

method, the following compounds are *normal* or *allo* systems; yohimbine, yohimbone, yohimbane, β -yohimbine, corynanthine, alloyohimbine, rauwolsine, 11-methoxyalloyohimbane and its racemate, methyl isoreserpate, corynantheine, ajmalicine, and tetrahydroalstonine,⁶ while the succeeding substances: reserpine, rescinnamine, deserpidine, methyl reserpate, 3-epi- α -yohimbine, ψ -yohimbine, and ψ -yohimbane,⁷ m.p. 96–97° (found: C, 81.32; H, 8.57; N, 9.59), prepared by a zinc-acetic acid reduction⁴ of 3-dehydroyohimbane,³ belong to the *pseudo* or *epiallo* series. The configurational assignment of these twenty compounds is in complete accord with their previously designated stereochemistry.^{2,8}

Infrared analysis suggests that the formerly proposed *pseudo* structure for serpine⁹ and *epiallo* formula for methyl 18-desoxydeserpidate¹⁰ require reassignment into the *normal* or *allo* series.

(6) Catalytic hydrogenation or sodium borohydride reduction of 3-dehydro or ring C tetrahydro compounds, e.g., alstonine, yields only *normal* or *allo* products (as yet unpublished observations in this laboratory and cf. ref. 3 and references contained therein).

(7) The preparation of this compound not only makes available the fourth and last, till now unknown, isomer of yohimbane, but also constitutes a total synthesis of the same in view of its derivation from yohimbane and the formation of the latter from totally synthetic yohimbone [G. A. Swan, *J. Chem. Soc.*, 1534 (1950); J. Jost, *Helv. Chim. Acta*, **32**, 1301 (1949)].

(8) (a) C. F. Huebner, M. E. Kuehne, B. Korzun, and E. Schlittler, *Experientia*, **12**, 249 (1956) and preceding papers; (b) E. E. van Tamelen, P. E. Aldrich, and T. J. Katz, *Chemistry and Industry*, 793 (1956).

(9) A. Chatterjee and S. Bose, *Experientia*, **10**, 246 (1954). The authors are most grateful to Dr. Hochstein for informing them of the fact that serpine is a mixture of yohimbine and rauwolsine (F. A. Hochstein, *J. Org. Chem.*, in press).

(10) H. B. MacPhillamy, C. F. Huebner, E. Schlittler, A. F. St. André, and P. R. Ulshafer, *THIS JOURNAL*, **77**, 4335 (1955). The authors are most thankful to Dr. Huebner for instructing them of the

fact that he has succeeded in proving by chemical means that the above deserpidine derivative possesses the *allo* configuration.

Finally, the new analytical method permits the classification of fifteen alkaloids of unknown configuration. Aricine,¹¹ tetraphylline,¹¹ reserpine,¹¹ mayumbine,² isoreserpiline,² and corynantheidine¹² belong to the *normal* or *allo* series, while isorauhimbine,² raunescine,¹³ isoraunescine,¹³ raujemidine,¹⁴ pseudoreserpine,¹⁵ isoreserpinine,¹¹ raumitorine,^{2,16} reserpiline,^{2,16} and akuammigine² are part of the *pseudo* or *epiallo* series of alkaloids.¹⁷

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fact that he has succeeded in proving by chemical means that the above deserpidine derivative possesses the *allo* configuration.

(11) The authors are most grateful to Drs. Djerassi and Diassi for the information of the fact that mercuric acetate oxidation, followed by reduction, of the cited alkaloids has led to the same stereochemical assignment (C. Djerassi, J. Fishman, M. Gorman, and J. P. Kutney, *ibid.*, in press).

(12) When considered along with the chemical evidence (ref. 8b), the infrared data suggest the *allo* configuration for this alkaloid.

(13) N. Hosansky and E. Smith, *J. Am. Pharm. Assoc., Sci. Ed.*, **44**, 639 (1955).

(14) P. R. Ulshafer, M. L. Pandow, and R. H. Nugent, *J. Org. Chem.*, **21**, 923 (1956).

(15) Taken in conjunction with previous chemical evidence [M. W. Klohs, F. Keller, R. E. Williams, and G. W. Kusserow, *Chemistry and Industry*, 187 (1956)], the infrared spectrum reveals the alkaloid to be a trimethoxybenzoyl derivative of methyl 17-demethyl-reserpate.

(16) The stereochemical identification of these two substances can be considered only tentative at this time because of the uncertainty of their spectra. It would appear that available samples might be admixed with an impurity that absorbs also at 3.4–3.7 μ .

(17) The authors are greatly indebted to Professor Janot, Sir Robert Robinson and Drs. Aghoramurthy, Hofmann, Huebner, Klohs, Neuss, and Ulshafer for supplying them with samples and/or infrared spectra for this study and to the Institute of Atomic Research, Iowa State College, for the use of a Baird infrared spectrophotometer.

BOOK REVIEW

Annual Review of Biochemistry, Volume 25. By J. MURRAY LUCK, Editor, Stanford University, FRANK W. ALLEN, Associate Editor, University of California, and GORDON MACKINNEY, Associate Editor, University of California. Annual Reviews, Inc., Palo Alto, California. 1956. ix + 794 pp. 16.5 × 23 cm. Price, \$7.00.

The current volume of the Annual Review of Biochemistry represents the twenty-fifth anniversary of an undertaking which has proved of tremendous value to the busy scientist who wishes to keep abreast of the biochemical literature. As stated in 1932 by Dr. J. Murray Luck and his advisory committee, it was hoped that critical surveys of the literature would minimize the task of referring constantly to original works. This goal has been admirably achieved by the Reviews in spite of the increasingly difficult task of examining critically the burgeoning field of biochemistry. The present volume includes among its many discriminating surveys a chapter completed by the friends and colleagues of Seymour Korkes as a tribute to his memory. A prefatory chapter is devoted to the life and work of Sir Edward Mellanby.

The contents are as follows: Sir Edward Mellanby by B. S. Platt; Nonoxidative and Nonproteolytic Enzymes by A. Meister; Proteolytic Enzymes by J. S. Fruton and M. J. Mycek; Carbohydrate Chemistry by E. J. Bourne and R.

Stephens; Chemistry of the Lipides by F. B. Shorland; Metabolism of Purines and Pyrimidines by C. E. Carter; Biochemistry of Viruses by F. W. Putnam; Metabolism of Lipides by S. Bergström and B. Borgström; Biochemistry of Cellular Particles by W. C. Schneider and G. Hogeboom; Chemistry of the Fungi by C. E. Stickings and H. Raistrick; Biological Oxidations by S. F. Velick; The Chemistry of Proteins and Peptides by H. Fraenkel-Conrat; The Hemoglobins by H. A. Itano; Metabolism of Amino Acids and Proteins by E. A. Adelberg and M. Rabinovitz; Water-Soluble Vitamins, Part I, by J. J. Piffner and O. D. Bird; Water-Soluble Vitamins, Part II, by E. E. Snell and D. E. Metzler; Water-Soluble Vitamins, Part III, by G. W. E. Plaut and J. J. Bethel; Fat-Soluble Vitamins by E. Kodicek; Nutrition by W. H. Griffith and M. E. Swendseid; The Biochemistry of Cancer by C. Heidelberger; Cholesterol Metabolism by M. Friedman, S. O. Byers, and S. St. George; Chemical Constitution and Immunological Specificity by M. Heidelberger; Metabolism of Drugs and Other Organic Substances by W. H. Fishman, and Carbohydrate Metabolism by S. Korkes.

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