which started in 1899 and extended to the late summer of 1904, large numbers of cattle were forced to browse on shrubs of all kinds and large herds came to the river to drink. As a result, the willows, shrubs, etc., along the banks of streams, were practically killed off. Large numbers of cattle died from starvation, and when the drought broke the unprotected banks of the streams melted away like sugar, until the channel reached the mammoth proportions of to-day.

As to the San Simon, I do not recall being told about the small channel being dug by the settlers; however, in 1900 San Simon Wash, within the present irrigated district, was not over 12 or 15 feet wide by 2 or 3 feet deep. Out on the "Mesa," just outside the irrigated district, there were two or three well-defined cattle trails made in going to and from water in the Gila, but the area was so smooth that one could cross anywhere with a team and buckboard. These cattle trails were soon formed into small arroyos and are to-day as described by Mr. Bryan.

It has been my observation, from what would be learned from the "old timer," that arroyo cutting started, in most cases at least, by overgrazing, since in almost every instance they claim that these arroyos did not exist at the time of the introduction of cattle.

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EVOLUTION AND THE UNIVERSITY OF NEBRASKA

THE New York *Times* of November 29, 1925, quotes Professor Henry Fairfield Osborn as saying in an address before the science section of the Association of Colleges and Secondary Schools of the Middle States that "in a recent journey through Nebraska he learned that even in the state university there was a 'hush' at the word (evolution)" and that "no teacher in the whole state of Nebraska is entirely free to be sincere, but is more or less obliged to dissemble his real beliefs." We do not know the source of Professor Osborn's information but wish to state emphatically that his information is absolutely erroneous and unrepresentative and therefore misleading and unjust. In the state university, from the chancellor down to instructors, there has never been a "hush" on the freest discussion and most open teaching of evolution.

In a recent address before a large religious body Chancellor Avery said, "I am an evolutionist" and "there is no inconsistency whatever between Christianity and evolution, and when linked together they can do marvelous work for the kingdom of God." In an interview in the Omaha *World Herald* of May 22, 1925, the chancellor stated that "at the state university evolution is taught as a theory, not as a dogma."

The departments of botany, geology, sociology and zoology teach evolution with the utmost freedom.

Professor E. H. Barbour, head of the department of geology and a close friend of Professor Osborn, says that "in the geology department our only solicitude is for truth. We take facts as we find them. We hold that the truth is sacred above all things." Professor Barbour gives a lecture on evolution each semester before some two thousand freshman students.

The department of zoology teaches evolution in every course and offers a special course each semester to a large group of students under the specific title of "Evolution."

We recently addressed a large group of science teachers of the state on the subject "Evolution an Inspiration." All members of the university faculty from the chancellor down hope that evolution may be kept out of controversy and left in the realm of scientific truth.

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UNIVERSITY OF NEBRASKA

SCIENTIFIC BOOKS

SOME RECENT BOTANICAL PUBLICATIONS

THE multiplication of general text-books on botany seems likely to continue until each university is represented by such a text. This arises from the fact that conditions of instruction vary so widely that instructors are compelled to adjust their presentation of botany to the local situation. When this is successful, it is likely to result in another text-book. Attention may be called to two recent illustrations of this fact.

At the University of Wisconsin, six botanists have cooperated in the preparation of a general text.[1] The authors are not differentiated in the text, thus segregating the various fields of botany, but have treated botany as a unit. For example, structure and function are so intimately associated that morphology and physiology are not segregated. In making such a composite presentation, the cell is first considered as the unit of structure and function, and this is followed by describing its combinations and activities in the various organs, leading up to a synthetic view of the plant as a whole. Following this presentation of the plant as a working organism, the great groups are considered, from algae to seed plants. The volume closes with a presentation of evolution and heredity and finally a consideration of the economic

[1] Smith, G. M., Overton, J. B., Gilbert, E. M., Denniston, R. H., Bryan, G. S., and Allen, C. E., "A Textbook of General Botany," The Macmillan Co., New York. 1924.

significance of plants. The volume is certainly very suggestive to teachers, and should help in somewhat reorganizing the presentation of botany as a unified subject, with such changes as local conditions may demand.

