

Science of Synthesis, Volume 10. Edited by E. J. Thomas, Thieme: Stuttgart, 2000, 916 pp, DM 3300 (RoW), US\$ 1740 (US), hard cover. ISBN 3 13 112241 2 (RoW); 0-86577-949-X (US).

Researchers in the pharmaceutical, agrochemical, and materials sciences are under increasing pressure to identify, optimize, and develop innovative agents with tailored activities and properties that meet various pressing socioeconomic and health-related demands. The breathtaking pace of research in chemistry brought about by recent advances in analytics, such as high through-put screening, and chemical synthesis, such as combinatorial chemistry, has resulted in both additional well-springs for discovery as well as placed greater pressure on the synthetic chemists. Consequently, there has been an explosive interest in reaction methods that provide access to novel versatile structures, especially when these constitute basic scaffolding for the preparation of compound libraries. In this regard, the dominance of heterocycles and, in particular heteroaromatics, in a wide range of fundamental structures of commercial importance is widely appreciated. The increased appetite for a structural and reaction database is satiated by the timely, welcomed appearance of Houben Wyl's *Science of Synthesis* with Vol 10, *Hetarenes and Related Ring Systems*, as the first installment in what promises to be a superb, valuable series for researchers across the numerous disciplines that constitute the modern chemical sciences.

It is a truism that the availability of various electronic data bases in the sciences have brought about a revolution in the laboratory with an enormous volume of information available, literally, at one's fingertips. What then can Volume 10, or a series such as *Science of Synthesis* have to offer to the chemist? Examination of the book makes it abundantly clear that Volume 10 of *Science of Synthesis* goes well beyond being just a database, as it presents in a clear, succinct, well-organized manner an authoritative, erudite collection of methods for the preparation of hetarenes and related ring systems. One is immediately impressed with the extensive up-to-date citations that extend well into 1998. Moreover, the tome embodies the high standards in presentation and scientific organization that the community has come to expect from its publishers Thieme. Although it is stated that at the outset that the compilation is not meant to be exhaustive, as over a century of heterocyclic chemistry has made it impossible to do so, it is certainly comprehensive and extensive in its coverage of multifarious approaches to various hetarenes. It is impressive in its inclusion of not only classic hetarenes syntheses but also the latest methods, such as those utilizing organo transition-metal reagents, and synthesis of immobilized, polymer bound structures. As such it provides a valuable compendium of heteroaromatic chemistry organized in a scholarly fashion that cannot be found in the best of electronic data bases.

The generalized overall organization of the book follows the heteroatomic sequence O, S, Se, Te, N, and P. For each heteroatom the volume is partitioned into chapters according to product class, which form the basis of the primary organizational breakdown of the book. Within this overall hierarchy, the volume is divided into twenty chapters, accordingly referred to as product classes, on the basis of hetarene structural types. The 20 product classes include: benzo[b] furans, benzo[c]furans, dibenzofurans, benzo[b]thiophenes, benzo[c]thiophenes, dibenzothiophenes, benzo[b]selenophenes, benzo[c]selenophenes, dibenzoselenophenes, benzo[b]tellurophenes, benzo[c]tellurophenes, dibenzotellurophenes, indole and its derivatives, 1*H*- and 2*H*-isoindoles, carbazoles, indolizines, benzophospholes, benzo[c]phospholes, dibenzophospholes, and phosphorus analogs of indolizines. The abundance of structural variants within certain product classes demands further breakdown into subclasses. Thus, for example, indoles (Product Class 10.13) are further subclassified into 1-hydroxy-1*H*-indoles, oxindoles, and indoxyls. What is particularly attractive of the volume is the next level of organization in which further categorization is effected according to the synthetic strategy used for the preparation of the hetarene. Thus, for example, within the subclasses for the largest product class, namely indoles, the next level of organization is: ring-closure, ring transformation, aromatization, substitution of existing substituents, and substituent modification. Within each of these strategic categories a further subdivision is found; thus, the category "synthesis by ring-closure" includes "by annulation to an arene," and "by annulation to a pyrrole." Each of these sections incorporate subheadings according to the specific bond formed, for example under "annulation to an arene" can be found "by formation of one N-C and one C-C bond," "by formation of one C-N bond," and "by formation of one C-C bond." A further layering within each of these sections occurs on the basis of the specific bonds made (i.e., within "by formation of one C-N bond" occur "with formation of the 1-2 bond," and "with formation of the 1-7a bond"). At this level of the hierarchical organization one arrives at a core feature, namely categorization by methodology employed. For example, the various methods found within the section "by formation of the 1-7a bond" provide an illustration of the wealth of information that is to be found: "method 1, from aryl hydrazones; Fischer synthesis; method 2, from O-alkenyl-*N*-arylhydroxylamines; method 3, from ortho-substituted nitroarenes; Bartoli synthesis; method 4, from arylamines and alkylsulfanylmethyl ketones, Gassman indole synthesis; method 5, from aryl amines and ketones; method 6, from arylamines and 1,2-diols; method 7, from arylamines and α -halo ketones, Bischler synthesis; method 8, from *o*-iodoaryl amines and alkynes; method 9, from *N*-acyl-*o*-bromoaryl amines and α -halo ketones; method 10, from ortho-thallated *N*-acyl-aryl amines and 3-chloroprop-1-ene; method 11, from *N*-alkyl-*N*-arylhydroxylamines and alkynes carrying electron withdrawing groups; method 12, from *N*-sulfinylaryl amines and Grignard reagents; and method 13, from

N-arylarenesulfonamides and phenyl(propynyl)iodonium triflate. The discussion of each method contains a valuable compilation of relevant information necessary for the interested practitioner to evaluate the approach in detail. This includes background, representative examples, reaction schemes, and importantly, detailed experimental procedure. Where necessary, following a method, the final organizational level can be found, namely, variations. These provide an additional level of resolution and furnish further information, as these are categorized according to specific starting materials or reagents that are utilized to effect the given method. It is particularly noteworthy, that although the volume makes no claim to being exhaustive in its coverage, the inclusion of useful and reliable methods and accompanying variants is certainly thorough and expansive. The attention to detail is evident in every feature of the volume; even descriptive sections are devoted to the discussion of safety aspects of reagents, compounds, and reactions. It is also noteworthy that nomenclature and mechanistic details are amply discussed.

In summary, Volume 10 in the *Science of Synthesis* series provides a treasured database with a level of organization that will make a welcome addition to the field. It will be indispensable to any serious modern practitioner of chemical synthesis in industrial and academic institutions in the varied disciplines of chemical sciences. The tome should be invaluable to discovery, medicinal, and process chemists alike, providing a wealth of information and data in conveniently accessed form.

Erick M. Carreira, Zürich, Switzerland

Article Identifier:

1437-210X,E,2001,0,04,0669,0670,ftx,en;B10401SS