that it deals with botany "with special reference to its economic aspects." The text is really a presentation of botany as contributing to human welfare throughout its whole history. It is made interesting, therefore, not only for students who propose to specialize in the subject, but also for those who come only into brief contact with it, opening up a perspective that is full of information and suggestion. The chief constituency for which the text is prepared, however, is for those interested in the application of botany "to horticulture or agriculture and other occupations founded in whole or in part upon the science of botany." With such a purpose, the organization of the text is of interest.

It is divided into five parts. The first is called the "Introduction." It introduces the student to the problems of botany by using the clover as an illustration. All through the text, the plants used are those that are familiar, rather than forms that are generally unknown. The general problems as presented by a flowering plant are numerous and difficult and are extended to include cell structure.

With this introduction, the second part deals with "The vegetative functions of plants," in twelve chapters, practically the problems of physiology, such as water absorption, transpiration, respiration, nutrition, growth, adjustment to surroundings, and many kindred problems. In short, it presents the plant in action, based on the structure illustrated by the clover.

The third part presents, in eleven chapters, the subjects of reproduction and life-histories, beginning with seed plants, telling "how seeds are made," and continuing the presentation through the Cryptogams. This part closes with a chapter on the problem of sex in plants.

The fourth part deals with the classification of seed plants, the preliminary chapters stating the principles of classification and evolution. The classification of Dicotyledons is presented in seven chapters, and that of the Monocotyledons in four. The families of economic importance are presented, and fully illustrated, so that the student is able to understand the origin and structure of the plant products with which he is familiar. This part of the book naturally resembles an encyclopedia, for consultation rather than for continuous reading.

The final part presents the subjects of genetics and evolution in four chapters, whose titles are suggestive: Heredity, variation, and environment; the physical basis of heredity; generalizations and special cases; evolution.

The general order of presentation of the plant groups is to descend from seed plants, with all their complexities, to the lower groups, reversing the order of evolution. The argument in favor of this sequence is that the first contact is with commonly known plants. The argument against such a sequence is that the first contact is with bewildering complexity of structure. There will always be differences in judgment as to which argument should prevail.

The belief that botany should be presented in its historical position and economic importance should certainly be commended, for it develops general interest in a great field of scientific activity, a field that has too long not received the appreciation it deserves. After all, the usefulness of a text depends largely upon the teacher who is using it, and Gager's book is full of information that can be made the basis of various kinds of teaching. The numerous excellent illustrations are to be especially commended, since they make the facts visible and help to interpret the text. As a whole the book is a valuable addition to our botanical texts, being a great collection of information and suggestion, and broadening the perspective of botany for the student. The details are too numerous for a critical review, but the attitude of the author may be judged by a quotation from Epictetus with which he closes the preface:

"If they who find some faults in it were as intimate with it as I am, they would find a great many more."

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SPECIAL ARTICLES

THE FACTOR OF AGE IN THE CHEMICAL STABILITY OF THE BLOOD DURING GESTATION[1]

DURING the past six years, investigations[2,3,4] have been undertaken in this laboratory which were concerned with the stability of the acid-base equilibrium of the blood in normal dogs at different age periods, and also in normal and nephropathic animals when subjected to a general anesthetic or intoxicated by uranium nitrate, an acid or an alkali. Such experiments have shown the relative inability of old animals to maintain or when disturbed to reestablish this fundamental balance of the blood. It would appear that

[1] Aided by a grant from the Ella Sachs Plotz Foundation.

[2] MacNider, Wm. de B., "Concerning the Influence of the Age of an Organism in maintaining its Acid-Base Equilibrium," SCIENCE, n. s., Vol. XLVI, No. 1200, 643, 1917.

[3] MacNider, Wm. de B., "A Consideration of the Relative Toxicity of Uranium Nitrate for Animals of Different Ages," *Jour. Exp. Med.*, Vol. XXVI, 1, 1917.

[4] MacNider, Wm. de B., "On the Stability of the Acid-Base Equilibrium of the Blood in Normal and in Naturally Nephropathic Animals," SCIENCE, n. s., Vol. LIII, No. 1363, 141, 1921.

as the state of senility is approached in the life of such organisms, some mechanism other than that of the kidney, which in part maintains a normal acid-base equilibrium for the blood and tissue juices, becomes less able to function when subjected to the strain induced by certain intoxications. Studies of a similar character have been carried on by McArthur[5] on planarians. He observed a decrease in the tolerance to acid and alkaline solutions as the age of these organisms increased.

