wise a slight excess of 50% potassium hydroxide. The evolution of nitrogen was quantitative. After warming to 60° the semicarbazone was prepared directly to yield 0.95 g. (56%) of semicarbazone, m. p. 172–173°, sintering at 166°.

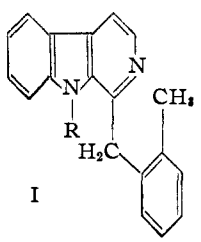
CHEMISTRY LABORATORY OF
THE OHIO STATE UNIVERSITY
COLUMBUS, OHIO MELVIN S. NEWMAN

RECEIVED DECEMBER 13, 1948

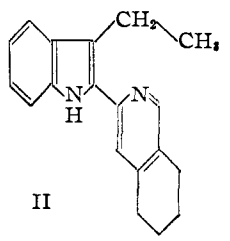
THE STRUCTURE OF SEMPERVIRINE

Sir:

The alkaloid sempervirine, $C_{19}H_{16}N_2$, from *Gelsemium sempervirens*, Ait., is remarkable for its color and its high degree of unsaturation. In a recent elegant investigation, Prelog[1] has shown that the substance is transformed to the isomeric yobyrine (I, R = H) when heated with selenium, and to tetrahydroisoyobyrine (II) on treatment

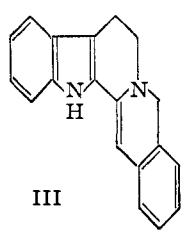


I

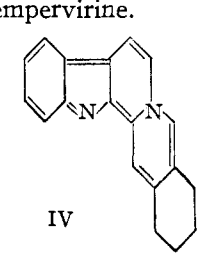


II

with Raney nickel. These results led to the proposal of structure (III) for sempervirine.

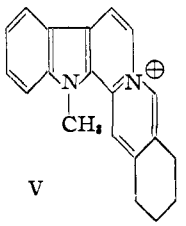


III

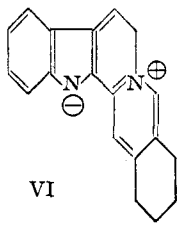


IV

We wish to propose a new structure (IV) for the alkaloid. In our view, the new formula is better in accord with the color of sempervirine, and with the formation from it of tetrahydroisoyobyrine. Beyond that we have been able to marshal new facts which provide further strong support for (IV). Thus, (i) the infrared spectrum of sempervirine *contains no band in the NH region*, while by contrast, all N-unsubstituted indole derivatives are characterized by an intense sharp band at 2.9 μ; (ii) when sempervirine methochloride is heated with selenium, a new base, m. p. 103° [hydrochloride, m. p. 229°, picrate, m. p. 235°, (calcd. for $C_{26}H_{21}O_7N_5$: C, 60.58; H, 4.11. Found: C, 60.38; H, 4.15)], is formed, which is clearly N-methylyobyrine (I, R = Me), since its ultraviolet spectrum is nearly identical with that of yobyrine, and its infrared spectrum possesses no NH band.[2] These observations support the view that the metho-salts of sempervirine contain the cation (V). The expression IV implies of



V



VI

course an important contribution of the fully aromatic ionic structure (VI). Consideration of this fact makes understandable the formation of metho-salts of the structure (V), as well as the color of the alkaloid, and its high basicity (pK, 10.6). The formation from sempervirine of a mole of methane in the Zerewitinow determination can be attributed to the presence in (IV ⟷ VI) of a virtual (substituted) γ-picolinium system.

We wish to thank M. Raymond-Hamet (Paris) and Professor M.-M. Janot for their gracious gifts of sempervirine.

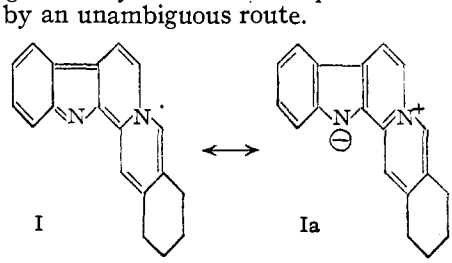
CONVERSE MEMORIAL LABORATORY
HARVARD UNIVERSITY R. B. WOODWARD
CAMBRIDGE 38, MASS. BERNHARD WITKOP

RECEIVED MAY 17, 1948

THE SYNTHESIS OF SEMPERVIRINE METHOCHLORIDE

Sir:

It has been suggested on the basis of analytical and degradative evidence that the alkaloid sempervirine possesses the remarkable structure I ⟷ Ia.[1] We have now been able to provide conclusive evidence for the proposed structure through the synthesis of sempervirine metho-salts by an unambiguous route.



I Ia

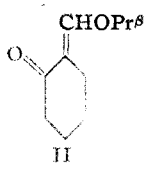
In model experiments, the lithium derivative of α-picoline was condensed with isopropoxymethylene cyclohexanone[2] (II) [b. p. 64–65° (0.2 mm.), $n^{26}D$ 1.4980, calcd. for $C_{10}H_{16}O_2$: C, 71.39; H, 9.59. Found: C, 71.18; H, 9.40]. From the acid-treated reaction-mixture, salts of the dehydroquinolizinium cation (III) were readily obtained (picrate, m. p. 237–238°, calcd. for $C_{19}H_{16}O_7N_4$: C, 55.34; H, 3.91; N, 13.59. Found: C, 55.41; H, 4.17; N, 13.36; per-

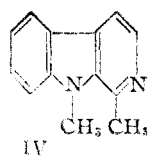
(1) Prelog, *Helv. Chim. Acta*, **31**, 588 (1948).

