without altering the position of the organism or disturbing its ionic environment. The saturation of a 0.03 ml drop depletes the 3 ml of solution in the chamber by only 1 per cent. Fig. 2, curve A, shows

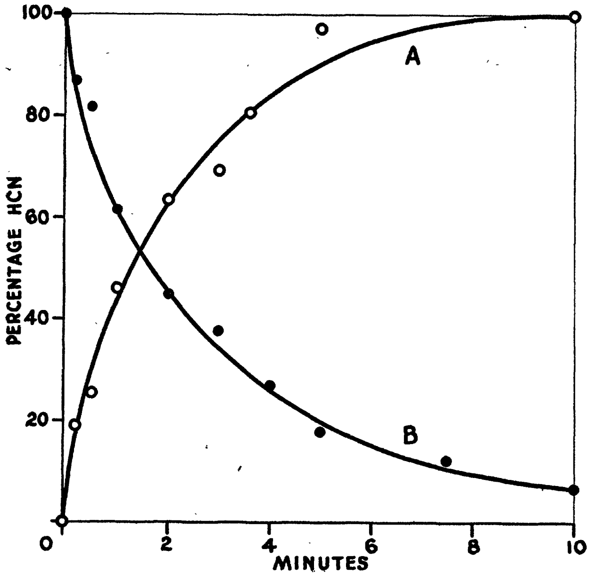

FIG. 2. Curve A. Ordinate shows the percentage saturation of a 0.03 ml hanging drop exposed to 3 ml of 0.01 M. HCN solution in the plastic chamber. Curve B. Ordinate shows the percentage of the original concentration remaining after the 0.01 M. HCN solution had been replaced by 1 per cent. KOH. Abscissas indicate time in minutes.

the rate of saturation of a drop after HCN solution is placed in the chamber. It is apparent that within 2 minutes the drop is almost two thirds saturated, and that after 5 minutes exposure to the HCN solution its concentration is almost the same as that of the larger volume of liquid. (All cyanide measurements were made by the phenolphthalin method.[2])

It is an equally simple process to watch the recovery from cyanide treatment. When the HCN solution is removed from the chamber with a pipette and replaced with a 1 per cent. KOH solution, the cyanide in the drop quickly passes into the alkali and leaves the drop in its original condition. As shown by curve B in Fig. 2, the concentration in the drop decreases 50 per cent. within 2 minutes after the replacement with KOH, and is less than one fifth of the original level in 5 minutes.

The cyanide solutions are prepared by dissolving a weighed amount of KCN in a volumetric flask, neutralizing it with dilute HCl (with a drop of phenol red as indicator), and diluting this stock solution to make the concentrations desired. Although it is theoretically preferable to make these solutions from liquid of the same pH and osmotic pressure as the medium of the hanging drop, there is actually very little difference in the HCN tension within a range of pH 6.8 to 7.4 and a salinity of 0 to 5 per cent. With sea water experiments the cyanide solutions should be prepared with sea water.

Three sample experiments suggest the possible uses of the method. (1) *Vorticella:* These protozoons placed in a hanging drop of pond water and exposed to 0.04 M. HCN were immediately stimulated and most of them became free-swimming, but in spite of the high concentration the majority of the animals were still alive after an hour. (2) *Artemia:* Brine shrimp in artificial sea water showed a marked variation in sensitivity with age, perhaps associated with the type of substrate being metabolized. Young animals were still living after an hour in 0.01 M. HCN, but older ones became inactive in 10 minutes with only 0.001 M. HCN. (3) *Ciliated Epithelium:* Cilia on sections of rat trachea suspended in buffered saline will beat for hours at room temperature. A concentration of 0.0003 M. HCN stopped most of this action in 5 minutes, but with 0.0001 M. it was only slightly slowed after half an hour. After the activity had been arrested by 0.01 M. HCN, the solution in the chamber was replaced with 1 per cent. KOH. Enough recovery occurred in 15 minutes to permit motion to start again, and by half an hour the ciliary activity appeared normal.

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SCIENTIFIC BOOKS

MINERALOGY

Dana's System of Mineralogy. By CHARLES PALACHE, HARRY BERMAN and CLIFFORD FRONDEL. Seventh Edition, Volume I, Elements, Sulfides, Sulfosalts, Oxides. New York: John Wiley and Sons, Inc., 1944. $10.00.

