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THE LONG AND SHORT OF NUTRITION[1]

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MODERN nutrition was getting under way about the time of World War I; it is about as old as the science of aviation. The origins of both can be dated somewhat earlier, but in the intervening years of gradual development the few voices that were raised in high prophecy were drowned out by the derision of scoffers. Many of the classical nutritionists who had dealt with protein and calories snorted at the simple techniques of the new school as representing a bankruptcy of brains. "Anybody can feed animals, anybody can do vitamin work." It may be admitted that anybody could have done some of it, that some of it should perhaps not have been done by anybody, but to-day it stands justified. Not only has the "importance of little things" in the diet been revealed, but remarkable progress has been made in the understanding of how these little things work. With the growth of the concept of vitamins there have been amazing advances in the study of enzymes, some of which contain vitamin components in the molecule or require them as co-enzymes. Through the jungle of cellular oxidation trails are gradually being blazed; the uninitiated traveler can not yet readily find his way, but the paths are being cleared and markers and guide-posts are being placed. The new vantage points thus provided have suggested new approaches to the study of the metabolism of all the foodstuffs, in particular, of minerals and of protein.

Discoveries in physics, in theoretical and organic chemistry and the new techniques growing out of them have furnished new tools for the solution of old problems. They have also created new problems, and have raised more questions than they have answered. Levene[2] once said, "so long as life continues the human mind will create mysteries." But we can also

[1] From an address on the Annual Sigma Xi Day at the University of Rochester on February 22, 1944.

[2] P. A. Levene, SCIENCE, 74: 23, 1931.

subscribe to the faith which Sir Frederick Hopkins[3] expressed in his Harvard Tercentenary address, that "biochemical and physiological activities will in the end reach to a description of living systems which, in so far as they are chemical systems, will be complete."

If there is a "long" and a "short" to nutrition, the description of living systems in completeness is the "short" of it; the goals are almost in sight. The "long" of it will be the application of this knowledge, to the end that the human family shall be more adequately nourished. The reason why this is the "long" of it is that human beings are not merely chemical systems; superimposed are certain incommensurables, imponderables. Ignorance, prejudice and selfishness are among the causes of man's lack of an inward grace, as the prayerbooks say, and these three human attributes plus poverty which results from them are the principal barriers along the road to improved human nutrition.

That the nutrition of the common man, even in prosperous and enlightened North America, is in need of improvement requires no argument. The impact of the war worsened some of the conditions which make for malnutrition and shocked people out of a complacent unawareness. The schedule of recommended daily allowances set up by the National Research Council's Board of Food and Nutrition provided the first comprehensive set of tentative criteria by which dietaries can be assessed. We hear it said that malnutrition can not possibly be as wide-spread as some surveys have implied. A recent account[4] is certainly shocking enough, a study of 24 young married women in a housing project in the Southwest. Calorie intake was 1,145 per day, protein, calcium and phosphorus were also about half the recommended allowances, thiamin, niacin and riboflavin a little above a third. Family income, $13.50 weekly. This may be among the worst, but it can be duplicated elsewhere in the South and perhaps in the North. The exact proportion of undernourished people, whether it is one third, or more, of our population, is not the important item. The real question is why need any be undernourished in a country where surplus food has sometimes been destroyed.

In modern times the western hemisphere has not seen the spectre of famine, but when one includes Asia in his view one may properly ask the question: Can the world produce enough food to feed adequately every one living on it? This question has been answered both ways. Certainly the world as a whole has never had enough food nor could it have enough by to-morrow or by next year, but given ten years to reorganize agriculture and readjust distribution and consumption, perhaps it might. Britain's home production of food has increased from 40 per cent. to 65 per cent. of the requirements during the past three or four years. Our Bureau of Agricultural Economics in its analysis of crops, their cost per acre and per day of labor, used 29.5 bushels of corn per acre as the national average yield. In the upper Mississippi Valley, which is admittedly the bread-basket of the country, the yields of hybrid corn last season averaged over 100 bushels per acre, three times as much. And the Mississippi Valley still has meadows and woodland that are not used for crops.

They tell us[5] that in prewar days 100 acres of crop land in the United States of America fed 32 persons, in Denmark 58 persons, in Sweden 69, and in France 80; these figures are corrected for imports. No one who has ever lived in the country of the Danes or the Swedes will scoff at their food. The agriculture that provided it maintained the land in a high state of productivity by fertilizing, the crops were better cultivated, they were of a kind which require more labor, and thus labor as well as land went into food. More foods were grown for direct human consumption rather than first being converted into meat, dairy products and eggs; and finally the foods produced were utilized more fully. Under a national food policy backed by a planned agriculture, we could feed twice, three times, as many persons per acre of crop land as we are now doing. Even a famine-ridden country like India could approach adequate self-support in food if some of the labor of its millions were efficiently used to grow more food under national planning, on soil made available by irrigation or by the drainage of malarial swamps.

