planned and in the main conducted by Armsby, and, after Armsby's death, was completed by the writer and his associates, and published in 1926.[4]

In this work the energy outgo during fast was used as the base value of heat increments of food for maintenance, and the heat production of maintenance was used as the base value of heat increments of food for body increase and milk production. On this basis the relative efficiency of utilization of metabolizable energy for maintenance, milk production and body increase was found to be, on an average, as 79.1, 72.8 and 57.3 per cent., respectively.

During recent years, however, the writer and his associates have advocated another point of view in this relation, involving the conception of a new base value of heat production—that of fast minus the energy expense of utilization of the body nutrients katabolized during fast. The present indication, from investigations not yet completed, is that from this more fundamental point of view the utilization of metabolizable energy for maintenance and for moderate amounts of body increase may be indeed essentially the same.

E. B. FORBES
THE PENNSYLVANIA STATE COLLEGE

HEPARIN AND BLOOD CLOTTING

IN a recent note[1] on this topic Astrup emphasizes the need for a plasma (or serum) factor necessary to the inhibitory action of heparin. It should be recognized that this was clearly enunciated by Howell and Holt[2] in the original work on heparin and, under the name of the *pro-antithrombic* (or *antithrombin-ogenic*) factor, has always held a prominent place in Howell's theory of blood coagulation. Quick[3] afforded evidence that the accessory factor was associated with the albumin rather than with the globulin fraction of the plasma proteins. Some recent investigations[4] confirm this point but stress a new interpretation which appears to clarify the "controversial statements" in the literature. It has been found that heparin readily *prevents* thrombin formation (the *antiprothrombic* action of Howell and Holt), provided that pure cephalin is used as the thromboplastic agent in forming thrombin from recalcified prothrombin. However, if tissue extracts (thrombokinase) or crystalline trypsin (thromboplastic enzyme[5]) are used instead of cephalin, the antiprothrombic action of heparin is overcome in all but the first minute or two of the process of thrombin formation.

The synergistic *antithrombic* (thrombin-*neutralizing*) effect of heparin-albumin mixtures is not dependent upon the mode of thrombin formation, in experiments which avoid thrombinolysis. Additional work is necessary to elucidate the true nature of "antithrombic" action, but there are clear indications that it shares with the process of thrombin formation a significant dependence upon the phospholipid-protein interrelationships in which a trypsin-like enzyme plays a leading rôle.

JOHN H. FERGUSON
UNIVERSITY OF MICHIGAN

THE BLACK DYE OF THE NAVAJOS

CARNOTITE, a canary yellow mineral usually found as a powder in the sandstones and conglomerates of the Colorado Plateau, has been and still is used by the Navajo Indians to make a black dye to color the wool which they shear from their sheep to make the famous Navajo rugs.

Carnotite is known to-day to be an ore of radium, uranium and vanadium. It was not until 1898 that the chemical composition was determined by Fuedel and Cummenge, of Paris, from samples obtained from the Colorado Plateau by Kimball and Poulot. Long before that, the Navajo Indians had learned the art of preparing a rich black dye from the yellow mineral —"a uranium black." The yellow powder had formerly been reported as "yellow ochre," a form of limonite.

The writer is indebted to Mrs. Louisa Wade Wetherill, of Kayenta, Arizona, for the method used by the Navajo Indians in preparing the dye. The carnotite powder is roasted in a frying pan placed over an open fire until it changes in color from yellow to black. In a similar manner, the Navajos roast the pitch from the pinyon trees (stunted pines) that grow on the high mesas in the region. The pitch becomes brittle and breaks down to a black powder. These two black powders are then mixed and stirred into a solution prepared by boiling the entire plant of the squaw-berry bush (*Rhus trilobica*) in water until it assumes the color of tea. This makes a concentrated dye which is further diluted with water to the required strength.

In a rug which the writer obtained from the Western Navajo Indian Reservation, the uranium black dyed wool was used in combination with wools colored with natural vegetable dyes prepared from the root of the caniegra plant (wild pie plant or dock). Various colors may be obtained by varying the length of time the roots of the plant are boiled in water. The colors range from *old gold* through *greenish yellow* to a brown approximating the color of *burnt sienna*. The longer the period of boiling, the more brownish is the color obtained.

DANIEL T. O'CONNELL
THE COLLEGE OF THE CITY OF NEW YORK

[4] *Jour. Agr. Research*, 33: 483–492, 1926.
[1] T. Astrup, SCIENCE, 90: 36, 1939.
[2] W. H. Howell and E. Holt, *Am. Jour. Physiol.*, 47: 328, 1918.
[3] A. J. Quick, *Am. Jour. Physiol.*, 115: 317, 1936.
[4] J. H. Ferguson, *Proc. Soc. Exp. Biol. and Med.* (in press).
[5] J. H. Ferguson and B. N. Erickson, *Am. Jour. Physiol.*, 126: 661, 1939.