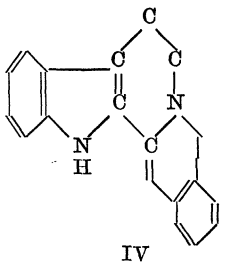

IV

Yobyrine
(Barger and Scholz, 1933)

The writers believe that definite conclusions as to the structural relationship between the ergot and the yohimbine alkaloids, tetrahydroyobrine and yobyrine, may be drawn from further study of the ultra-violet absorption spectra of these compounds and their hydrogenation products. Syntheses of the tetracyclic nuclear structure illustrated by rings 1 to 4 in I and of the corresponding tricyclic nuclei obtained by breaking either the C—N or the C—C bond between rings 3 and 4 are now under way in this laboratory.

We hope that this announcement of the probable close skeletal relationship between yohimbine and the ergot alkaloids, together with the statement of the work now under way in this laboratory, will be regarded by other investigators as a justifiable reservation of this approach to the problem. Their courtesy and consideration will be gratefully appreciated by the writers.

The writers are indebted to Drs. T. Hogness and P. Zscheile, Rockefeller Foundation grant fellow, for the absorption spectra measurements, and to the Eli Lilly Company for a supply of ergotocin.

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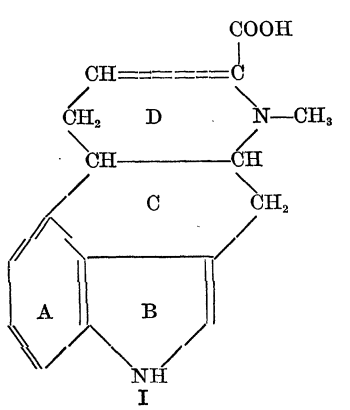
THE ERGOT ALKALOIDS. THE STRUCTURE OF LYSERGIC ACID

A PROVISIONAL structure for lysergic acid,[1] *viz.*, 3-propenyl-3, 4-dihydro-4-methylcarboline-5-carbonic acid, was suggested on the basis of the interpretation of its properties, of its degradation products and of a possible analogy to other alkaloids biogenetically related to tryptophane. More recent observations, however, have brought the conviction that this view must be revised. The nature of the previously reported product of the alkali fusion of dihydrolysergic acid, the base $C_{11}H_{11}N$, has now been determined. Although greatly handicapped by the very small yield of this base, we have convinced ourselves of its identity with 1-methyl-5-aminonaphthalene by comparison with that synthetically obtained.[2] The formation of this amine makes it probable that two fused six-membered rings enter into the make-up of lysergic acid and emerge on alkali fusion as a naphthalene derivative, and that the amino group is produced by cleavage of a fused pyrrol ring (an indol derivative).

The tribasic acid, $C_{14}H_9O_8N$, obtained in earlier work[3] by nitric acid oxidation of ergotinine and which retains the *N* methyl group of lysergic acid, has been found to yield quinoline, isolated as the picrate, on distillation with soda lime. It appears probable, therefore, that this acid is a quinoline derivative and possibly an N-methyl quinoline betaine tricarboxylic acid, as suggested by formula II. Picric acid has also been isolated from the nitric acid oxidation of lysergic acid, an observation compatible with an indol structure.

Finally, lysergic acid on catalytic hydrogenation yields at first dihydrolysergic acid which, contrary to the former, can no longer be titrated, indicating the proximity of the double bond and carboxyl group in the ring containing the $N \cdot CH_3$ group. Further hydrogenation appears to attack the indol ring system. The behavior of lysergic acid on hydrogenation leaves little doubt that it must be tetracyclic.

These observations, which together with other general considerations will be discussed more fully elsewhere, suggest a possible structure[4] for lysergic acid as presented in formula I. Oxidative cleavage with nitric acid of Rings A and B could give the tribasic



I

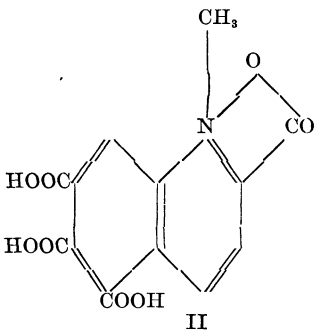
[6] At Bucknell University since September 15, 1935.

