tion. This belief can only be based on the tacit assumption that subcutaneously injected epinephrine is absorbed very rapidly into the blood stream, which is contrary to accepted experimental evidence. Since the discovery of the glycosuric action of epinephrine twenty-seven years ago, our dose of 0.2 mg per kilo and larger doses have been used in virtually hundreds of animal experiments by a great number of authors. In view of this the criticism of Cannon, if it were well founded, would be of far-reaching importance and it may therefore be worth while to examine the evidence he sets forth. First he calculates the equivalent of our dose of 0.2 mg per kilo of rat for a man of 70 kilos and arrives at the figure of 14 mg. This *argumentum ad hominem* can not impress those who know that the sensitivity of various species to drugs and hormones shows the greatest variation. There can be no doubt that the rat, rabbit, cat and dog are less sensitive to subcutaneously injected epinephrine than man. Secondly, Cannon states that pronounced physiological effects were obtained in rats with one twentieth of our dose. He does not mention the mode of application of epinephrine or describe the nature of the physiological effects observed. It is true that the *intravenous* injection of 0.001 mg of epinephrine per kilo per minute raises the blood pressure of rats, but this argues in our favor because experiments made in this laboratory have shown that the *subcutaneous* injection of our dose which is two hundred times larger has no effect on blood pressure. Hence, the absorption from the subcutaneous tissue must proceed at a rate less than 0.001 mg per kilo per minute which is, according to Cannon, within the physiological range. The dose we injected was *non-glycosuric* in animals rich in glycogen.[2] Absence of glycosuria under these conditions is generally accepted as evidence that the dose is moderate. Glycosuria appeared only when epinephrine was injected in conjunction with glucose feeding.[3] Cannon argues that the highest blood sugar in these experiments came early and was associated with the lowest glycosuria, and he concludes from this that the "huge doses disturbed the circulation." The figures on which Cannon bases this argument are as follows. Average sugar excretion from 0 to one hour 12 mg, from one to two hours 13 mg, from two to three hours 15 mg and from three to four hours 15 mg. It needs hardly to be emphasized that the increase in the average sugar excretion from 12 mg in the first hour to 15 mg in the last hour is not significant and Cannon's criticism is therefore ill-based. The rather constant sugar excretion from hour to hour was used for the following argument. It is definitely known that epinephrine acts only as long as it enters the blood stream. Since the glycosuria persisted for four hours, the absorption of epinephrine from its subcutaneous depot must have persisted for at least that length of time and from this it was calculated that the rate of absorption was well within physiological limits. This could recently be confirmed experimentally by determining the amount of epinephrine remaining unabsorbed in the subcutaneous tissue of the rat at various time intervals after the injection. In experiments to be reported in extenso elsewhere the following average values were obtained. Recovered after one hour 65 per cent., after two hours 52 per cent., epinephrine still present after four hours. This is direct evidence that the absorption proceeds at a very slow rate and shows that Cannon's assumption that our results were due to overdosage is unfounded. It would also seem that the mere fact that smaller doses of epinephrine than those used by us still influence metabolism can hardly invalidate our results.

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[2] C. F. Cori and G. T. Cori, *J. Biol. Chem.*, 79: 321, 1928.

[3] C. F. Cori and G. T. Cori, *J. Biol. Chem.*, 79: 343, 1928.

THE CHEMICAL NATURE OF ENZYMES

IN his "Outlines of Biochemistry" Dr. Ross Aiken Gortner reviews Willstätter's conception of the structure of enzymes as follows:

> Both Willstätter and Oppenheimer take the view-point that enzymes are amphoteric electrolytes which exist in a particular colloidal state. Willstätter discusses this question at considerable length, the conclusion being that enzymes contain a special reactive group which either combines with, or possesses some particular affinity for, definite groupings in the substrate, thus accounting for the specificity of enzyme behavior. This special reactive group is attached to a colloidal carrier, and enzyme action is determined in part by the affinity of the active group for the substrate and in part by the colloidality of the entire aggregate. He notes that when the colloidal properties of the aggregate are destroyed, then the activity of the enzyme likewise disappears.

