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A NATIONAL LABORATORY OF HUMAN NUTRITION[1]

THE Inter-Allied Scientific Food Commission, which held meetings during the spring and early summer of 1918 in Paris, Rome and London, decided to recommend to the four governments represented, those of France, Italy, England and the United States, that a laboratory for the study of human nutrition be established in each of those countries. The commission called attention to the fact that at least one quarter of the income of a nation is devoted to the purchase of food by its individual citizens and that, since the poorer the individual the greater is the proportion of his wage devoted to the purchase of food, it is therefore a matter of the highest importance for the welfare and prosperity of a country that the methods of the best possible utilization of its food resources for the benefit of its citizens be sought out and in time definitely established by reliable scientific data.

The comforts which one enjoys in the modern world are derived from the advance of science. Though the so-called "practical man" says he will accept no "theories," yet in reality he never acts except upon some theory of his own. The difference in the value of the opinions of the "practical man" and the "scientific man" is that the theories of the latter are more likely to be correct than those of the former.

If one looks back into history one notes the influence which an American-born scientist, Count Rumford, had upon the fortunes of Bavaria. Among the 60,000 inhabitants residing in Munich there were so many beggars and vagabonds, who were all potential thieves, that in the year 1790 Rumford authorized the seizure of 2,600 in one week and put them to

[1] A paper prepared in London in June, 1918, at the request of Professor Langlois for publication in France.

work under well-ordered and kindly direction. He also provided a soup kitchen which could feed a thousand or more people, and he prided himself that it cost only half a franc to pay for the fuel to cook for a thousand persons. He endeavored to introduce the use of maize meal into Bavaria and gave exact directions as to its cooking. He employed soldiers, who had acquired habits of indolence, upon public works. He arranged little gardens for the military, in which they cultivated potatoes, and through his improvements in the processes of cooking, by means of better boilers which consumed less fuel, he endeavored to make the soldiers much more comfortable than they had ever been before and at much less cost. He sought to improve the live stock of the country by proper breeding. He believed that science was at the foundation of all reformatory enterprise and in his own words sought "the providing of the wants of the poor and securing their happiness and comfort by the introduction of order and industry among them." And his results were successful because his theories were sound.

One can trace the life of this Bavarian community yet further, for in 1822 Liebig resided in Paris and met there the pupils of the great French scientist, the immortal Lavoisier. Liebig took back with him the fundamental truths discovered by this great Frenchman and later the town of Munich built the first great chemical laboratory, a laboratory destined to become the one in which his successor enriched the world by the discovery of artificial alizarine.

Lavoisier was the first to establish the modern truths concerning the nutrition of man and stated "La vie est une fonction chimique." He called attention to the fact that his experiments showed that the poor laboring man needed more food than the rich man who did no work, and yet that the laborer was much the less likely of the two to get sufficient food.

The provision of man with adequate food is a social obligation of the highest importance. In the middle of the eighteenth century Benjamin Franklin noted that where there was famine there was disorder, and that where there was disorder famine followed in its train. This, indeed, we now believe to be the sum and substance of the recent Russian revolution. After the Napoleonic wars famine devastated portions of Europe. In Magendie's "Journal de physiologie"[2] there is an account of famine which occurred in six provinces of France during the winter of 1817, the second following the Congress of Vienna, a time of great distress in Europe. A dropsy of a peculiar kind developed. Curiously enough, just one hundred years later, in January, 1917, a malady called "war edema," broke out in Germany and Austria, especially among prisoners of war. The cause of the disease was attributed to lack of nourishment, especially to lack of fat in the diet, for after giving 100 grams of fat daily for a week to each of three different patients a complete cure was effected without resort to any other remedy.

A national laboratory of human nutrition would have many unsolved questions to answer and perhaps a few of these questions might be suggested in this article.

There should be researches into the requirements of food necessary to maintain health, strength and work in men, women and children engaged in various occupations. It is well known that a man who is over the average weight is an inefficient laborer, but it is not certain whether a man who is reduced in weight and receives good food is as efficient as when he is of average weight. He might easily be just as effective and possibly more effective a worker when thin than when of average weight.

Another important question is whether the ration of about 500 grams of meat per day which has existed for over a hundred years in the American and English armies is not altogether too high for production of the maximum of physical work which can be accomplished by a soldier. It may well be that such a diet of meat may tend to mental relaxation and to a sensation of difficulty in the performance of a task, such as has been actually ob-

[2] Gaspard, B., "Effets des alimens végétaux herbacés," *Journal de physiologie*, 1821, I., 237.

served in laboratory experiments upon men who have taken large quantities of meat.

Furthermore, it would be interesting to know how much milk is required every day for children of various ages. It is not known to-day how much milk must be taken to prevent rickets developing in children.

It is also unknown how much food a child should be given at different ages, or whether a boy needs more additional food in order to do a certain amount of work than his father would need to accomplish the same amount of work. It may be that the growing muscles of a boy are not as efficient machines as those of an adult.

Then there is a vast field in the study of the psychology of food. The Jews are told as children that pork is unfit for food and they rarely conquer their repugnance to it. The English are told as children that maize is food for pigs, and though Americans eat maize bread with pleasure and have recently done so to a huge extent in order to make possible exports of wheat to Europe, the English persist in their unfounded prejudice against it. I once had a diabetic patient who was one of my own students and he had heard me say in my lectures that the sugar levulose was the only sugar that could be used by the body in that disease. When 100 grams of levulose were given to him he was apparently greatly benefited. His strength improved, as measured with an ergograph, and all his classmates remarked upon the wonderful change in his spirits. Alas, none of the sugar was used in his body and all the apparent benefit was derived from mental suggestion. In this little story lies the essence of much sincere self deception, as well as the foundation of dangerous frauds, such as are exploited by makers of patent medicines. It is also evident that the testimony to the effect that 500 grams of meat are desirable for a soldier may rest on an extremely shaky foundation.

