Not least important is the very elaborate and critical bibliography, which is arranged by chapter, at the end of the book; this bibliography is one of the most complete guides to the literature of historical chemistry available. The appendices—on the discovery of elements and isotopes, radioactive decay series, and Nobel prize winners in chemistry, physics, and medicine—will be of great value for reference purposes. The book occupies a distinctive place among histories of chemistry and will long be valuable to a wide variety of users.

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A Stocktaking Summary

Science, Technology, and Human Values. A. Cornelius Benjamin. University of Missouri Press, Columbia, 1965. x + 296 pp. $7.

Science, warns the author, "has become a dangerous word—dangerous in the sense of leading to confusion in thinking and producing misleading associations. . . . When anything calls itself science, beware!" In this volume A. Cornelius Benjamin, professor of philosophy at the University of Missouri, seeks to resolve the blur of meanings surrounding "science" in the contemporary world.

Benjamin has produced a comprehensive and competent handbook summarizing all the important literature concerning the method, logic, and metaphysics of science. He sees science as a "value response to the world" that has "much in common with art, religion, morality, politics, work, and play." Science classifies, associates, and orders symbols that refer to things in the natural environment; through measurement it seeks to give exactness to its descriptions.

Science must also rise above mere description by the process of "creative insight." The act of imagination, like that which gives rise to art and religion, enables science to transcend induction and begin to get to the heart of things. Brute facts are brought together "under an unifying conception" and "mysterious happenings yield to rational interpretation." Prediction and control of the natural environment is increased as hypotheses are refined in the face of empirical observation to reach a greater approximation of the verifiable reality: "an explanatory science includes the descriptive science out of which it arose and also statements about theoretical entities, statements about predicted facts, and either the fact so predicted or alternate facts which make their existence impossible." The "explanatory" power of science derives from the great constructs which are essentially artifices of the mind tested for success and refined through manipulation of the natural environment.

If this volume is considered as a stocktaking summary, Benjamin accomplishes his aim, and in so doing makes some wise and clarifying statements. But he leans a bit too complacently on the alleged solidity, reason, and benevolence of science. His distinction between the "pseudofact" of superstition and the "real fact" of science is too pat, as are his assertions concerning technology as the fruit of science, which fail to give emphasis to the converse relationship.

The scientist would perhaps be better occupied "doing science" rather than philosophizing about it; but, for those who desire greater understanding of the nature of his activity and its relationship to other social functions, Benjamin makes a useful contribution.

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Organic Chemistry

Newer Methods of Preparative Organic Chemistry. vol. 3. Wilhelm Foerst, Ed. Translated from the German (Weinheim, 1961) by Henry Birnbaum. Academic Press, New York, 1964. xiv + 544 pp. Illus. $16.

This translation, the third volume of a series, presents 11 reviews selected from among those published in *Angewandte Chemie*. The articles, which cover diverse and useful preparative methods in organic chemistry including examples of experimental details, are authoritatively written and aptly translated, but the literature coverage extends only to 1959 or 1960. The value of the series to the researcher could be increased manyfold by appendices covering the more recent literature. For example, the expertly written chapter (by Schoellkopf) on the Wittig reaction is now supplanted by a more recent and comprehensive review published in *Organic Reactions* (vol. 14).

The first chapter, on reactions of sulfur with organic compounds, is excellent. It includes not only the interesting Willgerodt reaction but some useful applications to heterocyclic compounds and many references to the author's own work and to other work found only in reports and patent literature.

Heterocyclic chemistry is discussed in at least four chapters that cover substitution in the pyridine ring, an area in which the lack of recent literature is being felt: syntheses of aromatic compounds from pyrylium salts; the acyllactone rearrangement which describes largely Korte's work of conversion of α-acyl lactones, thiolactones, or lactams by ring opening and reclosure into furan, pyran, thiophene, or pyrroline derivatives; and the extensive work by Bredereck and his co-workers on syntheses of purines, pyrimidines, imidazoles, and oxazoles by the use of formamide and other amides.

The biochemically interesting topic of synthesis of phosphoric acid esters, amides, and anhydrides is discussed in a brief chapter, but references to work published after 1960 would have been welcome. Other reviews treat the preparative use of chloramine in organic chemistry; reactions of *N*-bromosuccinimide with olefins, alcohols, ethers, amines, heterocyclics, and carbonyl compounds; the chemistry of diazoketones leading to syntheses of a large variety of functional groups (an excellent chapter by Weygand and Bestmann); and the formation of the acetylenic bond.

It is regrettable that the table of contents for each chapter was shortened drastically and that the references were placed at the end of each chapter rather than as footnotes in the text (as they were in the original German edition).

Although it is very questionable whether it is necessary to compile and publish in book form review articles from journals, *Newer Methods* remains a valuable aid to the organic chemist in his efforts in organic syntheses as well as in stimulating new approaches to various subjects discussed.

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