

REVIEW OF RECENT CHEMISTRY TEXTS FOR USE IN THE TEACHING OF CHEMISTRY AT THE HIGH SCHOOL LEVEL

C. W. DEWALT

Decatur, Illinois

In the consideration of recent textbooks in chemistry, I am reminded of a statement by Dr. Samuel Ralph Powers, regarding educational practices in general. He states that "practices in education are influenced by the condition of the times in which they are current and seem to represent a fusion resulting from conflict between apparent demands of an immediate and on-going social milieu and traditional procedures based upon supposed needs of the past!"¹ Examination of textbooks on the high school level reveals on one hand an obvious tendency to comply with the suggestions of modern educational procedure; on the other, a reluctance to break sharply with tradition. The observation is not intended as a criticism of publications in general, but as a statement of fact, as I see it. There is even a possibility of the condition persisting to the extent that the success of a textbook is measured in terms of volume of sale. If this is true, those attempting the production of a volume of material suitable to the needs of a course of instruction cannot be criticized too severely for an adaptation to an established practice—the manner in which work of this kind is approved, published, and accepted by the educational world.

One might be inclined to question whether or not there is cause for a certain devotion to the traditional methods of educational procedure; however, we do not have to search long to find evidence of it. Belting and Clevenger in *The High School At Work* remark . . . "though we live in a world of progress and change, tradition has spun its web around hundreds of our high schools so strongly that if one of the colonial schoolmasters could rise from his grave for a visit to them,

he would feel quite at home."² Dr. Powers in the discussion mentioned above says, "There can be no doubt that science teachers in many schools have failed to keep adequately in touch with trends in education and with the social, economic, and political developments of the dynamic society of which they as individuals and as teachers are a part. This is obvious to anyone who will take the trouble to observe it."³

Regardless of the status of science instruction, the tendency of many textbooks to follow the trends of modern educational practice should do much to correct a condition that has long been ignored by those who are subject-matter minded.

In the main, the modern approach seems to stress certain factors: namely, the education of numbers, regardless of individual differences; less formal presentation with greater adaptation to social needs; consideration of economic principles, that is, the conservation and utilization of natural resources; care of health, physical and mental; a recognition of the educational value of activity; and the organization of information into units of instruction that can be integrated with material of other courses.⁴

With these factors in mind, I should like to consider the following features:

1. Philosophy: What is the book expected to teach? How is the objective to be attained?
2. Mechanics: A. Basic organization. B. Outward appearance, dimensions, and construction. C. Size and clearness of print. Readableness of material. D. Number and quality of diagrams, photographs, and other illustrative materials.
3. Content Materials: A. Chemical principles, theories and laws. B. Discussion materials. C. Descriptive materials. D. Contributions of chemistry to science. E. Glossary of terms, tabular material, and appendices.
4. Learning Materials: A. Research activities and projects. B. Use of knowledge

¹ Powers, Samuel Ralph: "Preparations of Science Teachers to Contribute to General Education"; *School Science and Mathematics*, April, 1942, p. 315.

² Belting and Clevenger, *"The High School at Work,"* Chapter II, p. 19.

³ Powers, op. cit., p. 317.

⁴ Adapted from Powers, op. cit., pp. 316-17.

- gained. C. Development of ideas and principles. D. Topics for investigation. E. Unit recitation and tests. F. Supplementary exercises.
5. Teaching Aids: A. Films. B. Film strips. C. Slides. D. Posters. E. Displays. F. Free teaching aids.
 6. Evaluation: A. Methods for testing ability to think reflectively. B. Methods for testing ability to use the scientific method.

I should like to discuss, first, the texts of recent copyright still organized on the topical plan. In this group I have selected the following:

1. *New World of Chemistry*, by Bernard Jaffe; Silver Burdett Company, Chicago, 1941.
2. *Chemistry and Its Wonders*, by Oscar L. Brauer; American Book Company, 1938.
3. *First Principles of Chemistry*, by Brownlee, Fuller, Hancock, Sohon, and Whitsit; Allyn and Bacon, Chicago, 1940.
4. *General Elementary Chemistry*, by John C. Hogg and Charles L. Bickel; D. Van Nostrand Company, New York, 1941.

New World of Chemistry seeks to develop well informed, intelligent individuals, capable of complete adjustment to life situations. Furthermore, it seeks to impress students with the importance of science, and to create a desire for use of the scientific method. The book is attractive in design. The type is of moderate size, and clear. Diagrams, photographs, and murals are clear and abundant. They are well chosen and contribute much to a general theme, that is, the role of science in the development of civilization. Although there are a large number of chapters, the sequence is good. The language is simple and clear. Technical terms are made intelligible to the student. Chemical principles are carefully developed, and the illustrative materials are compact. At the close of chapters there is a brief list of selected readings; a summary of useful ideas developed; two groups of review questions—the second brief, but sufficiently difficult to challenge the stronger students. Also, there are suggested activities, projects and investigations. In addition to a development of chemical principles, there is direct effort to impress students with the importance of learning, and the values of the scientific approach. The work is inclusive, in that it treats the earliest developments, and also modern contributions. It suffers somewhat from traditional organization.

Chemistry And Its Wonders is intended to contribute to the general culture of the individual. An extreme effort is made to show the relation of chemistry to life. The book is attractive; however, it is

slightly cumbersome for ordinary use. The type is large, clear, and the material is very easy to read. Photographs and diagrams are numerous and appropriate, the latter being particularly illustrative. The reading material is interspersed with simple experiments to be demonstrated by the instructor. At the close of chapters and at appropriate places within chapters there are numerous review questions. The questions are designed to review scientific facts and to aid in understanding principles developed. Additional exercises for superior students, and supplementary reading lists, compensate in part for a lack of formal data. Some of the later chapters—*Chemistry and Health*, *How Chemistry Helps the Doctor*, *The Chemistry of Cooking*, *Chemistry and Transportation*, *The Chemistry of Common Things*—indicate the general purpose of the work. The book is an excellent reference, but it is scarcely adequate as a textbook for ordinary high-school work.