A laboratory of human nutrition should have at its disposal a close statistical analysis of the available food supply of the country and should be able to advise the government so that a sufficient quantity of suitable food may be always available. Thus, chemical analysis of the food products, which would show approximately the quantity of food materials obtainable from any given source, such as maize or hogs or cattle, should each year be determined.

There should also be an investigation into the food resources of the country so that they may be used in the best interests of human beings. For example, it is wrong to feed bread grains to pigs when human beings need them more.

If these four laboratories, British, French, Italian and American, be established, the directors should meet together annually and discuss results. And it would be wise to arrange for the exchange of trained assistants.

It may be said that to build a nutrition laboratory would be too costly for the state. In this connection it should be remembered that in Germany for the past eighty years, even in times of her greatest poverty, money has always been spent for laboratories accompanied by recognition of her scientific men, and these things made her rich and powerful more rapidly than culture lessened her inherent barbarism. Before gold was discovered in Alaska and in South Africa, I heard a professor of geology in New York say that the geological formation in these two sections was such that gold probably existed there. Other people got the gold that the scientist knew about. Take another illustration. Biffen, of Cambridge, England, developed a new brand of wheat called "Little Joss." In 1913 this brand of wheat was sown and it produced four bushels per acre more wheat than any other variety. The gain to the farmers that one year alone amounted to $1,000,000, while the laboratory in which the work was done cost $200,000 to build. It is probable that the work of a nutrition laboratory especially designed for investigations into the food requirements of man could be carried on at an expense of less than one hundredth part of one per cent. of the cost of the food supply of each of the Allied Nations, and if the director of such a laboratory were a man of broad vision and creative imagination, the laboratory would be certain to add to the knowledge of the

world, to the welfare of the community and to the dignity and honor of the nation.

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THE IRWIN EXPEDITION[1]

The Irwin Expedition of Indiana University organized in cooperation with the University of Illinois which started in June, 1918, to study the fresh-water fishes of Peru and Chile and of the Titicaca basin, has returned, bringing very large collections. Miss Adele Eigenmann, a medical student in Indiana University, returned in January, Mr. W. R. Allen traveling fellow of the University of Illinois, returned in April, and I returned the first of June.

Aside from the institutions mentioned the expedition had the cooperation of the American Association for the Advancement of Science, and the Bache Fund of the National Academy of Sciences.

Five weeks were lost in New Orleans waiting for passports. This delay made it inadvisable to attempt to cross the Andes at Cajamarca as planned and the expedition went directly to Callao. From Callao we went together over the Central Railway of Peru to Oroya. From Oroya Mr. Allen went to Lake Junin and down the valley of the Huallaga. Miss Eigenmann and myself first went south as far as Huancayo, later east to La Merced, at an elevation of 2,500 feet, then north to Cerro de Pasco and Gollalarsquisca, then to Casapalca, from where we examined various lakes, reaching an elevation of 15,900 feet. We then returned to the coast, went south by steamer to Mollendo, and by the Southern Railway over the crest of the Andes at Crucero Alto (nearly 14,000 feet) and north to Cuzco. Collections were made at Cuzco, in Lakes Lucre, Urcos, and Langilaio, Chinchero and Huaipo, and in the Urubamba, from its source at La Raya (13,370 feet) to Santa Ana, in the tropics at an elevation of 2,500 feet. We visited La Paz to secure concessions for Mr. Allen in Bolivia, and then we returned to Lima, at the end of 1918. Early in January we went by steamer north to Paita, from where Miss Adele returned home. I went inland from Paita to Piura, south to Pacasmayo and inland from Pacasmayo to Llallan. I returned to Lima at the end of January.

Mr. Allen, after some delay from fevers and other causes, returned from the Huallaga early in November to Lima, and then went direct to Lake Titicaca. He spent the time from December to May about Lake Titicaca. He went entirely around the lake, in part by rail, in part by boat, and in part afoot, collecting in many of the tributaries. He devoted particular attention to securing a set of the parasites of the fishes of Titicaca for the University of Illinois. It is hoped that the parasites will give some indication of the origin of the peculiar fishes so abundant in the high Andean lakes.

In February I went south to Chile, and collected in some of the rivers between Puerto Montt and the Rio Copiapo, which is the last of the rivers south of the Desert of Atacama. I also crossed from Puerto Varas, on Lake Llanquihue, to Lake Nahuel-Huapi, in the Argentine, collecting on the way in Lake Todos Santos and in Laguna Fria.

Large quantities of material were collected, and it will take many months to make a complete report. It is interesting to state that we secured four distinct faunas. The fish fauna of the region about Puerto Montt is highly tinctured with species belonging to families that are also found in Australia. These begin to decrease north of Valdivia. At Conception, aside from the lampreys, only one Australian type was found. The fauna about Santiago is quite different from that about Puerto Montt, and north of Santiago this fauna gradually dwindles. In the last river south of the desert, at Copiapo, only introduced gold fishes were found. It is probable that pejereyes and other fishes of marine origin are to be found about the mouth of this river. About Copiapo it rarely rains, but at Puerto Montt and Valdivia in the south the

[1] Mr. Will G. Irwin, of Columbus, Ind., made the expedition possible. See Science, August 2, 1918.