

nitrogen compounds, and this would, of course, be extremely pertinent to the vexed problem relating to the nature of the boron-nitrogen bond and in particular its degree of π -character.

Two further areas which are much neglected are those of kinetics and mechanisms on the one hand, and thermochemistry on the other. In the latter connexion, it is strange to find the boron-nitrogen bond energy in *tris*-(dimethylamino)borane quoted as 89.7 kcal/mole. The authors may refer to the discussion in T. L. Cottrell's *The Strength of Chemical Bonds* (Butterworth, London, 1958). There is no doubt that chemists working in this area will constantly require to refer to this valuable book.

M. F. LAPPERT

ON THE SURFACE

Surface Chemistry

Edited by Per Ekwall, Kjell Groth and Vera Runnström-Reio. (Proceedings of the Second Scandinavian Symposium on Surface Activity, Stockholm, November 18-19, 1964.) Pp. 315. (Copenhagen: Munksgaard, 1965.) 84 D.kr.

It is an interesting observation that in countries where great emphasis is placed on technology, research in surface chemistry is very actively pursued and well supported. In Russia, for example, much of the research carried out in physical chemistry is devoted to surface and colloid chemistry, and the Academy of Sciences has a special laboratory for this purpose. The Scandinavian countries also rate this branch of science very highly, as is evident from this volume. The Royal Swedish Academy has recently founded a laboratory for both fundamental and applied research in surface chemistry and, in addition, regular research symposia are being organized in Scandinavia.

The present volume contains the papers and discussion of the symposium on surface chemistry held in Stockholm in November 1965. The meeting was an international one and some twenty-five papers were contributed on a variety of topics. On a very broad basis they can be put into three groups. First, there are those with a technical bias, for example, some aspects of the physics of frost heave in mineral soils, mineral surfaces and rigid water layers, oppositely charged mixed collectors in flotation, chemisorption of collectors, some geopractical effects of variable surface constitution in mineral soils, surface chemistry in lubrication and adhesion. Second, there are the fundamental aspects, such as surface dilatational properties, studies of solubilization using nuclear magnetic resonance, ordered chain models for liquid-crystalline and micellar systems, phase equilibria in aqueous three-component systems of amphiphilic substances and the bonding of amines to silicates. Third, there are the biological aspects such as investigations of the solubilization of hormonal steroids, the micellar structure of bile salt solutions and the biological degradation of surfactants.

It is perhaps both the strength and at the same time the weakness of surface and colloid chemistry that it covers such a broad area of science. The fact that the answers to many technical and biological problems lie in the study of surfaces stands out very clearly from a volume such as this one. The problems are complicated, however, and a full solution will only be obtained with the vigorous pursuit of the fundamental aspects of the subject side by side with the applied. Symposia such as that recorded in this volume are clearly a means of coordinating both types of work. The discussion was both extensive and lively, a sure sign of a healthy subject. Those working in this general field will find this an interesting volume.

R. H. OTTEWILL

MOLECULAR ORIGINS

Phage and the Origins of Molecular Biology

Edited by John Cairns, Gunther S. Stent and James D. Watson. (Dedicated by the Authors to Max Delbrück on the Occasion of his Sixtieth Birthday.) Pp. 340. (Cold Spring Harbor, L.I., N.Y.: Cold Spring Harbor Laboratory of Quantitative Biology, 1966.) \$12.50.

FESTSCHRIFTS are generally a bore, and Max Delbrück, nearing his sixtieth birthday, foared the worst: an unedited collection of barely related essays, shop-worn methods and rejected papers. He could not have been more surprised and pleased by these carefully selected and styled reminiscences by some thirty of his devoted admirers and colleagues in phage genetics. It is a charming and instructive account of the oddies and currents, the personalities and places of a twenty-five year campaign that helped make the biological revolution. The account makes clearer to me Delbrück's dominant influence in this campaign to conquer the basic mechanics of phage. The zeal of the campaign made it more like a crusade. A convert from physics, Delbrück reportedly proselytized from those ranks. These new biologists brought the strategies of physics to their mission but remarkably few of the tactics. I used to feel hurt that biochemistry was such a heresy to Delbrück and his church, but we learn from this volume that chemistry in general, including structural chemistry, was also severely ignored if not scorned. When advances in chemistry of deep significance for genetics were made, however, Delbrück, like the leaders of other successful religions, incorporated this knowledge into his preaching. My only criticism of the book is its title and a persistent implication throughout that the origins of molecular biology and its explosive development are attributable largely to these and closely related studies of the phages. Has anyone heard of neurospora, coli or the red cell in the recent history of biology, and what of collagen, haemoglobin and the enzymes? Despite a plethora of books and reviews, especially on the subject of molecular biology, this collection of memoirs and insights is very much worth reading and owning.

ARTHUR KORNBERG

GENE'S PROGRESS

The Gene

A Critical History. By Elor Axel Carlson. Pp. xi + 301. (Philadelphia and London: W. B. Saunders Company, 1966.) 63s.

DR. CARLSON begins his history of the gene concept with the rediscovery, if such it was, of Mendel's theory of heredity in 1900. The arena, for such it was, is approached through Bateson, the primed and principal apostle, who saw in the exact determination of the laws of heredity a knowledge which would "probably work more change in man's outlook of the world, and in his power over nature, than any other advance in natural knowledge".

This book is of interest to students of genetics and those who are concerned with the evolution of ideas. There are many such books but few are as stimulating as this. Extensive quotations, readably incorporated into the text, are used to create dialogues between Bateson, Morgan, Castle and others who do battle as much against each other as against the ignorance they all seek to conquer. This technique immediately involves the reader, who finds himself taking sides and, so well is the atmosphere created, he forgets the wisdom of his hindsight and judges the issues on the evidence available at that time.

A means of auto-analysis is thus provided, and one sees that to be right one need not be scientific, that evidence overrides debate, and the inductive leap which