inhibiting action of a certain serum varies to some extent for different corpuscles. Details concerning these differences will be published later.

5. *Heloderma* serum does not activate its own venom.

6. Although *Heloderma* is naturally immune against the chief toxic effects of its own venom, the venom will, when added to lecithin or to an activating serum, cause hemolysis of the blood corpuscles of *Heloderma, in vitro.*

7. The hemolysin passes through a Berkefeld filter, dialyzes very slowly, resists a temperature of 100° C. for 10 minutes, and is wholly or partially destroyed by heating to 100° C. for 30 minutes. It is, therefore, relatively very resistant to heat.

8. As the preceding statements indicate, the hemolysin of *Heloderma suspectum* differs in several respects from the hemolysins of snake venoms. It may also be added that compared with such powerfully hemolytic agents as the venom of cobra, the venom of *Heloderma* is only weakly hemolytic.

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The biological relations of seed proteins.

By **THOMAS B. OSBORNE.**

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At a recent meeting of this society, Reichert and Brown gave the results of their examination of the crystal forms of hemoglobins obtained from a large number of different species of animals.[1]

The crystallographic method was adopted because they believed that by this means they might succeed where the chemist had failed.

That the chemist has failed to establish differences between homologous proteins which are quite as marked as those indicated by the method employed by Reichert and Brown, I cannot admit.

Without wishing in any way to detract from the importance of the highly interesting results reported by Reichert and Brown, I would like to call your attention to the results obtained by purely chemical means in the investigations of the vegetable proteins

[1] Reichert and Brown: This journal, 1908, v, p. 66.

which have been made in my laboratory during the past years, and which are in complete harmony with the results of Reichert and Brown.

The most marked instance of the agreement of both physical and chemical characteristics of the protein constituents of any group of seeds with the biological relations of the seeds is shown by the proteins of the cereals.

The seeds of the cereals are the only ones containing protein soluble in relatively strong alcohol. These proteins yield no lysine, much proline and ammonia, relatively little arginine and histidine, and, with the exception of that from the maize — which, however, yields nearly 20 per cent. — very large amounts of glutaminic acid. There is likewise a close resemblance between these seeds in the character and proportion of the several different forms of protein which they contain.

The proteins of the leguminous seeds are very much alike but very different from those of the cereals. The proteins of the pea, horse bean, and lentil appear to differ from each other only in the proportion of their different forms, and from those of the vetch only in the absence of vicilin which is found in the other seeds.

The proteins of these four legumes differ distinctly from those of *Phaseolus* in properties, ultimate composition, and in the proportion of their decomposition products. Distinct differences have not been observed between the proteins of *Phaseolus vulgaris* and *Phaseolus radiatus*.

The proteins of the cow pea and the soy bean are different from one another, as well as from those of the legumes just mentioned, yet the proteins of all these seeds are very similar in most respects. The proteins of the lupines show the greatest divergence from the general type of leguminous proteins, but in the proportion of their decomposition products they are similar. There are differences between the proteins of *Lupinus luteus* and *Lupinus angustifolia*, although in most respects they are very much alike.

The proteins of such other seeds as have been carefully studied cannot be compared in respect to their botanical relations, because the seeds from which they have been obtained are not very nearly related to each other.

The results of my work have shown that no two seeds are alike in their protein constituents, and that those proteins which appear to be alike are found only in seeds that are botanically closely related.

As I have elsewhere pointed out, it would seem that these differences in the reserve food substances of the endosperm must have an important bearing on the character of the developing embryo which derives its first food from them.

This food substance, and the embryo as well, are the final products of the series of chemical changes which led to their formation. When the embryo begins its development it finds at hand a definite food; which for each individual of the same species is the same, but for the individuals of different species is different. Each member of a species begins its independent life under similar chemical conditions, but under chemical conditions which are different from those of every other species.

When, therefore, each individual plant reaches that stage of development at which its organs of assimilation are able to furnish it with nutriment from its external surroundings, it is highly probable that its chemical processes have already been established along definite lines which it must follow throughout the rest of its life.

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Variation in hydrochloric acid secretion during the digestive period.

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These observations were conducted on dogs having Pawlow double stomachs. After test meals of hashed meat, alone or mixed with crackers and water, it was noted that the percentage of HCl in the gastric secretion varied somewhat during the digestive period. Estimations of the HCl were repeatedly made for each hour during the period, by the Volhard method of chlorine determination, after neutralization of the juice with NaOH and careful incineration. The total chlorides and the metallic chlorides were determined, and the difference between them reckoned as HCl. By