The following observations[6] have been made over a period of ten years. They are concerned with the stability of the acid-base equilibrium of the blood during gestation, and with the influence of the age of the animal and the duration of the gestation period in maintaining this balance of the organism. Seventy-four dogs have been studied during the period of pregnancy. The animals have varied in age from eleven months to ten years and four months. Determinations of the acid-base equilibrium of the blood as indicated by the reserve alkali of the blood (R.pH) were made by the method of Marriott[7] at the fourth week of the gestation period and during the terminal week. As a result of these studies in which the factor of the age of the animal has been considered, they may be divided into three groups. Group I is represented by twenty-two pregnant dogs between eleven months and three years of age. At the end of the fourth week of gestation, no disturbance had occurred in the acid-base equilibrium of the blood of this youngest group of animals. The reserve alkali of the blood was normal and varied from 8.0 to 8.15. Two of the animals in the group during the last week of the gestation period were unable to maintain this balance and showed a reduction in the reserve alkali of the blood to 7.95. The remaining twenty animals maintained a normal acid-base equilibrium of the blood throughout the period of gestation.

Group II is represented by thirty-four dogs, which varied in age from three years and one month to six years. The group is represented by animals between the two extremes of youth and early senility. By the end of the fourth week of the gestation period, one of the dogs in this group showed a reduction in the reserve alkali of the blood to 7.9. At the end of the gestation period, during the ninth week, twelve of the thirty-four animals showed a reduction in the reserve alkali which varied from the slight reduction from a normal of 8.0 to 7.95 to the maximum reduction from a normal of 8.15 to 7.85. Twenty-two of the animals in the group came to the end of the period of gestation without any disturbance in the acid-base equilibrium.

Group III is represented by eighteen dogs, which varied in age from six years to ten years and four months. These animals comprise the group approaching senility. At the end of the fourth week of the gestation period in animals falling in this group, eleven had shown a disturbance in the acid-base equilibrium of the blood. The reserve alkali was reduced from the normal readings of 8.0 or 8.15 to 7.9. At the end of the gestation period fourteen of the eighteen animals had developed in the reserve alkali a reduction which varied from a reading of 7.95 to 7.85.

The above observations on seventy-four pregnant animals of different ages and falling in three age groups, indicate that during a period of gestation in normal dogs there is a definite tendency for one of the physico-chemical states of the organism to become unstable. In a certain number of the animals there occurs a reduction in the reserve alkali of the blood. These observations furthermore show that this instability of the acid-base equilibrium of the blood during gestation is associated with the age of the animal and the duration of the gestation period. Pregnancy in old animals (Group III) is more apt to disturb this equilibrium than is the case in young animals. In old animals the disturbance develops at an earlier stage of the gestation period than it does in the younger groups of animals. The suggestion is made that these observations may have some connection with the development of the toxaemias of pregnancy.

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[5] McArthur, J. W., "Changes in Acid and Alkali Tolerance with Age in Planarians," *Amer. Jour. Phys.*, Vol. LIV, 138, 1920.

[6] MacNider, Wm. de B., "Concerning the Stability of the Acid Base Equilibrium of the Blood in Pregnant Animals," *Jour. Exp. Med.*, Vol. XLIII, 53, 1926.

[7] Marriott, W. McKim, "A Method for the Determination of the Alkali Reserve of the Blood Plasma," Arch. Int. Med., Vol. XVII, 840, 1916.

THE MAGNETIC MOMENT OF ATOMIC HYDROGEN[1]

THE researches of Stern and Gerlach[2] have established the quantum nature of magnetic moment for several of the atoms. Unusual interest attaches to the magnetic moment of the simplest of the atoms, atomic hydrogen.

In this research atomic hydrogen was prepared in a long discharge tube from undried electrolytic hydrogen by the method of R. W. Wood. An all-glass slit

[1] Contribution from the Chemical Laboratory, University of Illinois, Urbana, Illinois. September 11, 1926.

[2] *Ann. d. Phys.*, *74*, 673 (1924); *76*, 163 (1925).