Asymmetry, and Chirality" (6 pp.), in which these three sometimes confused concepts are carefully distinguished; "The Specification of Molecular Configuration" (7 pp.); "The Search for Chiral Centers Other Than Carbon" (13 pp.). (Although most of the book deals with organic compounds, this chapter considers trivalent and "pentavalent" nitrogen and other heteroatoms); "The Stereochemistry of Trivalent Carbon Species" (6 pp.), dealing with carbonium ions, carbon "free radicals," and carbanions; "Rotational 'Barriers' about Single Bonds and Steric Effects" (11 pp.); "The Stereochemistry of Cyclic Compounds: The Early History" (18 pp.); "The Origins and Development of Conformational Analysis" (17 pp.), including both acyclic and cyclic compounds; "Asymmetric Transformations" (8 pp.); and "Some Recent Developments and Future Expectations" (24 pp.), including work on chemical "curiosities" such as cyclophanes, betweenanene, tetrahedrane, barrelene, propellanes, bullvalene, catenanes, carbenium ions, etc. as well as biological stereochemistry.

As the chapter headings show, the volume gives an excellent survey of the progress of stereochemistry from its inception to the 1960s. It is a gold mine of facts, both well known and little known. Intended not for the professional historian but for "the chemist, the research worker and the nonspecialist who wishes to bring himself up to date on the historical background," it does not include references, but names of scientists and dates of their discoveries are given in the text as well as in a "Chronology of Events and Publications in the History of Stereochemistry." An important feature of the book is the inclusion of a large number of photographs and diagrams of historic atomic and molecular models by Dalton, Hofmann, Kekulé, Dewar, Körner, von Baeyer Paternó, Emil Fischer, and others. A most delightful and unusual appendix (9 pp.) is provided on "Stereochemical Satire," and a 4-page list of supplementary readings, a 5-page glossary, and subject (4 pp.) and name (4 pp.) indices are included. Errors in the book are virtually nonexistent; the few that I found range from venial (Ernest Mohr for Ernst Mohr, p. 167) to mortal (G. G. Kauffman for G. B. Kauffman, p. 248). This volume is highly recommended, and chemical educators will find it not only a fascinating story but also a source of valuable material for classroom use.

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Transmutation: Natural and Artificial

Thaddeus J. Trenn, Nobel Prize Topics in Chemistry, Heyden & Son, Ltd., Philadelphia, PA, 1981. xvi + 128 pp. Figures. 14.5 × 22 cm. $29.00 HB and $13.50 PB.

This slim volume is the third in Heyden's Nobel Prize Topics in Chemistry, a "Series of Historical Monographs on Fundamentals of Chemistry," edited by Johannes W. van Spronsen (The first and second volumes—"Inorganic Coordination Compounds," by George B. Kauffman, and "Stereochemistry," by O. Bertrand Ramsay—are reviewed separately. The "Stereochemistry" review contains information about the goal and scope of the series).

Trenn's book, which begins with a foreword by Glenn T. Seaborg, himself a Nobel Laureate in Chemistry (1951), is a unique blend of the old and the new. Believing that "the speculation surrounding the transmutation of matter seems quite unrivalled in the entire history of science," Trenn surveys his chosen theme from "the alchemical tradition dating back over two thousand years" to the latest developments in nuclear technology such as the fusion power toroid reactor, which he views as the modern version of the worm of Ouroboros—the tail-devouring serpent, a key alchemical symbol of the unity of matter. He pursues this unusual and provocative juxtaposition of the ancient and the modern consistently throughout the book, and he finds interesting parallels between central concepts of the ancient hermetic art and modern discoveries of nuclear chemistry and physics. For example, he sees natural and artificial transmutations as fulfillments of alchemical prophecies with subatomic particles functioning both as *prima materia* and as the philosophers' stone. And although modern nuclear "alchemists" have succeeded at tremendous cost in transmuting other elements, e.g., mercury and bismuth, into gold, Trenn, like Frederick Soddy before him, regards the true "gold" of such transformations not as the noble metal itself but as the tremendous amount of energy released during such changes.