DANA'S System of Mineralogy is America's most important compilation of information on mineral species, and has been a reference standard for about a century. It holds a place of authority in mineralogy somewhat analogous to that of Gray's Manual in the field of botany. The last edition of the System appeared in 1892, and supplements to it were published in the form of Appendices in 1899, 1909 and 1915. Since these appeared x-ray diffraction has been developed into a new tool with which to study crystals generally, and has been intensively applied to the study of minerals. The science of mineralogy has been greatly enriched by its aid, not only in sheer

[2] W. A. Robbie, *Arch. Biochem.*, 5: 49, 1944.

weight of new data, but also in the new perspective which the study and correlation of such new data have made possible. Naturally, mineralogists have awaited eagerly a new edition of the System in which the new data and the new viewpoints would be incorporated.

This edition of Dana's System is more than just a revision. The authors have not limited themselves to adding to the old edition new data which subsequently had appeared in the literature. Rather, they regarded the opportunity of revision as a challenge to initiate a large-scale research project concerned with the investigation of any little-known or doubtful species or families of minerals. In this aspect of the "revision" they did not hesitate to enroll their colleagues. Their chief task was the critical sifting and rearranging of all the resulting old and new data. The final result was a new work, which is the old Dana only in aim and excellence. To carry out this unusual type of revision in all its aspects, the authors were aided by a grant from the Penrose Fund of the Geological Society of America.

The authors of this revision, Professor Charles Palache, the late Professor Harry Berman and Dr. Clifford Frondel, all members of Harvard's Department of Mineralogy, composed an excellent team for their project, for this combination assured a command of traditional mineralogy and crystallography together with a conversancy with the newer x-ray crystallography and its offspring, crystal chemistry. The combination has produced a work which thus bridges the old and the new in mineralogy. The mineralogical fraternity may congratulate itself that in the new Dana they thus have a bridge and not just one side or the other of a hiatus.

This volume represents the first of a series of three. It is devoted to the elements, sulfides, sulfosalts and oxides (excluding silica). The arrangement of material is chemical. Thus the species are first arranged according to the following chemical "classes": (1) Native elements; (2) Sulfides, selenides and tellurides; (3) Sulfosalts; (4) Simple oxides (exclusive of silica); (5) Oxides containing uranium, thorium and zirconium; (6) Hydroxides, and oxides containing hydroxyl; (7) Multiple oxides [such as $MgAl_2O_4$]; (8) Multiple oxides containing columbium, tantalum and titanium. These "classes" are further subdivided into "types" according to the ratio of cations to anions in the chemical formula. For example, the simple oxides are divided into the following "types": M_2O, MO, M_3O_4, M_2O_3, MO_2 (exclusive of SiO_2) and miscellaneous M_mO_n.

This scheme of classification, now familiar in its broader aspects to all American mineralogists, is an elaboration of the general chemical classification so successfully utilized in previous editions of Dana, and dating from the fifth edition by Dana and Brush, published in 1868. Dana's chemical classification was characterized by arrangement according to common anion, in contrast with the scheme whereby minerals are arranged primarily according to a common cation. The latter system, sometimes adopted because it places together all minerals containing copper, for example, is an unnatural one except for economic purposes. Its use hinders rather than helps the scientific study of minerals, since it places together minerals having no common crystallographic features. Dana's common anion classification, on the other hand, has been successful because it groups together minerals with related crystal features. In the light of the crystallochemical knowledge now available to us, we realize that this is because the packing of the larger anions determines the broader aspects of crystal structures, the smaller cations merely fitting into the interstices of the anions according to certain rules. Structures are comparatively insensitive to substitutions in the filling of interstices, and thus family resemblances occur in minerals having common anions. Dana's scheme of classification is crystallochemically sound, and thus it has stood the test of time. Almost all mineralogy books now follow it.

In common with the sixth edition of Dana, the description of each mineral species follows a certain form, but the form is longer in this edition to take account of our extended present-day horizons. The name of the species is followed by its chemical composition and a list of synonyms or names by which the mineral was formerly known. The crystallographic characteristics of the species are next listed, including its crystal system and class, together with the full Mauguin point-group symbol, axial ratio, gnomonic projection constants, a list of two-circle goniometer coordinates of known forms and cell constants derived from x-ray diffraction studies. Then follow discussions and lists of data under the headings of physical properties, optical constants, chemical composition (including representative analyses), occurrence, alterations, artificial production of the species and a brief section on the origin of the mineral name.