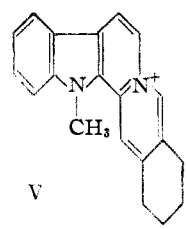
(2) More recently the nature of the base has been confirmed through direct comparison with a synthetic sample kindly supplied by Dr. Percy L. Julian.

(1) Woodward and Witkop, THIS JOURNAL, **71**, 379 (1949).

(2) Prepared from hydroxymethylene cyclohexanone by the method of Claisen, as reported by v. Auwers (*Ber.*, **71**, 2082 (1938)) and developed by Johnson and Posvic (THIS JOURNAL, **69**, 1361 (1947)).







chlorate, m. p. 187.1–187.8°, calcd. for $C_{13}H_{14}O_4NCl$: C, 55.05; H, 4.97. Found: C, 55.12; H, 5.05).

In a similar reaction, the use of the lithium derivative of N-methylharman[3] (IV) led to the smooth synthesis of salts of the methylsempervirinium cation (V). Synthetic samples of sempervirine methopicrate, m. p. 239–240°, and sempervirine methochloride, m. p. 330–332°, showed no depression in melting point on admixture with the corresponding salts of identical melting points prepared from natural sempervirine. The identity was further confirmed through the reproduction by synthetic sempervirine methochloride of the very characteristic ultraviolet absorption behavior of the salt from the natural alkaloid [$\lambda\lambda_{max.}$ (log ϵ): 241 (4.56), ~250 (4.49), 292 (4.20), 330 (4.28), 395 (4.22); $\lambda\lambda_{min.}$ (log ϵ): 280 (4.14) 305 (4.09), 365 (4.10)].

(3) *Cf.* Späth and Lederer, *Ber.*, **63**, 2102 (1930). Our material was made from N-methyltryptophan, which was itself prepared very smoothly by a new synthesis analogous to that used by Warner and Moe (THIS JOURNAL, **70**, 2766 (1948)) for the preparation of tryptophan. Our melting point (285°) for N-methyltryptophan agrees wth that (289°) of Wieland, Konz and Mittasch (*Ann.*, **513**, 23 (1934)) rather than that (225°) recently reported by Snyder and Eliel (THIS JOURNAL, **70**, 3853 (1948)).

CONVERSE MEMORIAL LABORATORY
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RECEIVED JANUARY 11, 1949

NEW BOOK

Microdiffusion Analysis and Volumetric Error. By EDWARD J. CONWAY, M.B., D.Sc., Professor of Biochemistry, University College, Dublin, and Member of the Royal Irish Academy. Crosby Lockwood and Son, Ltd., 20 Tudor Street, London, E. C. 4, England, 1947. xix + 357 pp. Illustrated. 14 × 22.5 cm. Price 21/- net.

Although the literature shows an ever-increasing application of the microdiffusion principle, the lack of a general description of the technique in books on methodology makes this detailed and carefully written book especially valuable.

Conway was the first to develop the microdiffusion technique to a point where full advantage is taken of the simplicity, accuracy and convenience inherent in this method. By eliminating distillation or aeration in the determination of volatile substances, labor, apparatus and time are saved particularly in serial analyses. It may surprise many that the diffusion time in the micro-ammonia procedure, for example, may be less than thirty minutes and that the accuracy is equal to that of the macro procedure.

The book is divided into three sections. The first deals with the design of the diffusion cell and the factors governing the rate of diffusion. The second section describes critically and in detail most of the published applications of the microdiffusion principle. The last section discusses the factors influencing variable error in volumetric analysis and establishes a rational basis for maintaining macro accuracy in micro procedure. This discussion should be of value to all analysts who wish to maintain given standards of accuracy in volumetric analysis.

JACOB W. DUBNOFF

BOOKS RECEIVED

November 10, 1948–December 10, 1948

A. D. BOOTH. "Fourier Technique in X-Ray Organic Structure Analysis." Cambridge at the University Press. The Macmillan Company, 60 Fifth Ave., New York 11, N. Y. 1948. 106 pp. $2.75.

LI CH'IAO-P'ING. "The Chemical Arts of Old China." Chemical Education Publications, 2030 Northampton St., Easton, Pa. 1948. 215 pp. $5.00.

ALEXANDER FINDLAY. "A Hundred Years of Chemistry." The Macmillan Company, 60 Fifth Ave., New York 11, N. Y. 1948. 318 pp. $4.50.

R. W. HARMON AND C. B. POLLARD. "Bibliography of Animal Venoms." University of Florida Press, Law Building, Gainesville, Fla. 1948. 340 pp. $8.00.

JOSEPH H. KEENAN AND JOSEPH KAYE. "Gas Tables. (Thermodynamic Properties of Air Products of Combustion and Component Gases. Compressible Flow Functions.)" John Wiley and Sons, Inc., 440 West 44th St., New York 16, N. Y. 1948. 238 pp. $5.00.

HUGH C. MULDOON. "Organic Chemistry." Third Edition. The Blakiston Company, Philadelphia 5, Pa. 1948. 648 pp.

R. T. SANDERSON. "Vacuum Manipulation of Volatile Compounds." John Wiley and Sons, Inc., 440 West 44th St., New York, N. Y. 1948. 162 pp. $3.00.

R. STOOPS, Editor. "Rapports et Discussions sur les Isotopes." 76–78 Coudenberg, Bruxelles. 411 pp.

"Reports of the Biochemical Research Foundation of the Franklin Institute." Vol. IX. 1946–47. Dr. Ellice McDonald, Director. Biochemical Research Foundation, Newark, Del