COLLOIDAL PHENOMENA AND CLASSICAL THEORY

Colloid Chemistry. By ARTHUR W. THOMAS. McGraw-Hill Book Company, Inc., pp. 1–512, $4.00, 1934.

APPLICATIONS of classical chemical theory to the phenomena of colloidal chemistry have become increasingly numerous and successful in recent years. Professor Thomas has adopted this point of view in his "Colloid Chemistry" with marked success. The more important phenomena have been discussed in detail with complete references to the literature, but the book does not attempt to cover the entire field. "Clouds and Smokes," "Brownian Movement," "Liquid Dispersed Systems," "The Nature of Micelles" are thoroughly discussed and interpreted from the point of view of classical chemistry. Protein and carbohydrate colloids are discussed separately and Loeb's theory of the behavior of protein solutions is accepted in general. There are shorter discussions of precipitation by electrolytes, surface phenomena, absorption, foams, emulsions, gels and jellies, and also chapters on the experimental methods, such as dialysis and ultra-filtration and the preparation of colloidal solutions.

In the reviewer's opinion the experimental part is relatively too detailed, while some of the subjects, such as gels and jellies, could be expanded to advantage. The biological phenomena, such as agglutination of bacteria, the precipitin reaction and enzyme reactions are not discussed. On the whole the book furnishes a very clear introduction to the theory of colloidal reactions.

JOHN H. NORTHROP

THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH
PRINCETON, N. J.

THE PRACTICAL APPLICATIONS OF ACOUSTICS

Applied Acoustics. By OLSON AND MASSA. P. Blakiston's Son and Company. Pp. 430 + xiv, 1934.

ACOUSTICS, as one of the classical divisions of physics, has been a field of investigation for many distinguished philosophers and scientists from ancient times. The great mass of our present knowledge of the subject in its more purely scientific aspects is contained in the classical works of v. Helmholtz and Lord Rayleigh, but through the development of new instrumental means of investigation and the coordinate development and invention of other scientific apparatus during the past few decades, greater progress has been made in experimental acoustics, and in its application to our daily life, than in all previous times. This development was also facilitated through the general recognition of the close relationship between the problems of acoustics and of electrical circuits.

A number of excellent treatises have been published in the last few years which have presented these modern developments from different points of view. The book under review deals with the subject, especially with reference to its modern applications. The authors, as physicists in the laboratories of one of our larger industrial organizations interested particularly in the manufacture of acoustical equipment, have themselves made a number of notable contributions. They are therefore well qualified to give up-to-date information on the present status and trend.

The greater portion of the book is devoted to a description of the characteristics of the more important types of modern electro-acoustic transducers, such as microphones, receivers and loud speakers, and of methods for determining their performance. Emphasis is laid particularly on such instruments as have found application in radio broadcasting and talking pictures. The illustrations for these are taken mainly from the laboratories or manufacturing department of the organization with which the authors are connected.

The book limits itself to those instruments and methods which will be found useful in a modern acoustical engineering laboratory. No mention is therefore made of acoustical research methods which may have considerable historic interest but little use to-day. A chapter each is devoted to architectural acoustics and noise measurements.

The discussion within the descriptive part of the book, while entirely sound, is in a form that may be easily followed by any one familiar with the elements of mechanics and of alternating current theory. For those wishing to obtain a more thorough understanding of the principles underlying applied acoustics several chapters at the beginning of the book are devoted to fundamental classical and modern acoustical theory. For the reading of these a somewhat wider mathematical knowledge is required.

The book should be helpful to students who wish to familiarize themselves with the latest developments in applied acoustics, as well as to research workers of acoustical laboratories.

E. C. WENTE

A MANUAL OF THE RUSTS

Manual of the Rusts in United States and Canada. By JOSEPH CHARLES ARTHUR. Purdue Research Foundation, Lafayette, Indiana, pp. xv + 438, with 487 figs., 1934.

THE plant rusts with their complicated life-histories conditioned by variable spore-forms, strict parasitism and heteroecism have always been a difficult group taxonomically. The earlier and most of the later investigations have been analytic. We have

names based on separate spore-stages, host-specialization and obscure structural characters. In the present manual the author has taken the great mass of details accumulated by these numerous and varied analytic studies and has attempted to synthesize them in a manner to show new conceptions of relationship. A presentation is here available which combines the practical view-point of identification with the biological consideration of relationship and does it without much nomenclatorial disturbance. Even if the detailed results are not always acceptable the method is stimulating and the objective laudable. Botanical science is fortunate to have this notable work from the laboratories of one so eminently qualified by years of research devoted to this group of parasitic plants. Long experience and availability of a great collection are important factors in the development of such a contribution.