[1] W. A. Jacobs and L. C. Craig, *Jour. Biol. Chem.*, 111: 455, 1935.

[2] V. Veselý, F. Stursa, H. Olejnicek and E. Rein, *Coll. Czech. Chem. Commun.*, 1: 506, 1929.

[3] W. A. Jacobs, *Jour. Biol. Chem.*, 97: 739, 1932.

[4] The position assigned to the carboxyl group and double bond in Ring D in this formula, as well as the size of the betaine ring, in II is still arbitrary. There is also possibility that production of lysergic acid itself from the alkaloid may involve stereochemical rearrangements or a shift of the double bond in a precursor.



II

acid II. The already reported production of propionic acid on alkali fusion appears to be compatible with the cleavage of Ring D. Likewise the methyl group of the above methyl naphthylamine can be formed by cleavage of Ring D. And finally, the dimethylaminobenzaldehyde reaction given by lysergic acid would be expected from this formula since the α position of the indole nucleus is free. In the older carboline formula this point remained a difficulty.

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THE CHROMOSOMES OF DROSOPHILA ANANASSAE[1]

DURING the autumn of 1933, *Drosophila ananassae* De Meijere (*D. caribbea* Sturtevant) was found frequently in Tuscaloosa, Alabama. Cytological examination of neurocytes of male larvae showed the presence of a J-shaped Y-chromosome. The stock differs, therefore, from the Panama and Cuba material with a rod-shaped Y, used by Metz[2] in his original description of the chromosomes of this species. Recently, through the kindness of Dr. W. P. Spencer, I have been privileged to examine a stock of *D. ananassae* from Dr. H. Kikkawa's laboratory in Kyoto. This also has a J-shaped Y. Further knowledge of the extent of distribution of the two types of Y-chromosome within the species awaits the study of material from those regions of tropical America from which *D. caribbea* has been reported.[3]

There are eight chromosomes in diploid cells of *D. ananassae;* four pairs of V-shaped chromosomes in the female; three pairs of V-shaped autosomes, a V-shaped X and the Y in the male. One pair of the autosomes are considerably shorter than the others. In the aceto-carmine preparations used for the present study, two of the longer autosomes show the same type of pronounced sub-median constriction which exists in the left arm of the second chromosome of *D. melanogaster.*[4] The other pair of long autosomes have constrictions in positions similar to those of the third chromosomes of *D. melanogaster.* The short autosomes are attached to the nucleolus (or nucleoli) during early prophase stages in ganglion cells of both sexes. In the male, however, the Y-chromosome forms the third member of a group which is associated with the nucleolus. The absence of a nucleolus-forming region from the X-chromosome of this species contrasts with the condition in other species of Drosophila, in which the nucleolus develops in the X.[4, 5]

Several of the ganglia studied, both male and female, contained patches of tetraploid tissue. Trisomics and XO individuals also were found.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

CARDBOARD FOR ANATOMIC RECONSTRUCTION MODELS

IN 1905 (published in 1907) Mrs. S. P. Gage[1] demonstrated a method for making reconstruction models from microscopic sections, which involved the use of blotting paper instead of the usually employed wax. The technique of this method was further developed by Dr. S. W. Miller in 1931[2] and 1932.[3] He also described apparatus for cutting and mounting the paper sections. Blotting paper has the following advantages over wax: (1) it is less expensive, (2) the labor involved in rolling plates is saved, (3) it is not softened in hot weather, and (4) the resulting models are much more durable in other respects. A material which is still better than blotting paper, in my judgment, is described in this article.

About three years ago, I attempted to get blotting paper of uniform and special thickness. I was informed, however, by the paper dealers whom I consulted that only one thickness was available in large sheets and that was not uniform. I learned, however,

[1] A preliminary note.
[1] *Anat. Rec.*, 7: 166–169.
[2] *Anat. Rec.*, 48: 191–196.
[3] *Anat. Rec.*, 51: 249–250.

[2] C. W. Metz, *Amer. Nat.*, 50: 587–599, 1916.
[3] A. H. Sturtevant, Publ. 301, Carnegie Inst. of Wash., 1921.
[4] B. P. Kaufmann, *Jour. Morph.*, 56: 125–155, 1934.
[5] E. Heitz, *Zeitschr. Zellforsch. u. mikr. Anat.*, 20: 237–287, 1933.