again revising his book, protests are already being heard even from across the Atlantic. Success entails responsibilities.

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Occasional Papers of the Museum of Zoology, University of Michigan. Nos. 1–35, 1913–17 (each separately paged). Ann Arbor, published by the University.

Dr. A. G. Ruthven, the Director of the Museum of Zoology of the University of Michigan, is heartily to be congratulated upon the appearance of the first volumes of these "Occasional Papers." Nowadays when every one is continually receiving requests to subscribe to some new journal or other, this series comes as a refreshing delight; it is not published for sale! We learn that the papers are issued separately to libraries and specialists, and, when sufficient matter has accumulated, a title page and an index—an excellent index by the way—is prepared and the volume is sent forth.

The contents will appeal especially to the modernized systematist, who tries, at any rate, to take interest in ecology, zoography and the careful noting of life histories. We find notices not only of such astonishing novelties as *Lathrogecko, Pseudogonatodes* and *Calliscincopus* among reptiles, and of *Cryptobrachus* and *Geobatrachus* among amphibia, but of more general interest are the very interesting observations upon the egg-laying and hatching of several South American species of amphibia, of varied genera, in all of which some significant and peculiar adaptation or modification is recorded. The series is not, however, for the herpetologist alone. Reighard and Cummins have a model description of a new *Ichthyomyzon* with notes and figures of its appearance and customs. Other writers discuss crustacea, insects of various groups, trematodes, as well as birds and mammals.

That these articles were not chosen for the collection but simply represent the natural output for this comparatively new and hitherto little-known museum indeed augurs happily for the future of the series and for that of the museum as well. Workers in the Museum of Comparative Zoology at Harvard are perhaps naturally more *sympatico* than others and when they review their own museum's past it is not difficult for them to foresee the swift growth of another great university museum of similarly unrestricted interest and endeavor at Ann Arbor.

T. BARBOUR

SPECIAL ARTICLES

CONCERNING THE INFLUENCE OF THE AGE OF AN ORGANISM IN MAINTAINING ITS ACID-BASE EQUILIBRIUM

THE importance of the maintenance on the part of the blood and tissue juices of a hydrogen ion concentration within certain narrow limits of variation has been established through the work of J. S. Haldane and L. J. Henderson. Recent investigations have not only served to emphasize the importance that the organism should maintain a certain acid-base equilibrium for its physiological life, but have also shown that when the mechanism which regulates this equilibrium is interfered with so that the hydrogen ion concentration of the blood is increased and maintained for an adequate time, the organism no longer functionates normally, but becomes pathological in certain of its reactions.

It is not the object of this note to enter into a discussion of the factors concerned in maintaining a normal acid-base equilibrium, nor to discuss those pathological conditions in which a variation from the normal is frequently observed. The object is to call attention to the influence of the age of the organism in controlling the mechanism by which the acid-base equilibrium is kept within the bounds of normality.

Some years ago, while conducting a series of experiments in which uranium nitrate was employed as the toxic agent to induce an acute nephritis, the observation was made that this substance was more toxic for old animals than for young animals.[1] This variation in

[1] MacNider, W. deB., "On the Difference in the

degree of toxicity was expressed by the older animals becoming both albuminuric and glycosuric at an earlier period following the use of uranium than was the case with the young animals. Furthermore, the quantitative output in the urine of both albumin and glucose was greater in the old animals than in the young animals. When the kidneys of these animals were studied histologically there was found to exist more evidence of kidney injury in the organs from old animals than in those from young animals. In so far as the kidney was concerned in the reaction, uranium was more toxic in an old animal than in a young animal.

In a later series of experiments[2] in which the age of the animals was taken into account, animals following an intoxication by uranium gave evidence of developing an acid intoxication much earlier than did the younger animals. The experiments also demonstrated that the acid intoxication in the older animals was of a severer degree than in the young animals. The evidence for the development of an acid intoxication in these animals of different ages consisted in noting the time of appearance and quantitative output in the urine of acetone bodies, and in determining the relative degree of tolerance for an alkali by the two groups of animals. The old animals showed an earlier appearance in the urine of acetone bodies, a greater quantitative output of these bodies, and a greater tolerance for an alkali than did the younger animals.

In these experiments it was furthermore shown, that by the intravenous use of an alkali in a young animal the kidney could be successfully protected against the toxic effect of an anesthetic while in the older animals the difficulty of furnishing this protection increased with the age of the animal.

In a recent study[3] of the relative toxicity of uranium nitrate in animals of different ages, the observation has been made that the old animals not only show a severer grade of acid intoxication as indicated by the appearance of acetone bodies in the urine than do the younger animals, but these old animals also show a more marked increase in the hydrogen ion concentration of the blood, which is associated with a more rapid depletion of the alkali reserve of the blood and a greater reduction in the tension of alveolar air carbon dioxide. Associated with this change in the acid-base equilibrium of the blood there develops a kidney injury which is histologically more marked in the old animals than in the young animals.

In a final series of experiments[4] it has been found possible to maintain in some measure the functional capacity of the kidney and the response of this organ to various diuretic substances by employing a solution of sodium carbonate to restore the alkali reserve of the blood and maintain an acid-base equilibrium of the blood which approaches in degree the reaction of normality. The ease with which the acid-base equilibrium of the blood can be restored and maintained in an animal intoxicated by uranium, and the degree of protection which is furnished the kidney is dependent upon the animal's age. The acid-base equilibrium is more easily restored and can be maintained for a longer time in a young animal than in an old animal. The protection of the animal against the toxic effect of uranium is more perfect in a young animal than in an old animal.

