bottom lies 6 to 8 feet below the present water table as exposed in Nicollet Creek, which feeds the west branch of Itasca. The bone bed varies in thickness up to about 4.5 feet. It lies from about 3.5 to 9 feet beneath the present surface of the bog, which consists of living grasses, sedges and marsh weeds growing above successive layers of massive peat, sandy peat, marly sand and more consistent marl having abundant snail shells. Immediately below this stratified bog is the old lake bottom of boulders, cobbles, gravel and sand.

The bones are well preserved and some of them, even as washed in the field, are distinctly seen to be mineralized. Their surfaces are knife-marked to an unusual degree. None have been noted bearing tooth marks of carnivores.

Among the bones rescued and identified in the field are those of bison (*Bison occidentalis*)[2] represented by a skull with horn cores, long bones, jaws, vertebrae, cartilage and fragmentary identifiable pieces. There are bones of elk, represented by several jaws, vertebrae and long bones—two of which have been modified for artifacts. There are a few bones of bear, caribou and, probably, moose and wolf. Besides, there are numerous bones of fish and carapace of at least two species of turtles.

Five stone artifacts have also been recovered from the bone bed, three of which are flake specimens with retouching, while the fourth and fifth are chopping tools chipped to rough, parallel faces, and retouched on working edges.

ALBERT ERNEST JENKS
UNIVERSITY OF MINNESOTA

A FIRE-BALL

THE electrical phenomenon known as a "fire-ball" is rather a rare occurrence. Therefore one that I saw at Fitzwilliam, New Hampshire, at 5 P.M. on August 10 may be worthy of record. I was seated on a second story porch enclosed with glass watching the storm. A radio aerial extends from a distant tree to a point on the side of the house some distance from the porch. Coincident with a crash of thunder, the fire-ball appeared. I can not say that it followed the wire or came from the sky. It just came out of space and seemed to move directly toward the window and then fell as though to enter the cellar of the house. It was a round, bronze, glistening ball with gleaming rays shooting from the top and sides; by its beauty and brilliance reminding one of an ornament at the top of a Christmas tree. Such was my fleeting sight of a fire-ball. Probably at the same instant, all electric fuses in the house blew out with unusual violence.

MARY ETHEL HUNNEMAN

SPECIAL ARTICLES

CATATONIA PRODUCED BY THE INTRODUCTION OF HEAVY WATER INTO THE CEREBROSPINAL FLUID

THE mammalian central nervous system is known to react to heavy water (deuterium oxide). Barbour and Trace[1] described in mice hyperexcitability succeeded by depression, when the animal's body water was about one third saturated with deuterium. Hansen and Rustung[2] in more acute experiments, with several cc of deuterium oxide at one time, described depression, catatonia and rolling movements. We[3] have seen the same effects, as well as potentiation of the convulsant action of ergotoxine.

In larger animals we have now achieved concentrations effective for the nervous system by injections directly into the cerebrospinal fluid, whence, due to slow drainage, the deuterium is dissipated much more slowly than from other sites.

Over the parietal brain cortex of seven rats we have introduced one or two tenths of a cc of deuterium oxide through a previously made trephine hole. The uniform result was catatonia (catalepsy). This state developed within a few minutes, lasting usually for many hours, sometimes being evident on the next day. Ultimately complete recovery occurred in all animals. Other central effects were observed in some; for example, the eyeballs receded in three rats, two showed ataxia and one showed hyperexcitability, with jumping. Two adult cats were also given deuterium oxide, by lumbar puncture, with the successful production of catatonia in both cases. This was accomplished in a female cat of three kilos by withdrawal of 0.4 cc spinal fluid, followed by injection of 0.7 cc deuterium oxide, 99.5 per cent., and in a male four-kilo cat, from which 1.5 cc fluid was removed and 2.8 cc deuterium oxide injected without excess pressure.

Abundant evidence has accumulated in this laboratory[4] of a variety of pharmacological actions occurring when 20 per cent. heavy water is in contact with body cells. In the catatonia experiments a like degree of saturation must have been attained in parts of the

[2] Identified by Dr. Samuel Eddy, associate professor of zoology, University of Minnesota.

[1] H. G. Barbour and Jane Trace, *Jour. Pharm. and Exp. Therap.*, 58: 460, 1936.

[2] K. Hansen and E. Rustung, *Klin. Wochenschr.*, 14: 1489, 1935.

[3] H. G. Barbour and J. B. Herrmann, *Jour. Pharm. and Exp. Therap.*, 1937. (In press.)

[4] H. G. Barbour, *Yale Jour. Biol. and Med.*, 9: 551, 1937.

central nervous system immediately adjacent to the cerebro-spinal fluid.

