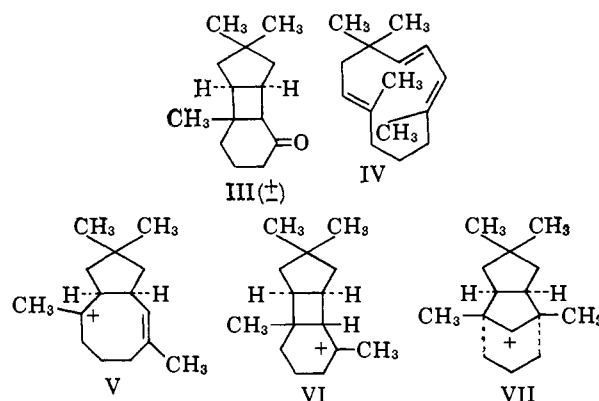


40% aqueous sulfuric acid at 0 to -5° for 15 min., and further at 25° for 2 hr., gave synthetic α -caryophyllene alcohol (approximately 50% yield), m.p. $118-118.5^{\circ}$, undepressed upon admixture with authentic material.⁸ *Anal.* Found: C, 81.14; H, 11.77. The n.m.r. and infrared spectra of the synthetic and naturally derived α -caryophyllene alcohol were identical. The former showed peaks due to methyl groups at 0.82 p.p.m. (two CH_3), 0.90 p.p.m. (one CH_3), and 1.03 p.p.m. (one CH_3).

An especially simple mechanistic explanation for the formation of II from humulene by an acid-catalyzed process involves prototropic rearrangement of humulene to the isomeric conjugated triene IV and protonation of IV with subsequent formation of the carbonium ions V, VI, and VII. On the basis of this hypothesis, it is to be expected that the tertiary alcohol obtained by methylation of the ketone III would give rise to α -

(8) We are indebted to Drs. A. Nickon and J. B. DiGiorgio for providing an authentic sample of naturally derived α -caryophyllene alcohol.



caryophyllene alcohol under acidic conditions, as is indeed the case.⁹

(9) This work was supported by the National Science Foundation, Grant GP-221.

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RECEIVED MARCH 13, 1964

BOOK REVIEWS

Techniques in Protein Chemistry. By J. LEGGETT BAILEY. American Elsevier Publishing Company, Inc., 52 Vanderbilt Ave., New York, N. Y. 1963. 310 pp. 21.5×14 cm. Price, \$11.66.

A volume of this type seems primarily designed as a textbook for students and research workers concerned with modern techniques for the analysis of protein composition and purity. It covers most of the standard techniques such as paper and column chromatography, electrophoresis, and ion exchange for amino acids and peptides. Techniques such as dialysis and gel filtration, column chromatography, and zone electrophoresis of proteins are also described. Dr. Leggett Bailey includes extensive discussions of reactions used to study the composition of proteins. There are sections dealing with disulfide bonds and selective cleavages of peptides in a framework of sequence determinations. The over-all subject matter is extremely well presented.

I do have some criticism regarding the scope and organization of the book. It is somewhat distressing that a chapter on thin layer chromatography is absent. In addition, since the author stresses techniques in a rather random fashion, it is difficult to follow a logical sequence from the isolation through the analysis of a given protein. Lastly, the title of the work seems too broad. Certainly, ultracentrifugation, X-ray diffraction, light scattering, rotatory dispersion, and salt precipitation are important techniques in protein chemistry which are not included. Perhaps the book should have been called "Chromatography and Sequence Determination in Protein Chemistry." Within these two general areas the book should prove to be a valuable source since it describes the techniques from an experimental point of view.

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Polyanions et Polycations. By P. SOUCHAY, Professeur a la Faculte des Sciences de Paris. Gauthier-Villars, 55 quai des Grands-Augustins, Paris (VI^e), France. 1963. 247 pp. 16.5×25 cm. Price, 42 F.

Interest in the constitution and behavior of the polyions is in no sense a recent development. The interaction of phosphates with molybdates was indeed observed by Berzelius as early as 1826. It remained, however, for chemists of the modern era to

demonstrate the great generality of the phenomenon of condensation in solution brought about by acidification. The nature of the condensed ionic species in solution is sometimes very difficult to establish with certainty, as the conversion of one form to another may be so slow that true equilibrium is rare even at high temperatures. The newer techniques developed for the study of complex ion equilibria have nonetheless been brought to bear on the problem with fruitful results. Together with X-ray analysis, they have been able to elucidate the structures of many of these remarkably complex inorganic compounds.

In the nine chapters of this book, Professor Souchay has summarized the present knowledge on the structure, behavior, and uses of substances consisting of polycations, isopolyanions, or heteropolyanions. He writes with authority, as one who has contributed to the development of the subject and has observed the work of others with the discernment and perspective that are indispensable to a useful assessment of its value.

In the introductory chapter, the different kinds of polycations and polyanions and the methods by which they are formed are described. Reactions initiated by acidification, dehydration, deamination, and solvolysis are likewise discussed. The isopolyanions formed by polymerization of simple chromates, phosphates, vanadates, silicates, and tungstates are perhaps most familiar to the reader. Chapter 2 is devoted to a discussion of these systems together with the corresponding acids. A brief but rewarding description of the composition of borate solutions is included. A separate chapter, Chapter 7, deals in detail with the polyanions of phosphorus.

Chapter 3 is devoted to heteropolyanions, especially those containing tungsten and molybdenum, which are among the most important and typical of this class. Chapters 4 and 5 describe in some detail the methods that have been used for the study of polyanions in solution and in the solid phase. These include spectrophotometry, polarography, kinetics, cryoscopy, potentiometry, differential thermal analysis, and X-ray methods. Compounds related to the polyanions, for example, peracids and persalts and derivatives containing sulfur and fluorine, are described in Chapter 6.

As polyanions are often formed by the action of a strong mineral acid on certain anions, similarly polycations are formed by the action of hydroxide ion on certain simple cations. The methods of studying these condensed cations, described in Chapter 8, are analogous to those used in the investigation of polyanions. The application of sedimentation and light scattering methods is dis-