An important feature of the new Dana is that references are given to at least the most recent investigations of each mineral species. This enables the research mineralogist to gain an introduction to the literature of a species through its most recent contributions. In this edition of Dana the references are better arranged than in older editions, and they are annotated and interspersed with valuable critical comments by the authors.

The introductory section on crystallography is not well treated. Some thirty-odd pages are devoted to "morphological crystallography," chiefly in its computing aspects, and the rest of the science of crystallography is compressed into some four pages. This leaves much of the subject untouched. For example, a discussion of the plastic behavior of minerals, a topic now of great interest in several advancing research fronts, is missing. Certainly this section presents an ill-balanced account of the crystallographic aspects of mineralogy, and might better have been omitted than treated as it is.

The reviewer would hesitate to criticize the authors' choice of fonts for headings except for the fact that two more volumes of this work are yet to appear, and they could be made much more readable by a different selection of headings. Properly chosen, headings divide the work into coordinate and subordinate parts whose relative ranks are obvious. In this volume, however, headings of four different ranks are all printed in bold face type of approximately 10 point size. These are differentiated only by use of capitals and italics, all of which look much alike in heavy type. The reviewer suggests that in subsequent volumes of Dana's System, the authors follow the excellent style set in the 1932 edition of Dana-Ford's "Textbook," which is a condensation of the System.

These two criticisms are trivial compared with the solid virtues of the book. Nowhere else can the mineralogist find such a complete or up-to-date compilation and arrangement of mineral species data. The authors are to be congratulated on a splendid achievement and on performing a welcome service. Among other things, this volume will stand as a monument to one of the co-authors, the late Dr. Harry Berman, who lost his life in an aircraft accident while serving the Allied cause in his chosen field of mineralogy.

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FRESH-WATER SNAILS

The Molluscan Family Planorbidae. By FRANK COLLINS BAKER. (Collation, revision and additions by Harley Jones Van Cleave.) xxxvi + 530 (including 141 plates) + 1 portrait. Urbana: University of Illinois Press. 1945. $14.50.

To this taxonomic monograph, the late F. C. Baker has contributed the magnificently figured results of years of dissection and of microscopic study of radulae, in addition to photographs of the shells of most American forms and of examples of the foreign genera. On the basis of these new data, collated with those of other students, the Planorbidae of the world, after exclusion of the Bulinidae, are divided into 4 subfamilies and 34 genera: Planorbinae with 12, Segmentininae with 11, Helisomatinae with 7 and Planorbulinae with 4 genera. *Choanomphalus* (Choanomphalinae) and *Poecilospira* are considered "groups of uncertain affinities." All the divisions are defined carefully, with lists of "valid" forms and notes on distribution. Although opinions may vary in regard to the generic rank of some of these groups, their content and relationships are carefully worked out, so far as present knowledge permits. A chapter on general ecology discusses planorbids as intermediate hosts for trematodes.

A principal difficulty is that the wealth of new and compiled data, in this indispensable reference book, is indexed imperfectly, probably due to F. C. Baker's untimely death. Especially in such a thorough revision, with so many new or unfamiliar combinations, the lack of an alphabetic list of the specific and subspecific terms forces a perusal of all the book to find in what genera the forms, most of which were described in *Planorbis,* are now included. In addition, the nine new species and seventeen varieties described in part 13, and several of the names which appear in the plate explanations, are omitted from the systematic account. In this connection, the author probably meant to put *Menetus coloradoensis* (p. 230) in *Promenetus* (p. 178). Also, *Tropicorbis orbiculus dunkeri,* a "new name" (p. 494) is not included in the index to new forms but appears only in the plate index, and then under *T. obstructus.* Incidentally, the "index to text" lists seventeen "new varieties" (p. 525) but only fourteen "varieties, new" (p. 526). Misspellings are fairly infrequent, although they include fourteen species names in *Gyraulus* (pp. 66–71). But, despite these minor defaults of taxonomic desuétude, Van Cleave, with his interesting biography, careful bibliography and fine portrait, has shaped an admirable monument to an eager investigator and inspiring friend.

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