

from one group to another. Such laboratory directions exist, of course, in the literature, but they are so widely scattered that many turn aside from work in this field. The reviewer can imagine no more attractive subject for a student course in inorganic preparations than, for example, the cobaltammines, with their varying colors, their differences in ionization, and the multiplicity of possible transformations.

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Die Alkaloide. Eine Monographie der natuerlichen Basen. Von DR. ERNST WINTERSTEIN, Professor, und DR. GEORG TRIER, Assistant, an der eidgenössischen polytechnischen Schule in Zurich. Verlag von Gebrüder Bronträger, Berlin, 1910.

The appearance of this book is very timely. While text-books on organic chemistry usually contain a short chapter on alkaloids, special treatises on this subject are few and appear at long intervals. The book is excellently gotten up from the standpoint of workmanship, and contains almost every alkaloid whose existence has been definitely established. By omitting detailed methods of manufacture, leaving out descriptions of alkaloidal salts, and cutting down bibliographic references to a minimum, the authors have managed to condense a vast subject into 340 pages. A special feature of the book is the special attention given to the physiological behavior of those alkaloids whose effect on living organisms has been tested. The book consists of a general introduction, a special part and a large chapter on the function and generation of organic bases in plants. The introduction consists of ten chapters: Definition; historical review; occurrence; general methods of preparation, detection and quantitative estimation; general properties; constitution and methods used for its determination; synthesis of alkaloids; physiological behavior; phytotoxins; relation between constitution and physiological action; classification. The authors distinguish between alkaloids in general and alkaloids proper. The first term applies to all nitrogenous bases found either in vegetable or animal organisms; the second is restricted to vegetable bases containing nitrogen in heterocyclic union and possessing physiological activity. In the chapter on physiological activity the supposition is advanced ascribing this activity to a molecular combination of alkaloid and protoplasm, the enormous effect of relatively small doses being due to the smallness of the molecular weight of the organic bases as compared with the exceptionally large molecular weight of the albumins. A thorough discussion is given of the remarkable tolerance of some animals towards poisonous bases, atropine, for example, having no effect upon the rabbit, and the lethal dose of morphine being ten times larger for chickens and a thousand times larger for goats than for man. The authors criticize the utility of antidotes whose action, like that of tannin, consists in the formation of insoluble combinations with the organic base. Since many

alkaloids exist in the poisonous plants in the form of tannates, the administration of tannin cannot be expected to destroy the toxicity of the bases. In the chapter on the relation between constitution and physiological action, the authors, after enumerating the well-established regularities, arrive at the conclusion, expressed in the words of Schmiedeberg, that it will be more difficult to establish a scientific theory of this relation than of that between constitution and color. In the special part no attempt is made to classify the alkaloids according to any definite system. The aliphatic bases are treated first, then comes in succession the aromatic with an aliphatic side chain, pyridine, quinoline and isoquinoline derivatives, bases containing several nitrogen atoms in the molecule and finally the alkaloids of unknown constitution. In the voluminous chapter on the function and generation of alkaloids in the plants the authors review the various proposed theories, and express their preference for the supposition that the vegetable bases are catabolic products of the albumins, and that their formation has no other purpose than the removal of nitrogenous decomposition products that have become useless or even harmful to the living plant. Pictet's general theory of the formation of the alkaloids from certain so-called protoalkaloids of simple constitution which are themselves decomposition products of the albumins is accepted in its general features, but it is shown that, contrary to that theory, formaldehyde cannot be regarded as the direct methylating agent, and that Pictet's scheme of the formation of alkaloids with a pyridine nucleus from pyrrole is not quite satisfactory. The objection to formaldehyde as a direct methylating agent is based, among other considerations, upon the fact established by Winterstein that alkaloids are frequently formed in seeds during germination in the dark when there is no photosynthesis to produce formaldehyde. The authors think that the direct methylating agent is methyl alcohol which, however, may in some cases owe its formation to the aldehyde produced primarily. The alkaloids containing a pyridine nucleus are formed not from pyrrole, but from lysine produced in the splitting up of the albumins. Even the nitrogen-free groups, like benzoyl, cinnamyl, etc., frequently present in the molecule of alkaloids, are produced from the amino acids of the albumins by a reaction similar to the one called by Ehrlich "alcoholic fermentation of amino acids." An important role in the formation of alkaloids is ascribed to the betaines the constitution of which is assigned to several bases, *e. g.*, guvacine and arecaine, which hitherto were not supposed to be betaines. The authors' views are illustrated by many examples showing the genetic relations between the albumins and the alkaloids. A characteristic feature of the successive phases of the transformation of the former into the latter consists in the destruction ("blocading") of the reactivity of the hydrogen atoms of the amino groups by reactions of methylation or, in some cases,

condensations with alcohols, phenols or aldehydes. For this reason the authors propose a new definition of alkaloids as "organic compounds produced in the formation or transformation of protoplasmic substances (proteins, proteids, phosphatides, etc.) in such a way that the reactive hydrogen atoms of the basic groups are closed, so that the resulting products are unable to regenerate the original or to form new protoplasmic substances." The presence of choline and of purine bases in the molecules of the albumins is ascribed to the action of ammonia on some of the nitrogen-free intermediate products of photosynthesis. The book is full of suggestions and deserves a prominent place in every well-equipped library.

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