From the experiments which have been cited it would appear that there is a definite association between the toxic effect of uranium and its ability to induce an acid intoxication

Response of Animals of Different Ages to a Constant Quantity of Uranium Nitrate," *Proc. Soc. Exp. Biol. and Med.*, Vol. XI., 159, 1914.

[2] MacNider, W. deB., "The Inhibition of the Toxicity of Uranium Nitrate by Sodium Carbonate, and the Protection of the Kidney Acutely Nephropathic from Uranium from the Toxic Action of an Anesthetic by Sodium Carbonate," *Jour. Exp. Med.*, Vol. XXIII., 171, 1916.

[3] MacNider, W. deB., "A Consideration of the Relative Toxicity of Uranium Nitrate for Animals of Different Ages," I., *Jour. Exp. Med.*, Vol. XXIV., p. 1, 1917.

[4] MacNider, W. deB., "The Efficiency of Various Diuretics in the Acutely Nephropathic Kidney, Protected and Unprotected by Sodium Carbonate," *Jour. Exp. Med.*, Vol. XXIV., 19, 1917.

and that the age of the animal very largely determines the rapidity of development and the severity of this intoxication.

When animals of different ages are intoxicated by this metal the factor of the age of the organism in the reaction is expressed by an inability of the senile animal to maintain with the same degree of perfection a normal acid-base equilibrium as is the case with the younger animal.

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BOSTON MEETING OF THE AMERICAN CHEMICAL SOCIETY. V

On the mechanism of the potassium chlorate-manganese dioxide reaction: RAYMOND F. BACON and R. W. MILLER. As the result of their experimental investigation of the mechanism of the so-called potassium chlorate-manganese dioxide reaction, the authors conclude that: (1) Avoiding local heating, potassium chlorate and manganese dioxide begin to react at 255° C. The most vigorous reaction occurs at 310° C. (2) The potassium chlorate oxidizes the manganese dioxide at the lower temperature to form a higher unstable oxide, which is decomposed later into manganese dioxide. It is impossible to isolate this intermediate oxide on account of the great velocity of the reaction. (3) This initial oxidation generates heat, and this, coupled with the heat applied, causes the reaction to go, with a very rapid rise in temperature. This high temperature causes certain secondary reactions to occur. (4) The first of these secondary reactions between the potassium chlorate and manganese dioxide results in the formation of manganous chlorate, which decomposes into manganous chloride, chlorine and oxygen. The manganous chloride is partially oxidized to manganese dioxide and chlorine. Potassium oxide reacts with manganese dioxide, in the presence of oxygen, to form potassium manganate, which is changed by some of the chlorine to potassium permanganate. The excess of chlorine escapes. Of the potassium chlorate used, only 0.503 per cent. enters into these changes. (5) An average of 5.428 per cent. of manganese dioxide is used up in this reaction. Almost all of this loss is accounted for from the soluble manganese compounds produced in the secondary reactions. (6) The manganese dioxide serves as an interacting catalyst in this reaction, hastening the speed of the change by actually reacting with the potassium chlorate, to form an intermediate oxide, which sets free the manganese dioxide again before the conclusion of the reaction.

The measurement of the compressibilities of solids under hydrostatic pressure up to 12,000 megabars: LEASON H. ADAMS and ERSKINE D. WILLIAMSON. The compressibilities of the following metals under hydrostatic pressures from two to twelve megabars have been measured by a comparative method—silver, bismuth, copper, zinc, brass, tin, cadmium, lead, gold, aluminium, tin-bismuth alloy. The results are accurate to about 1 per cent. of their values. In the case of the more compressible metals an estimation of the falling off of the compressibilities at higher pressures is obtained.

Compounds formed by the alkali oxides K_2O and Na_2O with the trioxides of aluminum and iron: GEORGE W. MOREY. A description of the preparation and properties of some alkali aluminates and ferrites.

Sulfuric acid as an acidimetric standard: MARSTON LOVELL HAMLIN and CHARLES BLAKE CLOUD. The preparation and use of 100 per cent. H_2SO_4 for a primary acid: nitric standard is described, previous work is cited, comparison of results with standardizations by other methods is given.

The production of ozone in the corona: F. O. ANDEREGG. One of the methods for the fixation of nitrogen is its "burning" in the electric arc, the combination being due chiefly to the ions. The laws that govern the important relationships between ionization and chemical action are still obscure. To simplify the problem the study with a single gas has been begun with the formation of ozone in the corona which is probably the simplest form of electrical discharge occurring at atmospheric pressure. Opposed to the ozonizing effect there is a deozonizing effect with a resulting equilibrium.

Some properties of the oxides of lead: L. H. ADAMS and H. E. MERWIN. The oxides PbO and Pb_3O_4 were prepared in well crystallized form and their densities and optical properties determined. The monoxide exists in two polymorphic modifications having an enantiotropic inversion point at about 570°. Some interesting effects of pressure on crystals of the yellow form of PbO are described.

A new illuminator for microscopes: ALEXANDER SILVERMAN. The illuminator consists of a small circular tube lamp surrounding the objective, and