There are many collectors who will welcome a book which will be serviceable in the determination of species of rusts. The treatment of this group in Vol. 7 of the North American Flora (New York Botanical Garden) while entirely systematic is without notes or illustrations and is based on a classification difficult for any but the specialist to master. A book on the "Plant Rusts," by Dr. Arthur (and several collaborators) in 1929 is biologic and not systematic.

The present volume supplements these earlier works and fills a need not supplied by them. For some years there have been available systematic treatments of the Uredinales by various authors for England, Switzerland, Australia, New Zealand, South Africa and many other regions. There are also available numerous state lists (California, Indiana, Oregon, Delaware, Pennsylvania, etc.) by different authors, but this is the first workable comprehensive account for the United States and Canada. Greenland, Newfoundland, Alaska and the Aleutian Island are included.

There are several features of great biological interest. One of these is the record, even though brief, of cultures. The vast amount of such work which has been carried on by the author and his assistants can not fail to make an impression. Cultures have been a most important aid in establishing species, completing life histories and determining relationships.

The classification which the author says shows "the relationship of species and genera as consistent with the present state of knowledge as lineal arrangement permits" is also of biological interest. Two families are recognized, the Melampsoraceae and the Pucciniaceae, the first represented by four tribes and the second by three. There are in all 32 genera and 5 form-genera. Many workers who are familiar with Vol. 7 of the North American Flora will be glad to see the genera *Puccinia* and *Uromyces* reappear. Equally satisfactory is the inclusion of microcyclic and macrocyclic species, formerly referred to distinct genera by the author, in the same genus. Specific identity is maintained. This arrangement makes it possible to indicate relationships more clearly. To show relationship still further some genera are subdivided into sections rather than splitting them into separate genera, and some species are subdivided into varieties rather than separating them into species. The most novel feature to indicate relationship is what might be called the "aggregate species." This is really a group of forms, more or less distinct, considered to represent a broken ancestral species. The group is treated in the key as if it were still one species, but the nomenclature is arranged so that each component retains its identity. In this way are brought together full cycle and reduced species which are beyond doubt related. This method of grouping is carried out to the greatest extent in the genus *Puccinia*. By using a single number for these "aggregates" the author states that he has reduced the numbers for this genus in the key from 419 to 332 or approximately 26 per cent.

A desire to accept the International Rules of Nomenclature is expressed, but "two deviations" are admitted, one an exception and the other an interpretation. The case for taking these liberties is well presented. The exception is the date for the beginning of nomenclatorial priority, 1753 and not 1801 being used. It is claimed that following the rule would mean the substitution of five unfamiliar specific names for well-known names.

The interpretation has to do with the question of whether names applied in the form-genus *Uredo* are to be recognized. The rule is not clear, but the argument presented by Dr. Arthur in favor of their recognition is clear and doubtless will be convincing to many mycologists. It is very certain that according to the rules names applied to aecial stages are excluded from nomenclatorial priority and this Dr. Arthur accepts. But as to the other point the rules read that names applied to the "perfect state" must be recognized and defines the "perfect state" not as the teleutospore or its equivalent but as that which "ends in the teleutospore or its equivalent." The uredo stage is a part of the "perfect state" under such a definition, and in this work recognition is given to it.

The press work and make-up of the book are attractive. An interesting feature is a list of authors for rust species (prepared with the assistance of Dr. J. H. Barnhart). Four pages are required for this list. Many of us will be glad to have this to consult in order to know the full name of the various workers. The dates of birth, and of death for those not contemporary, are added and serve to make the list still more interesting. A short glossary is included. A

review would be incomplete without favorable reference to the illustrations, all of which have been provided by Mr. George B. Cummins, of Purdue University. Unnecessary apology is made because space does not permit the depiction of variation in the shape and size of the spores. The illustrations are well done and will be much appreciated by all users of the book.

