Prof. Harris's interests. One wonders whether it might not have been a better book if it had simply been called "Cell Culture" and had been limited to those chapters in which Prof. Harris deals in a magisterial fashion with subjects in which he is a specialist.

This having been said, it must be stressed that Prof. Harris sets high standards of scholarship, and it is difficult to think of a better general account of the field of animal cell culture than the relevant chapters in this book. There is therefore little doubt that the work will be a success with students and research workers in this field, and deservedly so.

HENRY HARRIS

BIOLOGICAL INSTRUMENTATION

The Experimental Basis of Modern Biology

By J. A. Ramsay. Pp. xii+337. (Cambridge: At the University Press, 1965.) 40*s*. net.

Instrumental Methods of Experimental Biology

Edited by David W. Newman. Pp. xiii+560. (New York: The Macmillan Company; London: Collier-Macmillan, Ltd., 1964.) 115*s*.

MANY of the most important recent advances in biology have resulted as much from the development and application of sophisticated physical techniques to study the behaviour of biological systems at the molecular level, as from the emergence of new theoretical concepts. These two books, which, in different but to some extent complementary ways, lay their main emphasis on experimental techniques, are therefore welcome.

As Dr. J. A. Ramsay says in his introduction, modern biology can be wildly exciting, and it is obviously vital for the subject that potential biologists should realize this at an early stage in their education. But a sense of excitement is not conspicuous in most school and university text-books, and the accounts of the latest work in the popular scientific press are often, perhaps unavoidably, over-simplified. He has therefore set out to bridge the gap by discussing critically the kind of experimental evidence on which some of our present ideas are based. He has wisely not attempted to write a comprehensive treatise on elementary cell biology, and concentrates in Part 1 on the structure of some primitive and some specialized cells, in Part 2 on the general principles involved in energy metabolism in living cells, and in Part 3 on the genetics both of micro- and of higher organisms. Part 1 begins with an admirable summary of modern methods of structural analysis, including accounts of light and electron microscopy, X-ray diffraction, and several ancillary techniques; it continues with a well-illustrated description of the cell nucleus and the cell membrane, the mechanism of cell division, and of organelles such as the mitochondrion. Description is perhaps the wrong word, since throughout the book Dr. Ramsay has successfully avoided giving the usual descriptive catalogue of dreary facts, and provides instead a lively argument concerned primarily with the nature of the experimental observations that support his statements. The subject for Part 2 is conceptually more difficult, requiring as it does an understanding of biochemical thermodynamics. However, Dr. Ramsay again achieves a both lucid and readable account, not neglecting to say enough about modern biochemical techniques to whet the appetite of any experimentally minded reader. Finally, in Part 3 he reaches the deepest water of all, and discusses the explosive advances of the past few years in the study of the mechanism of inheritance. It is hard to see how, in a relatively brief space, and not omitting to describe the experimental methods in adequate detail, he could have dealt better with this fascinating topic. This book can be very strongly recommended, not only to all would-be biologists at school and university, but also to those already established or in any way interested in biology.

The readers who will make most use of the book edited by Dr. D. W. Newman are the university students of biological subjects who wish to know more about the techniques to which such copious reference is made in the present scientific literature, and those starting research in biology who need preliminary guidance in choice of methods. The word 'preliminary' is used advisedly, since a book of this size cannot attempt to discuss at length every possible technique, and even though several important types of instrument are omitted altogether, some of the chapters are somewhat cursory in their approach. About half the book is concerned with methods of fractionating molecules of biological origin, that is with paper, thin-layer, column and gas chromatography, with zone electrophoresis and with ultracentrifugation. The rest is taken up with a more diverse collection of topics, such as freeze-drying, weighing devices, measurement of *p*H, spectroscopy from the ultra-violet to the infra-red, manometry, measurement of osmotic pressure, transducers and finally read-out devices. It is not clear what has governed the precise choice of topics. Even if one accepts that it is reasonable to omit all mention of microscopy and all but very brief reference to isotope techniques, on the grounds that there are already plenty of books about them, one can think of other obvious lacunae. In the chapter on spectroscopy, for example, flame photometry deserves more than ten lines, and the section on fluorometry could also have been expanded. When dealing with glass electrodes for measuring *p*H it seems a pity not to mention those sensitive to Na^+ and K^+ ions. Regrettably, there are no chapters on light-scattering measurements, or oxygen electrodes, or micro-calorimetry, or surface-tension measurements. However, most of the techniques which are included for discussion are handled very competently, and the book undoubtedly gives a useful guide both to the type of equipment available for various tasks and to the main limitations of the methods concerned.

R. D. KEYNES

CELL SYNCHRONIZATION

Synchrony in Cell Division and Growth

Edited by Erik Zeuthen. Pp. xi+630. (New York and London: Interscience Publishers, a Division of John Wiley and Sons, Inc., 1964.) 132*s*.

THE necessity for unravelling growth in terms of the cell cycle has long been a conviction at the back of the minds of most cell biologists; but the problem is beset with many difficulties. Few techniques are sensitive enough for single-cell investigations, while naturally synchronous cell systems which might provide an adequate bulk of tissue are seldom both typical and convenient.

The pioneer work in this field is that of Rapkine, published in 1932, on the variation in sulphydryl groups during the mitotic cycle of eggs of the sea urchin. But it was not until about ten years ago that the editor of this book himself developed the means of artificial synchronization of *Tetrahymena* which has led to such a burst of fruitful work.

Artificial synchronization techniques have now been worked out for many micro-organisms, as well as for animal cells in culture. They all involve altering the physical or chemical environment in various ways, often repeatedly. It has come to be recognized that the artificially synchronized cell is not, in every respect, normal. Nevertheless, it is a functional living system, sufficiently close to the normal for its investigation to be amply rewarding.

The ideal, of course, would be to achieve synchrony, not by imposing it forcibly on a complete random population of cells, with the consequent risk of distorting the normal sequence of events, but by separating out from the population only those cells that are of a given size