In the north porch of Bath Abbey there is a tablet commemorating Malthus, and as the verger points it out he bemoans the fact that the people of England spurned his teaching and instead followed the example of good Queen Victoria. Was Malthus right when he proclaimed that pestilence, war and famine and the vice and misery that attend them are the only checks upon an increase in population beyond the limits of the earth to support it? Pestilences are slowly being abolished or at least confined; our fighting men may unhappily bring us some of them from India's coral strands, but they will soon be brought under control. This war is to be the last war; it must not be allowed to happen again. And if we also abolish famine the last check on over-population is gone.

There is another horn to this dilemma. The idea of a pint of milk for every Hottentot has occasioned a good deal of raillery, some of it good-natured, some of it biting. Isn't it just possible that if we do not

[3] Sir F. Gowland Hopkins, SCIENCE, 84: 255, 1936.

[4] Jet C. Winters and Ruth E. Leslie, *Jour. Nutrition*, 26: 443, 1943.

[5] John D. Black, "Food Enough," Jaques Cattell Press, 1943, p. 122.

give them milk we will have to give them eggs (otherwise known as bombs)? The world has become so small that it can not long remain at peace if half the people are well fed, the rest ill-fed.

But granted that improved methods of production can greatly increase our own available food supply, with something to spare for the Hottentots, and granted that our standard of living can be maintained whatever our relations and commitments to the rest of the world, how can the rank and file of our citizens be assured of better nutrition? The answer is by education, a dual education in nutrition and in democracy.

In the opinion of many, the great efforts of the human mind manifest themselves much more frequently in times of war than in times of peace. As a nation we are becoming nutrition-conscious; the trend appeared before the war, but the movement for better nutrition has been accelerated by the presence of our fighting men in far-flung arctic and tropical regions, and all that this entails. Because of the mechanized character of this conflict, the nutritional status of industrial workers has attracted an attention that its shortcomings have long demanded. And finally, "food will win the war" in a sense quite beyond that in which the phrase was used three decades ago. Famine is even now stalking through Europe with a heavier tread than history records, and stable governments can not be established by starving nations.

People are always interested in their own health. A liberal thinker in the Protestant ministry once remarked that if he wanted to start a new religious cult or sect he would not fail to include a health clause in his creed; with this it would go over big. The old patent medicine business that still parades under other trappings is proof enough that people want to be well. What they need is enlightenment as to what they can do about it. Nutrition classes under various auspices have been supported with enthusiasm. The press carries some good material and even those who din into our ears the virtues of their vitamin tablets have added their bit. They have received two bits in return, for the American people are buying vitamin pills to the tune of more than 150 million dollars a year. Those who have participated in the development of the vitamin field may well stand aghast at such shameless prostitution of scientific knowledge, an abuse that is fully as reprehensible as the patent medicine game, except that people are getting a little something for their too much money. The real problem is to create an intelligent interest in good nutrition and in how to secure it. Good nutrition can not be achieved by adding a vitamin tablet to an inadequate diet poorly prepared. Man lives not by vitamins alone nor by 15 basic elements, count them. The easy way is not always the sure way.

Industry has lent a hand by improving the kind and quality of food served in factory restaurants and canteens and by providing something better than cokes and candy bars for a mid-morning snack. School lunches, if they are nutritious and well prepared, are heard about at home. Our food processing industries are also helping to spread the gospel of better nutrition; individually and in groups like the Nutrition Foundation, they are sponsoring worthy investigations in food and nutrition.

By and large, the medical profession is not yet making its proper contribution to the enterprise of nutritional education. Nutrition has too long been a stepchild in the medical family; the University of Rochester is a notable exception, as is well known. It is high time that medical students should be made aware of the impact of nutrition upon every aspect of medical practice. A pediatrician lately told me of a letter that came with a child being referred to him, in which the doctor said he did not think that the child's recurrent temperature was caused by the specific dynamic action of food.

Physicians are usually respected leaders in their communities; they can be influential citizens. The medical student should appreciate the fact that if he knows something about nutrition he will be listened to and will be consulted by his colleagues that know less than he does.