Recently, in connection with a study of the insoluble tyrosinase of the velvet bean seed coat the writer prepared an aqueous solution from a mushroom (species not yet determined) which, when filtered through ordinary filter-paper appeared to be very clear and was found to possess marked activity toward the chromogen, 3.4-dihydroxyphenyl alanine, a constituent of velvet bean cotyledons. This filtrate was dialyzed over night in a cellophane dialyzing tube and the dialysate was found to be quite active,

although it was more dilute than the original filtrate. A repetition of the experiment duplicated the results.

Before using the dialyzing tubes they were tested with distilled water and apparently did not leak.

From these experiments it would appear that this particular mushroom contains a very active soluble tyrosinase which is either not colloidal or is so decidedly on the borderland between the crystalloidal and colloidal states as to invalidate a general application of the Willstätter conception.

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THE SECRETION OF ADRENALIN

THERE has been a great deal written on the subject of adrenalin reviving people after death. Dr. W. H. Schultz, of the University of Maryland, read a paper at the recent Physiological Congress in Boston showing that the factors ordinarily controlling the normal growth of adrenalin-secreting cells may be defective, in some instances, in a way that will make the gland capable of storing up adrenalin. Even thirty to fifty times the normal amount may be stored and if it is suddenly released can poison and even kill. Should one thousandth of the amount be suddenly released it would cause high blood pressure, whereas one hundredth of the amount would cause death.

It was chemical and biological studies that laid the foundation for the hospital treatment of hyperthyroidism—a dangerous disease involving questions of metabolism. Similarly this work lays a scientific foundation for hospital treatment of certain types of blood pressure.

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SIMON'S "LES ARACHNIDES DE FRANCE"

ALL students of the Arachnida will welcome another instalment (Part 3) of the long-awaited sixth volume of Eugene Simon's "Arachnides de France." This is a posthumous work carefully edited by his devoted colleagues, L. Berland and L. Fage. Simon began the publication of this great work in 1874, and the fifth volume was completed in 1884, volume 7, devoted to the Pseudo-scorpions and Opiliones, having been published in 1879. It was originally intended that volume 6 should treat of the families not considered in the previous volumes, but with the passing of the years while the author was busied with the preparation of his great work on the genera of the spiders of the world, this plan was abandoned. Instead, volume 6 was projected as in reality a new edition of the series; the earlier work was to be revised and brought down to date while the families which had been omitted were to be treated. Part I of the volume was published in 1914; the war intervened and at the time of Simon's death in 1924 no more had appeared. Fortunately, the manuscript was complete and the task of seeing the work through the press had been delegated to the present editors. By carefully executing this mission they have won the gratitude of all students of spiders throughout the world.

The present instalment, pages 533–772, completes the treatment of the family Argiopidae. The publisher is L. Mulo, Paris.

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HERMAPHRODITISM IN DENDRASTER

HEILBRUNN[1] has very recently reported in this journal two hermaphroditic specimens of Arbacia from Woods Hole. This increases the list of hermaphrodite echinoderms to five, two of Paracentrotus having previously been described by Herlant[2] and by Drzwina and Bohn,[3] respectively, and one of Sphaerechinus by Viguier.[4] While engaged in physiological investigations on the eggs of *Dendraster excentrica,* we found a hermaphroditic sand-dollar, the gonads of which were symmetrically divided into testicular tissue on the right of a diameter passing through the anus, and ovarial tissue to the left of it. The eggs were in better condition than the spermatozoa, and self-fertilization did not seem to be possible. As the first instance of hermaphroditism in the clypeastroid echinoderms, this circumstance may be worth record.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

DECEREBRATION OF THE DOMESTIC FOWL

THE domestic fowl has been little used in laboratory decerebration experiments because of the exceptionally high mortality that has accompanied such operations. Since there are obvious advantages in the use of the larger-sized bird, the following summary of procedure is presented in the belief that the method would be of interest. Domestic fowls

[1] SCIENCE, 69: 427, 1929.
[2] *Archives de Zool. Exp. et Gen.*, 57: 28, 1918.
[3] *Comptes Rend. Acad. Sci.*, 178: 663, 1924.
[4] *Comptes Rend. Acad. Sci.*, 131: 63, 1900.