the country is not receiving the benefit of all of the ideas worth considering. Independent inventors are reluctant to contribute the fruits of their efforts through a board whose members are identified with large industrial concerns. Unfortunately the sad story of the inventor who receives no compensation for his discoveries is only too well known. He lacks the means for proper experimentation, as well as for manufacture, and to obtain aid of the capitalist he has to mortgage his prospects too heavily.

A correspondent has suggested that prizes should be offered to stimulate individual enterprise, but only investigators having private means would be in a position to compete for such prizes. It would be a better plan for the government to offer scholarships and to maintain extensive research laboratories and shops where experimental work could be done on a large scale. The work of thousands of inventors is entirely wasted not only because of duplication, but because they are compelled to abandon their investigations after making some discoveries of more or less potential value. If records of their work were preserved a new epoch in the advancement of science might be inaugurated.

On April 2, W. H. Fauber, of Brooklyn, addressed a paper to the board of governors of the Aero Club of America advocating the creation of a government board of invention and research in aeronautics. He also called attention to the fact that it takes so long to adjudicate a patent that the inventor is apt to die during the process, and that an invention really is not protected unless it is in the hands of a powerful corporation.—The New York *Evening Sun.*

SCIENTIFIC BOOKS

BOOKS ON FOOD

William M. Bayliss, the celebrated English physiologist, has written a small volume entitled "The Physiology of Food and Economy in Diet" (Longmans, Green and Co., 1917). In a hundred pages he presents in clear, concise and fascinating language the fundamental principles of nutrition. Bayliss, though noted for his work on the secretory glands and not recognized as an expert on nutrition, has nevertheless written with the appreciative touch characteristic of the master mind.

Miss Winifred Stuart Gibbs, the supervisor of home economics of the New York Association for Improving the Condition of the Poor, has made a valuable contribution to the food problem in "The Minimum Cost of Living" (The Macmillan Co., 1917). The income and expense accounts of seventy-five families receiving charitable aid, in the form both of advice and of money, were analyzed. A food allowance made up from twenty-two items in quantities calculated to suffice for the maintenance of the family, as constituted, gave very successful results. The author states: "Any one who has had experience in working with the tenement population knows how intimate a connection exists between food and the more common diseases of poverty." Thus, before the allowance was granted, record after record read, "children anemic," or "mother suffering from malnutrition." But the allowance of a minimum standard laid the foundation of good health. "Such a sum can restore shattered nerves and renew courage for a mother who has been harassed by irregular and uncertain payments of an income inadequate at best. Such an assured minimum can change pale, listless children into rosy-cheeked romping boys and girls." The "unit" of value for food per "man" per day was taken at 3,000 calories and cost on October 1, 1916, thirty-four cents. Children were rated according to their ages at various fractions of a "man." These latter values appear to be minima. The book tells of an inspiring deed of good work.

Another book, "Food for the Worker," by Miss Frances Stern and Miss Gertrude T. Spitz, with a foreword by Lafayette B. Mendel (Whitcomb and Barrows, 1917), should fill a great need at the present time. In this volume are found 120 household receipts, with their food values, and the arrangement of these recipes into different menus of balanced rations for use during a period of forty-nine days or seven weeks. It should be of aid to any economical housewife, although it aims specifically

to designate the food requirement of a family of five, containing three children whose ages are between eight and sixteen. The diet provides 12,500 calories, contains 375 grams of protein, and cost one dollar and six cents per day in July, 1916. Of this, twenty-four per cent. was spent for bread, thirteen per cent. for milk, fifteen per cent. for meat, and the rest for seventy other articles. The bread ration contained 4500 calories or 35 per cent. of the total energy value of the food. This kind of information is of highest value to the housewife of limited means and can be successfully applied by any intelligent person.

"The Mothercraft Manual," by Miss Mary L. Read (Little, Brown and Company, 1916), presents, in language which is a delight, modern as well as old world knowledge helpful in the creation of the best environment for the family and describes the care, nutrition and development of the child.

GRAHAM LUSK

SPECIAL ARTICLES

THE THEORY OF SEX AS STATED IN TERMS OF RESULTS OF STUDIES ON PIGEONS[1]

AT the 1911 meeting of this society, in Princeton, I first made known the fact that the sex of pigeons had been experimentally controlled by Professor Whitman. The main fact of method being briefly that from a family cross practically only males, and from a generic cross nearly all males, are produced; but if, by special means the birds of generic crosses are forced to excessive reproductive overwork then the earlier eggs of such a series produce mostly or only males, while the later eggs—from the end of the series—will produce mostly or only females. At the same time and place I made to this society a first report upon the nature of the results of my own studies upon the ova of some of these sex-controlled series. These results then indicated—to quote from the published abstract of that paper[2]—

that eggs (yolks) of *smaller size, higher water-content* and *smaller energy-content* (*i. e.*, fewer units of physiologically available energy) can be *correlated* with *maleness* in the offspring. That eggs (yolks) of *larger size, lower water-content* and *greater energy-content* can be *correlated* with *femaleness* in the offspring.

The later results, which I have from time to time presented before this society and elsewhere, have fully confirmed and much extended the evidence for that early announcement of the nature of the germinal differences which characterize the two sexes.

Though all of the several lines of study that I have carried out on the doves and pigeons have thrown light on the *nature* of germinal and adult sexual difference most of these lines of study were primarily designed to test the possibilities of selective fertilization, differential maturation and elective elimination of ova in the ovary as alternatives of a true sex-reversal or control. In view of the well-established fact that the hetero-gametic sex produces germs of two kinds—a sex-chromosome being a differential already recognized—it has seemed obligatory to supply decisive tests for the possibilities just named. This has all been thoroughly done in the pigeons; the result has been made possible because the female here is the hetero-gametic sex, producing male and female ova, and we have here learned to identify each of the two kinds. In these forms Whitman controlled sex and clearly demonstrated the methods of control. In these same forms I have for six years repeated the control and fully confirmed the method. In addition I have obtained adequate proof of the reality of the sex-control as against the above-mentioned alternatives and have further shown that in this material sex is a matter of essentially *all* gradations. And, of signal and unique importance is the fact that all, or at least many, gradations of sex are obtained from the same pairs of parents. The *outlines* of these findings have been published in several short papers beginning in 1911;[3] the entire body of evidence

[1] Paper read December 28, 1916, before the American Society of Zoologists (New York Meeting).

[2] SCIENCE, N. S., Vol. XXV., No. 899, pp. 462–463; March 22, 1912.

[3] See under note 2; and, Carnegie Year Book, 1913; SCIENCE, Vol. 39, 1914; *Bull. Amer. Acad. of Med.*, Vol. XV., 1914; *Amer. Nat.*, Vol. L., July, 1916.