing (University of Copenhagen) divalent ions can in some cases control the specificity of active cation transport mechanisms. For example, silkworm gut possesses a very specific $K^+$ pump which in the absence of $Ca^{2+}$ loses its specificity.

Arguments about the mode of action of ionophorous compounds such as valinomycin, particularly at the molecular level, were to be found not only in the symposium on membranes but also on photosynthesis. Studies by Dr G. Stark and his colleagues (University of Konstanz) on artificial lipid bilayers suggested that valinomycin enhances $K^+$ movement across the membrane by acting as a mobile carrier. On the other hand, Dr W. Junge (Technische Universitat, Berlin) does not think this "jump" mechanism occurs in natural membranes. By analysing the voltage-current characteristics of chloroplast thylakoid membranes he argued that valinomycin is rigidly fixed in the membrane and increases $K^+$ conductance by acting as a bridge across a unimolecular lipid layer.

The importance of proton fluxes in plant cells was emphasized in a number of papers. Dr F. A. Smith (University of Adelaide) proposed a model to explain active anion accumulation by plant cells which involved a primary pumping of $H^+$ from the cytoplasm. He thinks that the anion uptake results from the back flow of protons down the concentration gradient. Dr U. Luttge (Botanische Institut, Techn. Hochschule, Darmstadt) also emphasized the possible importance of net proton movement across various cytoplasmic membranes influencing ionic transport at the cell surface, and indeed, Dr W. J. Vredenberg (Center for Plant Physiological Research, Wageningen) suggested that the light induced depolarization of the membrane potential in *Nitella* cells is caused by changes in cytoplasmic ion distribution. Plant and algal cells actively transport $Na^+$, and sometimes $K^+$, as emphasized in papers by Drs N. Higinbotham (Washington State University, Pullman) and J. Barber (Imperial College, London), but there still seems to be considerable doubt as to whether the mechanism can be closely identified with the well established $Na^+/K^+$ pump characterized in various animal tissues.

In a plenary lecture, Dr U. Lassens (August Krogh Institute, Copenhagen) explained the problems and artefacts which may arise when measuring membrane potentials in very small cells or organelles with microelectrodes. The main problem is the leak of current caused by the micropuncture. He has had some success with Ehrlich ascite cells and giant red blood cells from a salamander (*Amphiuma*) by using a piezoelectric electro-mechanical driven microelectrode. Using this, together with rapid recording techniques, reliable measurements have been made before the discharge of the membrane potential. With very small cells and organelles, however, he feels the problem is insurmountable and such measurements must be taken with some reservations.

BLOOD CELLS

# New Primate Antigens

from a Correspondent

IN the search for a better understanding of the immunogenetic aspects of organ transplantation it is natural that attention should turn to sub-human primates. Support for the concept that there are two closely linked strong antigenic systems controlling the fate of transplants came from the analyses of the recent workshop and symposium on transplantation genetics of primates held at the Radiobiological Institute T.N.O., Rijswijk, from September 6–21. Teams of investigators from many parts of the world spent two weeks typing the erythrocytes and leucocytes of the Rijswijk monkey colonies.

Dr A. S. Wiener (Laboratory for Experimental Medicine and Surgery in Primates, New York) and his colleagues described three chimpanzee erythrocytes systems using standard human red cell methods. Four groups studied rhesus erythrocytes and there was a measure of agreement to use the six systems described in detail by Dr P. T. Sullivan (University of Wisconsin) as the basis for further studies. Four groups studied the reactions of chimpanzee lymphocytes with chimpanzee, human, baboon and rhesus antisera. There were good correlations described between the groups for the antigen distribution on chimpanzee cells as revealed by chimpanzee isoantisera and human isoantisera (Dr H. Balner, Radiobiological Institute, Rijswijk ; Dr R. S. Metzgar and Dr H. F. Seigler, Duke University). It was agreed that it was too early to assign a Ch La nomenclature to the system but thirteen "workshop antigens" (Ch W) were described.

The rhesus lymphocyte antigens were studied by four groups both in a random population of monkeys and in sixteen families. The evidence presented by Dr G. N. Rogentine (National Institutes of Health, Bethesda), Dr C. C. Darrow (Bionetics Research Labs, Bethesda) and Dr A. D. Barnes (United Birmingham Hospitals) supported the claim of Dr H. Balner (Radiobiological Institute, Rijswijk) for an Rh La system. Three Rh La antigenic specificities were agreed and eight "workshop antigens" (Rh W) were suggested. The results of the family studies support the concept that there are two closely linked series of antigens in this species as in man and mouse but the evidence is not conclusive.