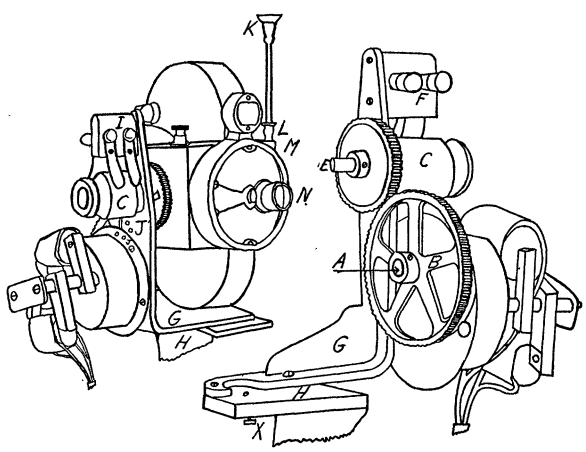
FRANK D. KERN
THE PENNSYLVANIA STATE COLLEGE

SCIENTIFIC APPARATUS AND LABORATORY METHODS

FLEXIBLE CONTROL OF SPEED AND FOCUS FOR MOTION PICTURE CAMERAS

MANY phenomena of nature that progress slowly can be studied to advantage from motion picture photographs taken at appropriate intervals of time. The film may be speeded up to a convenient duration and repeatedly shown until the process is familiar to the experimenter and his audience. Such equipment has been used for many years[1] and the chief remaining difficulties to be solved in adapting the motion picture camera for such records are a constant speed motor and a simple means of focusing the camera.

The larger double telechron motor (M-43) is light enough to be attached readily by a bracket (G) to the stand (H) supporting the camera, Figs. 1 and 2.



FIGS. 1 and 2. Telechron motor and the attachment to the stand (H) which supports the motion picture camera.

As there is practically no vibration, no special mounting is necessary when the stand is placed on a rubber kneeling pad held by bolts to the baseboard with a rubber stopper between the stand and the bolthead. A motor may be obtained with a built-in reducing gear so that the motor shaft (A, Fig. 1) will turn one revolution per minute. Suitable gears (B and D) may be interposed to give the camera drive shaft (E) any desired speed. One of the bolts holding the motor should have several positions (JJ', Fig. 2) to allow for the different distances between the shafts when the gear combinations have a different total number of teeth. These inexpensive gears may be changed easily to give the outfit the necessary flexibility which is lacking in the commercial models now on sale at prohibitive prices. A drum (C) is provided with electrical contacts (F and I) so that a magnetic shutter may be operated synchronously with the camera.

The telescope (K) of a nasal pharyngoscope[2] may be used to see the focus of the image on the film in the camera. A bracket (M) gives strength and support and a movable stop (L) holds the pharyngoscope at the proper level in the camera. The stop will also hold it above the film when it is not being used or it may be removed entirely from the camera and a stop placed in the hole to exclude light. The tube of the pharyngoscope is small enough to pass between the shutter and the film gate of the camera. This is usable only when the camera shutter is open but does save the cost of a beam-splitter.

This arrangement is especially useful when photographing small objects or making titles. When the camera is used with the lower powers of the microscope, sufficient light is passed for focusing with the aid of the pharyngoscope. With the higher powers of the microscope, there is not enough light for visual focusing in the above manner and, in that case, a beam-splitter is required. Even when the beam-splitter is used, the pharyngoscope is useful in timing the shutter and in addition, it may be used to focus the image of a watch on the corner of the film frame by means of suitable auxiliary lenses. A detailed description of the complete apparatus will be published in the near future.[3]

OSCAR W. RICHARDS
OSBORN ZOOLOGICAL LABORATORY
YALE UNIVERSITY

AN APPARATUS FOR CONSTANT DELIVERY OF EQUAL WEIGHTS OF TWO OR MORE LIQUIDS

AN apparatus which delivers several liquids at a constant rate and at the same speed for each liquid

[1] O. O. Heard, *Jour. Biol. Photog. Assoc.*, 1: 4–19, 1932; O. W. Richards, *ibid.*, 2: 39–55, 1933.

[2] This focusing device was described at the second annual meeting of the Biol. Photog. Assoc. in Rochester, September, 1933.

[3] A grant from the Bache Fund of the National Academy of Sciences made possible the construction of this apparatus, which will be described in detail in the *Jour. Biol. Photog. Assoc.*, 1934.