this direction is largely responsible for the great length of the book.

Besides the problems usually treated under the kinetic theory of gases there is included about fifty pages on specific heats and about sixty pages on electric and magnetic susceptibilities. These subjects are dealt with in a necessarily sketchy fashion, since they belong more properly in statistical mechanics. A most unusual feature of the book is the chapter of about one hundred pages on the subject of ionic mobilities on which the author is a distinguished authority.

Another novel feature of this book is the extensive use of the results of molecular beam experiments in discussing the basic questions of velocity distribution, low pressure and surface phenomena. There is unfortunately a serious slip on page 540, where it is stated that the magnetic deflection pattern has a maximum at a distance z_a. This maximum, as is well known, occurs at a distance more nearly equal to $(1/3)z_a$.

There are also extended changes in Chapter 5 on the "More Accurate Equation of State" and in Chapter 6 on "Transfer Phenomena" to include a treatment of molecular force fields. The changes have proved rather unfortunate, since they come at a time when the work of Massey and Mohr and of Uhlenbeck has shown that these considerations are quite inadequate and that the results of the quantum theory of collisions can not be neglected.

However, despite some defects this book remains one of the best to put into the hands of beginning students of kinetic theory.

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CYTOLOGY FOR STUDENTS

Introduction to Cytology. By L. W. SHARP. Pp. xiv + 567. McGraw-Hill Book Co. 1934.

THE third edition of Sharp's "Introduction to Cytology" maintains the high standards of the previous editions, which have made this book the leading text in its field. The subject is treated from the standpoint of cell structure and morphology, with emphasis on chromosome behavior in relation to genetics. A general description of cells and tissues is followed by several chapters on various cell constituents. A description of chromosome structure, chromosome morphology, mitosis and meiosis serves as an introduction to six chapters on the more important aspects of the new hybrid science, "Cytogenetics." These are followed by chapters on chromosomes and sex, apomixis and cytoplasmic heredity. A historical sketch of the development of cytology is presented in the last chapter, followed by an extensive bibliography.

The transfer of most of the literature citations to footnotes makes the references available without breaking up the continuity of the text. An outstanding feature of the book is the impartial treatment of controversial subjects. A good balance is maintained between facts and theories which should be stimulating without misleading the student. The emphasis on cytogenetics is in keeping with the numerous important contributions on chromosome behavior in relation to genetics, taxonomy and evolution. To students in these fields of biology, as well as to students of general cytology, Sharp's book is indispensable.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

ON THE CULTIVATION OF SEVEN SPECIES OF TRYPANOSOMES IN VITRO[1]

DURING the last five years the writer has successfully cultured the following species of trypanosomes on N.N. media.[2] One or two strains representative of each species have been maintained *in vitro* for periods of from nine months to over three years.

With some experience one can distinguish the cultural forms of certain species from the others herein reported, on the basis of their morphology and rosette formation as they appear when cultivated *in vitro* under identical conditions. Thus the individual cell, as well as rosettes of *Tr. duttoni,* differ from *Tr. americanum* and *Tr. avium.* The *Tr. americanum* in culture differs from that of *Tr. melophagium;* the former has its peculiar groupings and movements and the individual cells are relatively much larger, while *Tr. cruzi,* by virtue of its broad and slender forms, its movement and rosette formation, can also, at times, be distinguished from species mentioned above.

All species studied formed circular colonies on the slant portion of blood agar tubes. *Tr. americanum, Tr. duttoni* and *Tr. cruzi* colonized much sooner and more readily on this medium than *Tr. lewisi* or *Tr. rotatorium.* The latter species formed colonies only after several months' cultivation; however, once they commence forming colonies, afterwards they colonize readily. The colonies of *Tr. rotatorium* at times reached about 8 mm in diameter and closely resemble colonies of *B. megatherium,* while the colonies of *Tr.*

[1] From the Hygienic Laboratory, University of Michigan.

[2] F. G. Novy and W. J. MacNeal, "Contributions to Medical Research, Dedicated to Victor Clarence Vaughn," p. 549. George Wahr, Ann Arbor, Michigan, 1903.