Holman and Robbins[2] have also published a general text, which is the result of experience with courses given to agricultural students and liberal arts students. The material of these two courses is combined in the text, and the method of presentation adjusted to these particular groups of students. It is interesting to note that the order of presentation is similar to that of the preceding text. Beginning with the cell, there follow chapters on the structure and activities of the whole plant and its organs, up to seed germination. This is followed by a description of the four great groups, and finally a chapter on evolution and heredity. In short, this text first develops knowledge of the plant as an individual organism, and then pictures the plant kingdom as a whole.

Another general text may be referred to, which has a more special purpose than the preceding ones, Tansley,[3] of England, has prepared a text intended primarily for medical students and those who do not intend to continue work in botany. This somewhat restricted audience naturally influences the selection of material for presentation. As in the preceding texts, however, plants are presented under two aspects, namely, the chemical and physical nature and behavior of organic substances, followed by a survey of the plant kingdom from algae to seed plants, type plants being selected to illustrate biological principles. The author presents his material in such a way that the result should be a general appreciation of life processes, rather than merely details of structure and classification.

One of the much needed special texts has just been prepared by Eames and MacDaniels,[4] of Cornell University. It is an introduction to a great and growing field which has never been presented in an organized way. Although introductory, it furnishes a working basis in this field, and incidentally clears up a much confused terminology. The book does not include the great mass of facts recorded in this field, but uses well-chosen illustrations. The emphasis is put on laboratory practice, for which the book furnishes a background. The sequence of subjects is said to be the result of experience with students. Only vascular plants are considered, with an occasional mention of lower forms. The term anatomy includes histology, which deals with internal structure, but excludes cytology as a special field. Beginning with the cell, the various tissues and organs are described, and the book closes with a sketch of the history of the subject.

In addition to these general texts, there have appeared recently a number of books dealing with special groups. Among these a notable one is by Skene,[5] of Aberdeen, who bases his presentation of the flowering plants upon experimental physiology. The book is full of information concerning modern research on plant life and behavior. It is written in a style that holds the interest of the students and gives a well-rounded view of the seed plant as a living organism. Some idea of the presentation may be obtained from the headings of the six chapters, namely, soil relationships, assimilating of carbon and transpiration, special forms of nutrition (as parasites, etc.), mechanical problems and protection, reproduction and dispersal and development.

A notable book dealing with a special group has been issued from Kew Gardens, by Dallimore and Jackson.[6] It is an elaborately illustrated work on the Conifers (including Ginkgoaceae), as announced "from the point of view of the gardener, forester and student rather than the botanist." In other words, it is not technical, but presents all the known species in simple language. An expedition to China yielded many new forms and facts of distribution. The descriptions were obtained from living plants, as well as herbarium specimens, the great Conifer plantation at Kew and many estates furnishing living material.

Buller[7] is continuing his important work on fungi, the second volume dealing with the problem of spore discharge in the Hymenomycetes. The details of structure and behavior are presented clearly in text and illustration. He finds great variation in these features, and recognizes several distinct types.

One of the most important special publications recently issued is that by Britton and Rose,[8] who have completed their presentation of the Cactaceae after

[2] Holman, R. M., and Robbins, W. W., "A Text-book of General Botany for Colleges and Universities," John Wiley and Sons, New York. 1924.

[3] Tansley, A. G., "Elements of Plant Biology," George Allen and Unwin, London; Dodd, Mead and Co., New York. 1922.

[4] Eames, A. J., and MacDaniels, L. H., "An Introduction to Plant Anatomy," McGraw-Hill Book Co., New York. 1925.

[5] Skene, Macgregor, "The Biology of the Flowering Plants," Macmillan Co., New York. 1924.

[6] Dallimore, W., and Jackson, A. Bruce, "Handbook of Conifera," Longmans, Green and Co., New York. 1923. Printed in London.

[7] Buller, A. H. R., "Research on Fungi," Vol. II, Longmans, Green and Co., London. 1922.

[8] Britton, N. L., and Rose, J. N., "The Cactaceae," 4 vols., Carnegie Institution. 1919–1923.

twenty years of study. It is a fine example of co-operative work in discovering the relationships of an unusually difficult group. Not only was field material studied, but the plants were cultivated in greenhouses. The work also involved visits to Europe to examine type material, and also extensive field trips into the various cactus regions. The work was financed not only by the Carnegie Institution, but was aided also by the New York Botanical Club, the U. S. National Museum and the U. S. Department of Agriculture. As a result, 1,255 species are presented, under 124 genera.