Elementary General Chemistry is strictly traditional chemistry. The book is plain in design, and organization. No particular philosophy is expressed by the authors. The numerous chapters close with a few questions on factual data. There is an occasional summary, and an occasional list of practice problems. At the close of the book there is an adequate list of supplementary readings; also, some review questions. Few of the questions provoke thought, nor do they test ability to use chemistry in a practical way. The book is designed to serve the needs of schools having one or two years of chemistry. I doubt if it would serve either very well.

First Principles Of Chemistry is a book that has enjoyed a wide usage. The authors were among the first to break sharply with tradition. Although the copyright lists three revisions since the 1931 edition was published, the book is sadly out of date. Compared with some recent publications, the book is not particularly attractive. It is lacking in photographs and illustrative materials. There are numerous learning exercises within chapters and at the close of chapters. Also, there are four general tests, designed to cover certain sections of the book. The summaries at the close of chapters deal with facts only. There is no provision for individual differences,

no projects are suggested, and no suggestions are made for supplementary readings. A satisfactory revision of the book is long overdue. (I understand the work is in progress.)

The second group of books considered are organized on the unit plan. I have selected the following for consideration:

1. *Modern Life Chemistry*, by Kruh, Carleton and Carpenter; J. B. Lippincott, Chicago, 1941.
2. *Chemistry and You*, by Hopkins, Davis, Smith, McGill, and Bradbury; Lyons and Carnahan, Chicago, 1939.
3. *Chemistry at Work*, by McPherson, Henderson, and Fowler; Ginn and Company, Chicago, 1938.

Modern Life Chemistry is based upon the philosophy that the individual is of prime importance. It is desired that the course of instruction will benefit the individual in a personal and social manner. The book is attractive, modern, and well organized. The diagrams and photographs are numerous, but many are not clear. The careless design of many diagrams constitutes a serious defect, in an otherwise very creditable publication. Numerous charts and tables have been used to good advantage. The book consists of eleven units; a number of discussions concerning contributions of modern chemistry; an appendix of useful materials; and a long list of supplementary references. Five of the units in the earlier part of the book deal with the fundamentals of chemistry. Six units in the latter part of the book deal with chemistry as it is used in a practical way. Each unit is organized about a basic idea, or principle. The units are broken down into specific contributory problems. All units and all problems have a definite assignment. Following the problem assignment is a presentation of subject matter and a list of summary exercises for all students. At the close of the units there are optional exercises, problems, and topics for investigation. Also, a unit recitation and test dealing with topics for oral or written recitation. The theory of the book is that knowledge alone is insufficient; the student must be trained to use the scientific method. The materials and organization of the book are well adapted to this end.

Chemistry And You is based upon the theory that individuals are constantly confronted with new problems. For this reason the students should learn to solve problems as they appear. In order that they may be able to do so, they must

learn to use the scientific method. The learning materials are adapted to this end. This is an attractive book. The print is small, however clear; the diagrams are not numerous, but they are adequate, and clear in design; photographs are few in number, but good. There are sixteen units in the book. The units are developed about fundamental principles and generalizations. Units open with a preliminary discussion. Major problems are suggested by means of specific questions. At the close of the assimilative material bearing on the problems, two or three appropriate readings are suggested. Also, there are suggestions for the application and use of chemistry. Research activities are given to stimulate continued study. At the close of the unit a comprehensive summarizing test is provided. It is followed by a discussion review. Attention is focused upon economic principles, through extensive units dealing with health, natural resources, and metals. An extensive list of supplementary readings is provided in the preface of the text. The content materials are well adjusted to the development of problem solving abilities.

Chemistry At Work is intended to teach students that science is the result of careful observation and experimentation; careful formulation of theories and laws; and that the body of knowledge is constantly growing. Furthermore, it is suggested that the material should be interesting, and as practical as possible. The book is attractive, and of good construction. While slightly larger than the average book, the dimensions are not objectionable. The print is of moderate size, and clear. The material is easy to read. Diagrams and photographs are numerous and generally good. The fourteen units in *Chemistry At Work* are broken down into chapters. Chapters are headed by a preliminary discussion. At the close there is a summary in question form. Also, numerous thought questions and optional exercises are provided. At the close of units an extensive list of supplementary exercises is given. Apparently, the authors do not feel that the student is of first importance. Contents of the book reveal a considerable respect for science as an end in itself.

Conclusions.—Practically all of the books mentioned are written on a secondary level and may be adjusted to the

needs of the average student. In most cases there is an increasing tendency to stress individual and social needs as well as factual data.

Three of the books: *Modern Life Chemistry*, *New World Of Chemistry*, and *Chemistry And You*, provide an abundance of learning materials, thus indicating a profound belief in the educational value of activity.

None of the books make suggestions concerning visual aids in the form of films, film strips, slides, posters, and free teaching aids.

No provision is made to evaluate progress made in the effort to employ reflective thinking, or to learn the use of the scientific method. There is urgent need for means and methods of measuring progress.

Often the teacher is reminded that instruction is of little value unless it becomes functional. In reply, the instructor asks, "How can it be made functional?" It is my sincere belief that the authors of *Modern Life Chemistry*, *New World Of Chemistry*, and *Chemistry And You* have done much to answer the question.