But one may say, no matter how well prepared the housewife is to feed her husband and children intelligently, she can not do it if the weekly pay envelope contains only 15 or 20 dollars. This question brings us to the consideration of a national nutrition policy which must embrace the entire economic problem of food production and distribution. Whether our democratic ship of state will embark on these vast and troubled waters remains to be seen, but that it should do so and can do so with some hope of reaching port is made plain by the little book to which reference has already been made.[5]

If we as a nation need education in nutrition and democracy the rationing program is a beginning in both. As compared with the recommendations of the National Research Council, the average estimated consumption per capita per day during the years 1936–1943 was entirely adequate, with the exception of riboflavin and the possible exception of niacin and calcium.[6] On the surface, this looks good, but the catch is that some people got more than their share and others got much less than their share. Rationing helps to relieve the pressure on price ceilings, but its principal function is to secure the distribution of food "more nearly in relation to need and thereby to obtain the greatest social return from the resources

[6] J. M. Cassels and Frances L. Hall, *Ann. Am. Acad. Polit. and Social Sci.*, 225: 106, 1943.

employed in its production."[6] Many Americans can tighten their belts without lessening their health and efficiency.

Even under rationing the lowest income group may still be restricted by limited purchasing power to quantities below the ration level. To allow them to buy as much as their ration cards allow, either their earnings must be supplemented or, as has been done in Great Britain, public restaurants and factory canteens must be established, provision made for school lunches and cheap milk. Food stamp plans might also do it.

The level of consumption in Great Britain since 1939 has been lower than ours, but thanks to excellent wartime food planning and rationing, the general nutritional status of the British people is now probably better than that of a large proportion of the lower-income families in this country. The effects of the war have been unbelievably tragic for the children of Europe, but in the opinion of Geoffrey Bourne,[7] with due allowance for all the disadvantages a child suffers from being brought up under war conditions, to the average British child it has been a benefit to live during the war. "Economic necessity is no longer a bar to obtaining milk, fruit, cod liver oil and other things that are needed for good health and growth. . . . After the war fullest use must be made of our new knowledge and experience on the subject of nutrition for maintaining and developing this improvement." In the words of Sir John Boyd Orr,[7] "priority in post-war planning should be given to the purchase and distribution by the state of basic foods in such quantities and at such prices as will put a health standard of nutrition within the reach of all."

It is doubtful that any measure of success in equable distribution of food can be attained without price control. Those who in 1918 had more than a physiological interest in food know what happened to food prices. The record of price control in the present war is open to all to read, and none are so blind as those who will not see. Too many favor price ceilings for every one but themselves.

Rationing and price control can not be completely effective unless production also is regulated and available supplies are brought into line with expected requirements. Rationing will probably not permanently be an acceptable feature of our national life, but we shall certainly be well advised if we insist on an intelligent system of control over distribution, prices and production for as long as may be necessary to avoid inflation and subsequent depression.

An enlightened democracy should be able so to order its affairs that production and distribution of food will insure every one enough to eat, and a reasonable profit to those concerned, without exploitation. The problem is complicated, but the greatest difficulties lie in man's inertia and in his short-sighted self-seeking. Desirable shifts in agricultural production, in methods of processing and in food habits, these will take time, but the time required to make the actual physical changes is less than that involved in the mental adjustments by which they must be conditioned.

Too many people who presume to speak authoritatively about these complex matters, especially in legislative halls, know too little about them. They should be told what the Irishman told his brother: "Drop that wheelbarrow! What do you know about machinery?" The necessary machinery is not as simple as a wheelbarrow. Also, too many people place private or political advantage before the public interest. There have been pressure groups ever since the caveman became a clansman. Recently in one of the Service Club publications there was a debate on butter *vs.* oleomargarine in which the butter-man said[8] that the reason for the maintenance of high license fees and a ten cent per pound tax on oleomargarine was to protect the consumer against the possibility of fraud. His powerful lobby has recently secured congressional action which continues this surcharge on a good and cheap food fat for those who can not afford to buy butter. The common man has no lobby.

Increased production of food is not enough. Twenty centuries ago a man who deeply desired to make a better world thought that more food might help; he even considered making stones into bread (which we can now figuratively do), but after further reflection he gave up the idea because he saw that moral integrity and not more food was what was needed to make a better world. "Nothing less wide than a system of planetary ethics will suffice in so small a world as this."[9]

What can we as individuals do in this matter? As citizens we can keep as widely informed as possible; we can join with others to hold up the arms of our enlightened public servants, and by letter and ballot we can reproach those who support entrenched neofascist minorities. The "common man" should also not escape condemnation when he seeks selfish advantage; in a final analysis this war is only another convulsive episode in his struggle with those in every land who are trying to forge the shackles of a new feudalism. To be worthy of democracy the common man too must learn that freedom can not exist without social responsibility.