There is also an increasing number of publications dealing with special subjects, especially cytology. Attention may be called to the work of Stomps[9] on heredity and cytology, which summarizes the most important recent results. It presents the subject under three general divisions, namely, the cell, with its ordinary division and reduction division; heredity, calling attention to the functions of the nucleus; and the relation of chromosomes to heredity. In connection with this last topic an account is given of the important researches, and the opinion is given that Morgan's work with Drosophila will hold.

Another cytological work by Schürhoff[10] is a monograph on plastids, dealing with the details of their morphology, cytology, composition, physiology and pathology. It is a general summary of our knowledge of plastid organization and behavior and brings together a mass of scattered information.

In this connection, attention should be called to the fourth edition of Chamberlain's[11] "Methods in Plant Histology." This edition is an excellent illustration of the rapid advances in cytological technique. The first edition was published in 1901, the second in 1905, the third in 1915, and now it was found necessary to almost completely rewrite the fourth edition. Since this book is a standard in its field, this edition will serve the purpose of bringing much technique up to date.

An interesting and unique book, which occupies a field of its own, is by Trelease.[12] It is a companion to his "Plant Materials of Decorative Gardening," published in 1917. It is a pocket manual for field use, and presents keys for the recognition of woody plants in winter, when the flowers and leaves used by the ordinary manuals are lacking. It enables one to recognize a plant from its winter twigs, using such characters as leaf scars and bud and pith characters. Since the characters used are "small differences in small parts," a pocket lens is necessary, supplemented by text illustrations. The Conifers are excluded, because they are evergreens, retaining the characters used in classification. The amount of work involved in this assembling of a new group of characters may be inferred from the fact that 328 genera are described in 94 families. There was no attempt to differentiate all the species and varieties, but this little book will certainly make an excellent companion in winter botanizing.

[9] Stomps, Theo J., "Erblichkeit und Chromosomen," Jena. 1923.

[10] Schürhoff, Paul N., "Die Plastiden," Berlin. 1924.

[11] Chamberlain, C. J., "Methods in Plant Histology," University of Chicago Press. 1924.

[12] Trelease, Wm., "Winter Botany," Publ. by author, Urbana, Ill. 1925.

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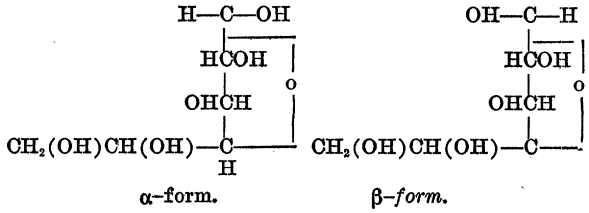
SPECIAL ARTICLES

ON THE α- AND β-FORMS OF SUGARS AND OF SUGAR DERIVATIVES

THE differentiation between the α- and β-forms of sugars is accomplished according to a rule introduced by Hudson. According to this rule, in a pair of sugars either substituted or non-substituted, the one with a higher dextrorotation (or lower levorotation) is recognized as the α-form and that with a lower dextrorotation (or higher levorotation) is regarded as the β-form. The rule of Hudson led to many important conclusions regarding the configurational relationship of carbon atom (1) of simple and complex sugars. The rule, however, was based on an entirely arbitrary principle. In the course of recent work, there arose doubts as to the applicability of Hudson's rule to every sugar derivative. This circumstance led to a new method for differentiation between the α- and β-forms which is based on a rational and not an arbitrary principle.

If solid models of the α- and β-forms are constructed, it becomes evident that the mutual relationship of the free hydroxyl on carbon atom (1) and of the extra nuclear carbon atom or atoms are different for the two forms. Thus, for the common glucose, the arrangement will be the following:



α-form. β-*form.*

It is seen that in this instance the old α-form may be regarded as a trans-form with respect to the rigid ring and the old β-form as the "cis" form. In the <1, 4> oxidic galactose the α-form is the cis-form