JULIAN B. HERRMANN
HENRY G. BARBOUR

LABORATORY OF PHARMACOLOGY
AND TOXICOLOGY
YALE UNIVERSITY

ATROPHY OF THE ADRENAL CORTEX OF THE RAT PRODUCED BY THE ADMINISTRATION OF LARGE AMOUNTS OF CORTIN

IT has been observed by Wyman and tum Suden[1] and by Ingle and Higgins[2] that transplants of adrenal glands do not regenerate in the presence of one intact gland. In unpublished studies Ingle and Higgins have noted that the regeneration of the enucleated adrenal does not take place in the presence of one intact adrenal, although the regeneration is consistently rapid when there is a "deficiency" in the activity of the adrenal cortex. Ingle and Kendall[3] found that the oral administration of large amounts of cortin suppressed the regeneration of enucleated adrenals. In addition to these results we have now found that the administration of large amounts of cortin to the normal rat will produce atrophy of the cortex of the adrenal and that this atrophy can be prevented by the simultaneous administration of a fraction of anterior pituitary extract which has high adrenotropic activity.

Male rats of the Wistar strain with body weight of 180 to 190 gm were matched in groups of three. One rat of each group received 10 cc of cortin daily in its drinking water; the second rat received 10 cc of cortin orally, and, in addition, 1 cc of an adrenotropic preparation[4] was given daily by intraperitoneal injection; the third rat was untreated. Six groups of rats were studied. At the end of seven days the adrenal glands were removed, weighed and examined histologically. The data on weights of the adrenals are summarized in Table 1.

TABLE 1
EFFECT OF ADMINISTRATION OF CORTIN ON ADRENAL WEIGHTS (BOTH GLANDS)

Treatment	Number of rats	Average, mg	Range, mg
Cortin only	6	14.7	14–16
Cortin plus adrenotropic preparation	6	25.3	24–29
Untreated	6	27.7	27–30

Our results indicate that the anterior pituitary or some mechanism which controls its activity is sensitive to variations in the amount of cortin in the body fluids or to physiologic functions influenced by cortin and that the changes in the adrenal cortex are mediated by changes in the output of the adrenotropic principle from the pituitary. When the physiologic requirements for cortin are increased there is an increase in the output of the adrenotropic principle, and when cortin is present in the body fluids in excess of physiologic requirements the output of adrenotropic secretions from the pituitary is suppressed. The experimental results and deductions of a number of other investigators support this hypothesis, and at the present time we are not aware of any contrary evidence.

D. J. INGLE
E. C. KENDALL

THE MAYO FOUNDATION
ROCHESTER, MINN.

1 L. C. Wyman and Caroline tum Suden, *Endocrinology*, 21: 523, 1937.

2 D. J. Ingle and G. M. Higgins, *Proc. Staff Meet.* Mayo Clinic, 12: 204–205, March 31, 1937.

3 D. J. Ingle and E. C. Kendall, *Proc. Staff Meet.* Mayo Clinic 12: 505, Aug. 11, 1937.

4 This fraction was prepared by the method of Moon and was supplied to us through the courtesy of Dr. O. Kamm, Detroit, Michigan.

THE SPARING ACTION OF LACTOFLAVIN ON VITAMIN B_1

THE sparing of vitamin B_1 by feeding high levels of certain substances was demonstrated several years ago by Evans and Lepkovsky,[1] at which time they attributed the beneficial effect of autoclaved yeast to the presence of vitamin G or B_2. Since then vitamin B_2 has been identified as lactoflavin and its availability in crystalline form has revived interest in this important problem.

The data presented here were obtained from three groups of 28-day albino rats whose mothers had been reared from weaning on diets adequate in all respects for growth and reproduction and varying only in their content of lactoflavin. The 1E grade of lactoflavin of the Borden Company was used, and, while not in crystalline state, it had tested free of vitamin B_1 and other water-soluble vitamins. The lactoflavin was added to the basal diet in such quantities that the final three diets contained approximately 1, 2 and 3 Bourquin-Sherman[2] units per gram, which for convenience will be designated here as diets 1, 2 and 3. In the experience of the author 2.9 γ of crystalline lactoflavin has been equivalent to 1 Bourquin-Sherman unit.

The 28-day young, whose previous dietary had been similar except for the lactoflavin content of the maternal died, were placed upon the Chase and Sherman vitamin B_1 deficient diet[3] and their weight recorded weekly until death. Three males and three females of typical weight were selected from each of the three diets.

1 H. M. Evans, S. Lepkovsky and E. A. Murphy, *Jour. Biol. Chem.*, 108: 429, 1934.

2 A. Bourquin and H. C. Sherman, *Jour. Am. Chem. Soc.*, 53: 3501, 1931.

3 E. F. Chase and H. C. Sherman, *Jour. Am. Chem. Soc.*, 53: 3506, 1931.