In Chapter 1 (30 pp.), which is alliteratively titled "Adepts, Awards, and Achievements" ("adept" being the classical title of alchemists who had attained the secret of transmutation), Trenn prefaces the three publications by the Nobel Laureates with a 7-page "Biographical Introduction." The publications themselves are all the products of teamwork—"Radioactive Change" by Ernest Rutherford and Frederick Soddy (theory of atomic disintegration, 1903); "A New Type of Radioactivity" by Irene Curie and Frédéric Joliot (discovery of artificial radioactivity, 1934); and "Concerning the Existence and Behavior of Alkaline Earth Metals Resulting from Neutron Irradiation of Uranium by Otto Hahn and Fritz Strassmann (discovery of nuclear fission, 1939). Rutherford received the Nobel Prize in Chemistry in 1908, Soddy in 1921, Joliot and Joliot-Curie in 1935, and Hahn and Strassmann, together with Lise Meitner, in 1944.

Chapters 2 and 3 survey the progress of alchemy "From Antiquity to Paracelsus" (14 pp.) and "From Paracelsus to Late Nineteenth Century" (12 pp.), respectively. Chapter 4, "Transmutation in the Twentieth Century," the longest in the book (40 pp.), is divided into five sections—"Natural Transmutation: 1896–1905;" "Artificial Transmutation: 1906–1919;" "Artificial Radioactivity: 1920–1935;" "Discovery of Fission: 1936–1940;" and "Controlled Transmutation: 1941–1981." Each of these sections is provided with an Introduction and Conclusion which link the events to ancient alchemical concepts. Chapter 5, "Future Expectations" (12 pp.), deals with recent attempts to put transmutation "on line" to produce energy, "the new gold." Among the topics discussed are fissile and fertile fuel, the thorium cycle, breeder, fusion, and hybrid reactors, plutonium, waste, and conservation. Trenn also clearly differentiates the reactor mode from the bomb mode of transmutation. To meet our increasing need for energy Trenn views controlled transmutation as "the only viable option for the coming generation or two." He thinks that fusion power is the ultimate power source, but until it can be achieved economically, he favors global use of fission power. The text concludes with a 2-page epilogue, Chapter 6, "Reflections on Transmutation."

Since the volume is not intended for the professional historian but for "the chemist, the researcher worker and the nonspecialist," the number of references is minimal (16), but appendices provide a 3-page chronology, "Some Historical Data on Transmutation," a 3-page "Glossary" (defining technical terms in the text which are marked with asterisks), and a 3-page list of "Suggested Reading." Subject (6 pp.) and name (2 pp.) indices conclude the volume. The few errors are minor misspellings ("corpuscle" on p. 58 and Strassmann on p. 118). This scholarly but readable book provides an excellent introduction to both alchemy and nuclear chemistry, while it simultaneously underscores the generally neglected relationship between the two.

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Total Synthesis of Natural Products: The 'Chiron' Approach

Stephen Hanessian, Pergamon Press, Elmsford, NY, 1983. xviii + 291 pp. Figures. $20.00 PB and $40.00 HB.

This book is a detailed study of the use of carbohydrate derivatives as chiral starting materials for the synthesis of chiral natural products. It is a highly specialized book, intended for use by professional synthetic organic chemists and advanced graduate students. A "chiron" (contraction of "chiral synthon") is explained to be an enantiomerically pure "synthon," generally obtained from an amino acid, a terpene, or a carbohydrate. The book's title is somewhat misleading, because its thorough coverage is limited to the use of carbohydrates.

"The 'Chiron' Approach" begins with a brief section on strategy, reviewing the types of chiral precursors and explaining how to find carbohydrate-type symmetry in natural products that do not superficially resemble carbohydrates. The rest of the book reviews over 100 natural product syntheses that exploit the stereochemistry present in carbohydrates. The brief discussions of synthetic strategy are accompanied by retrosynthetic flow charts and the actual syntheses with reagents. A brief description of the author's computer-assisted synthesis program completes the book. An excellent Index references the names of the natural products synthesized, those used as synthetic precursors, and the types of reactions and reagents used.

This book might be criticized for its lack of coverage of noncarbohydrate "chirons" and for its heavy emphasis on the author's own work. On the other hand, Hanessian has covered his own specific area of interest and expertise in an authoritative, current, and