College of Medicine. A Chinese professor of history, seeing the academic garb, exclaimed: "You have borrowed the ceremonial costume of the T'ang dynasty!" The west has indeed received from the east!

And I think also of the great cathedral in Peking, the site for which was given to the Jesuit fathers by the great emperor Kang Hsi in 1698 after he was cured of malaria by the Peruvian bark which these fathers had brought with them. The west was sharing with the east its medical discoveries.

It is in this spirit that I look forward to the going out of the graduates of Jefferson Medical College to-day, that they shall endeavor to find, wherever their lot is cast, elements that may enrich and strengthen the common humanity of which we all are a part.

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THE NET ENERGY CONCEPTION[1]

THE net energy conception of Armsby is the simplest and most inclusive of all general measures of nutritive value.

Net energy is the remainder after the deduction of all expenses and losses of utilization from the gross income of energy. Protein as well as non-nitrogenous nutriment contributes to the net energy, having an energy value, after its use as protein, and after deaminization, approximately equal to carbohydrate.

More specifically, the net energy of a feed is its total heat of combustion, that is, its gross energy, minus the energy equivalent of the feces, the urine, the epidermal offal, the methane and the heat produced by fermentation of carbohydrates in the alimentary tract, and the energy represented by the increase in heat production due to the feed consumption and utilization.

In terms of its use by the animal, the net energy of a feed is a measure of its capacity to contribute to maintenance, work and material production—as of flesh, milk, eggs, wool, etc.

The net energy conception implies nothing as to the method of utilization of the net useful nutriment. It simply measures that part of the total which is useful. Net energy may be used to supply any requirement, of whatever nature, for energy-producing nutriment.

Feeding standards based on the net energy conception, therefore, must consider all those conditions of practice which determine quantitative feed requirement in exactly the same way as do all other feeding standards.

[1] From an address before the American Society of Animal Production on December 2, 1923.

The use of net energy values does not imply that the total nutritive value of a feed or the entire nutritive requirement of an animal can be expressed in these terms. In fact, since the net energy value of a feed expresses its worth for only the one class of requirement implied by its designation (net energy) it is necessary in basing a feeding standard on this conception to make separate statements of other nutritive requirements, as of protein, mineral nutrients, etc., just as in the case of other feeding standards.

The justification for the use of net energy values as measures of food value generally is that, no matter what the purpose for which an animal is fed, several times as much nutriment is used, directly and indirectly, for energy production as is used for any other purpose or all other purposes combined. Admittedly, net energy is not a complete measure of nutritive value; no one unit can possibly measure the entire nutritive value of a feed, because nutrition involves several classes of nutrients, each of which is essential in the sense of not being replaceable by another. But net energy is the best possible standard for the expression of the most extensive nutritive requirement, and is, in this sense, the best possible single measure of food value generally.

Net energy of the same feed for different kinds of animals, or for different kinds of production, does differ, and so must be determined separately.

The following factors have determinable but practically negligible effects on net energy values: individuality, plane of nutrition, feed combinations (in relation to digestive efficiency and the dynamic effects of feeds), and the physical condition of feeds, as related to digestibility and energy-cost of handling.

Thermal environment, below the critical temperature, decreases net energy values, but in practice this does not ordinarily happen, because it is more profitable to keep the thermal environment above the critical temperature.

The following conditions affect quantitative feed requirement, but not the net energy values of feeds:

Exercise, as affected by fatness, sex, temperament, breed and type; light, as a stimulus to metabolism; age, as affecting intensity of metabolism, especially oxidative functions; temperature of air, feed and water, humidity of air, and wind velocity—so long as these factors, combined, do not exceed the animal's capacity for physical heat regulation.

The net energy conception, therefore, affords a discriminating method for determining and expressing important differences in feeds which are not revealed by other systems of feed comparison; recognizes the final energy-value of the protein of the feed; recognizes not only liquid and solid wastes, but also wastes in gaseous form and as heat; recognizes the different

nutritive cost of different kinds of production; distinguishes between the net portion which is useful and the large fraction which is useless, in feeds; and is scientifically significant in being expressed in the unvarying terms of physical measurements.