As teachers and investigators we must cultivate

[7] Editorial quotation, *Manchester Guardian Weekly*, 50: 15, 1944.

[8] John Brandt, *The Rotarian*, 64: 35, 1944.

[9] E. G. Conklin, "Man: Real and Ideal," Scribners, 1943, p. 195.

unprejudiced objective thinking in ourselves and in our students. We must emphasize the human side of science and its intellectual and social implications.

Since time began poets and seers have dreamed of a far-off divine event, toward which the whole creation moves. When that event does appear, better nutrition, as one of the fruits of real democracy, will have helped to ring in the thousand years of peace.

OBITUARY

HENRY ANDREW BUEHLER

IN the death of Henry Andrew Buehler, "The Chief," on March 14, 1944, the geological profession lost one of its older and most respected and honored members. His loss is one which will be most directly felt in Missouri, the State of his adoption, but will also be sensed throughout the mining world.

Buehler was born at Monroe, Wis., on May 27, 1876. He received the degree of bachelor of science in chemical engineering in 1901 at the University of Wisconsin. In 1925 the honorary degree of doctor of science was bestowed upon him by the Missouri School of Mines and Metallurgy of the University of Missouri. While in the University of Wisconsin he became acquainted and associated with E. R. Buckley, then state geologist of Wisconsin. When Buckley became state geologist of Missouri, Buehler became his assistant immediately after his graduation from college.

With the exception of one year (1907–08) when he was employed by the Federal Lead Company, Mo., he remained a servant of the State of Missouri throughout the remainder of his life. In 1908 Governor Joseph W. Folk appointed him state geologist of Missouri. The wisdom of this appointment and the service of the "Chief" is best exemplified by the fact that he was reappointed by each of nine succeeding governors. Few people knew his politics—no one cared. He was accepted as being above party lines.

Buehler's publications numbered thirty-four. The larger portion of these were "Biennial Reports of the State Geologist to the Missouri General Assemblies." His unselfish attitude toward his fellow employees and associates resulted in the publication of many of his ideas and theories by these associates. He thoroughly enjoyed and glorified in the inoculation of an associate with an idea and seeing it culminate in a research paper. Had he taken the selfish position of publishing the results of his research and direction, his bibliography would have been several times thirty-four. His early work as a geologist under Buckley left to the State of Missouri and the geological profession three reports that are still in demand; these are "The Quarrying Industry of Missouri," "The Geology of the Granby Area, Mo." and "The Lime and Cement Resources of Missouri." The first publication to be released under his direction as State Geologist of Missouri was the masterly treatise by his former master and predecessor, E. R. Buckley, "The Geology of the Disseminated Lead Deposits of St. Francois and Washington Counties, Missouri," 1908. The last publication released under his supervision was by his assistant, H. S. McQueen, "The Fire Clay Districts of East Central Missouri," 1943. Truly did the "Chief" administer and direct in preference to research and the accumulation of a large bibliography.

Buehler was creative and progressive. He never stopped planning and initiating new fields of research. The appropriations he obtained were always inadequate, but he made the most of them by cooperative programs with the U. S. Geological Survey. He early recognized the necessity for detailed topographic quadrangles and spirit leveling. This made it possible to complete a reconnaissance gravity survey of Missouri, which was recently published as a gravimetric map of the state. He believed in the use of all available methods of geological exploration and saw the completion of the magnetic survey of Missouri. The surface waters of the State were believed by him to be a part of its natural resources. An extensive cooperative program has resulted in the accumulation of valuable data on the discharge of all major streams and rivers in Missouri. The Cambro-Ordovician formations of the Ozarks were difficult to identify in cuttings obtained from drilled wells; at his suggestion a study was made of the insoluble residues from these formations. These residues were found to be sufficiently diagnostic to permit the identification of each formation. This principle has been well received and his laboratories became the mecca for geologists faced with this problem.

While being progressive and ever willing to test new theories and practices, Buehler was erroneously considered by some to be a conservative. Any semblance of conservatism on his part was due to the inadequacy of information presented with a new concept. If the facts established the concept, he accepted it regardless of how revolutionary it might have been. He was a firm and staunch supporter of E. O. Ulrich's "Ozarkian Period." He believed his friend Ulrich knew better than any geologist the formations assigned to this highly controversial group of rocks. He likewise believed the deposition of the lead and zinc sulfides in the Ozarks was due to the downward circulation of cold meteoric waters. He was never convinced that sufficient evidence had been presented to explain these