

developments in mass spectroscopy and in solution by the advent of superacidic media. One might quarrel with the author about his choice of topics, but very few will fault him for omitting the subject of nonclassical carbonium ions.

The concept of free radicals dates back to the first half of the 19th century and gave birth in the investigations of Bunsen and Frankland to the field of organometallic chemistry and in those of Kolbe to organic electrochemistry. Gomberg's discovery of the triaryl-methyl radicals and Paneth's pioneering work with free radicals in the gas phase put radical chemistry on a firm footing, and it has been an important aspect of organic chemistry ever since. Leonard Kaplan's chapter on free radicals makes instructive and entertaining reading as he leads us past the pitfalls that await the unwary. Examples of fuzzy thinking, of faulty technique, and of jumping to conclusions are held up to the light during discussions of the structure, energetics, and spectroscopy of free radicals, the experimental techniques used to study them, their generation and trapping, and their reactions. The chapter is one every organic graduate student should read.

The following chapter on nitrenes by Walter Lwowski is more standard fare, being simply an updating of nitrene chemistry from the time of the author's 1970 monograph on the subject. It touches all bases—the various types of nitrenes, their generation, and their reactions—and eschews controversy. Peter P. Gaspar too is an old hand at reviewing his subject, divalent silicon species, the silylenes, which are covered in the next chapter, and he does it well. During the past half-dozen or so years, progress in the study of reactive intermediates and hyper-reactive molecules has been fast and furious, and Gaspar has much to report. Most of those active in the field, this reviewer included, have been skimming off the cream, not analyzing the milk. Mechanistic problems abound and are discussed in detail by the author. In a sense, the field is young and many "mechanisms" have as their experimental basis only the identity of the products that were isolated. The state of our knowledge of mechanism is summarized nicely by Gaspar in his concluding section, and it is clear that much remains to be done. The chapter might well have included the other major facet of reactive silicon intermediate chemistry—the unsaturated silicon species with Si=C, Si=O, Si=Si, Si=N, and Si=S formal double bonds. These are very new on the scene, and their discovery has added a new and exciting dimension to organ-

osilicon chemistry. Also missing from the chapter are the divalent germanium and tin intermediates, the germylenes and stannylenes. The former include transient species such as $(\text{CH}_3)_2\text{Ge}$ as well as isolable compounds such as GeI_2 . Their chemistry has been developed chiefly in France, by J. Satgé and his co-workers, and in the Soviet Union, by the research groups of V. F. Mironov and O. M. Nefedov. In terms of preparative applicability and breadth, the chemistry of the germylenes at the present time is richer than that of the silylenes.

The final chapter in the book, by K. N. Houk, deals with the theory of reaction intermediates and reaction mechanisms. It covers a large diversity of topics and discusses critically the recent developments in computational organic chemistry.

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