The newer knowledge of nutrition, especially regarding proteins, mineral nutrients and vitamins, has been quite without direct effect to modify the previous understanding as to energy metabolism.

Like any general measure of nutritive value, net energy is essentially a conception of convenience, and not an absolute standard, since it must ignore the finer points of specific effects of foods.

It can not be fairly judged from the point of view which regards each feed and each ration as presenting a separate chemical problem. In this light no feeds are comparable by any common measure.

Following the presentation of this paper a committee of the society was appointed to formulate a resolution expressing its attitude toward the net energy conception of Armsby, and the work of the Pennsylvania Institute of Animal Nutrition. The following resolution was reported and unanimously adopted:

Resolved, That the American Society of Animal Production, in annual convention assembled, strongly endorses the program of work of the Pennsylvania Institute of Animal Nutrition.

Scientists throughout the world realize the outstanding importance of the classical researches conducted at this institute by the late Dr. H. P. Armsby and his associates with the respiration calorimeter.

These investigations have revealed many important fundamental facts regarding the nutrition of farm animals and have furnished the most accurate quantitative measure of the productive value of different feeding stuffs.

The society endorses the Armsby conception of net energy values derived from his researches with the respiration calorimeter. It realizes that on account of the time and expense involved in net energy determinations it was possible for Dr. Armsby and his colleagues to make direct determinations on only a limited number of feeds. Furthermore, the larger proportion of the investigations have been conducted with steers. The society therefore appreciates deeply the importance to the animal industry of this country and of the world of continuing these researches and extending them to include the other classes of farm animals.

These investigations are of a type which involve great expense, and furthermore, are of world-wide importance. It is fitting, therefore, that the greatest possible use be made of the equipment of this institute which is the only such apparatus in the world.

Realizing the need for the continuation and expansion of this work the society strongly recommends that the United States Department of Agriculture extend to the Pennsylvania Institute of Animal Nutrition the fullest cooperation and support.

(Signed) FRANCIS G. BENEDICT,
JOHN M. EVVARD,
A. J. GRAMLICH,
A. G. HOGAN,
F. B. MORRISON, *Chairman*

Subsequently, the writer reviewed this action by the Society of Animal Production before the Subcommittee on Animal Nutrition of the National Research Council, of which he is the chairman; and this committee expressed its approval of the action of the society.

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SCIENTIFIC EVENTS

THE LONDON AQUARIUM

THE new aquarium in the Zoological Gardens was opened to fellows and their friends on April 5 and 6, and to other visitors to the gardens from April 7.

According to an article in the London *Times* the installation is the greatest enterprise undertaken by the Zoological Society in the course of its history, now nearly a century long. The building is placed under the Mappin Terraces, the hills of which conceal the high level reservoirs of the circulation system and give the necessary protection from inequalities of temperature. The area occupied is a crescent, following the curve of the hills and is almost exactly 450 feet in length. There are 25 tanks, ranging in length from 30 feet to 6 feet, for fresh-water creatures; 17 tanks, the largest two of which are over 30 feet, for marine animals; and there are 40 smaller tanks for tropical fish. The total cost of erection, equipment and stocking has been nearly £54,000, met partly by realization of the society's freehold property and partly by a loan guaranteed by the president, the Duke of Bedford, and the Fishmongers' Company. To provide for the cost of maintenance and a sinking fund for the debt nearly £10,000 a year will be required, and it is therefore necessary to make a charge for visits to the aquarium in addition to the payment for entrance to the gardens.

The anterior is divided into three halls, each with the same scheme of decoration, designed to show the aquatic creatures to the best advantage. The floors are paved with dark rubber, silent and pleasant to the foot, and the walls, columns and ceiling are enamelled in shining black. There are pendant electric lights in case of need, but the general illumination comes only through the windows of the tanks. Each of these is set back in a deeply shelving frame of dark green marble composition. The general