

INSTINCT AS A GUIDE TO FOOD

BY BENJAMIN HARROW AND CASIMIR FUNK

It is one of the axioms of physiology that the majority of the diseases of mankind are due to, or connected with, perversions of nutrition.

—Prof. R. H. Chittenden.

THE philosopher, the psychologist and the biologist dabble with the nature of instinct. Often enough the word is used by them as vaguely as the phrase "chemical affinity" is used by the chemist. Why do oxygen and hydrogen combine? asks the student. Because there exists a chemical affinity between them, answers the instructor—a matter of electronic distribution. What, then, causes a bird to come out from its egg and later to build its first nest? Instinct, is the ready response. The questioner, revolving the matter in his mind, may think of instinct as synonymous with intuition, with impulse, with spontaneity. He will be partly right, and yet not altogether so.

Instinct has been defined as "a propensity that urges an animal or human being, without exercise of reason, to the performance of actions which are for the most part normally useful or beneficial." We have selected this definition in preference to dozens of others, not because it is so much better, but because it expresses the meaning of the word as we shall use it in this article. The definition emphasizes the complete divorce between instinct and intelligence and points out that instinctive actions are, "for the most part," but *not invariably*, useful or beneficial.

The physiological and psychological processes involved in instinct are many and complicated. The more obvious sequence of events that may be noticed in an instinctive action are, first, that the mind is

excited by the object; secondly, that the mind becomes "activated," or mental processes arise, as a result of contact with the object; and thirdly, that there is action that has direct reference to the object. The suckling of young animals; the pecking of young chickens; nest building; the migration of birds; the honeycomb-making of bees; egg deposition by moths and butterflies, and the selection of food by all sorts of animals have been cited as typical examples of actions involving instinct. But there remains much disagreement among writers on the subject, some declaring that certain so-called instinctive actions have nothing to do with instinct, and some even going so far as to declare that instinctive actions may be very satisfactorily explained on purely physico-chemical grounds. One of the former was Wallace, the great naturalist, who in an article on bird's nests published as far back as 1870 said:

That the existence of true instinct may be established in other cases is not impossible; but in the particular instance of birds' nests, which is usually considered one of its strongholds, I cannot find a particle of evidence to show the existence of anything beyond those lower reasoning and imitative powers which animals are universally admitted to possess.

Among the adherents of a purely mechanistic conception of instinct, the late Dr. Jacques Loeb, of the Rockefeller Institute, was probably the ablest. In several instances—such as those of animals that are heliotropic, or sensitive to light—he was able to reduce actions hitherto regarded as instinctive to accord with well-established laws in physics. In other cases, such as that of the sexual instinct, Loeb

was of the opinion that chemical substances generated by the glands of the body and known as hormones play an all-important rôle. In this connection one may refer to the work of Steinach, of rejuvenation fame, who, by implanting ovaries into castrated male rats, has so transformed these animals as to make them resemble, in many ways, the females of their species, and to show corresponding instincts.

II

We must now narrow our horizon to limit ourselves to the play of instinct in the selection of food. What first gives rise to the desire for food? Obviously enough it is the sensation of hunger—the fundamental motive to individual self-preservation. Professor Cannon of Harvard and Professor Carlson of Chicago have shown that this is purely a physiological phenomenon: it is due to the muscular contraction of the walls of the stomach. We seek to still these pangs, and it is at this point that what we may call instinct comes into play, for the food that we select—often without knowing why we select it—not only stops the contractions of the stomach, but is usually well utilized by the body subsequently to repair waste tissue and supply energy.

Various writers have linked the sensation of appetite with that of hunger, and at times some have used the words appetite and instinct interchangeably. There seems to be reason for believing, however, that hunger and appetite are not different degrees of the same sensation at all, but really fundamentally different. "Appetite," writes Professor Cannon, "is related to previous sensations of the taste and smell of food; it has therefore, as Pawlow has shown, important psychic elements. It may exist separate from hunger, as, for example, when we eat delectable dainties merely to please the palate. Sensory associations, delightful or disgusting, determine the appetite for any edible substance, and either memory or present stimulation

can thus arouse desire or dislike for food. Hunger, on the other hand, is a dull ache or gnawing sensation referred to the lower mid-chest region. It is the organism's first strong demand for nutriment, and, if not satisfied, it is likely to grow into a highly uncomfortable pang, less definitely localized as it becomes more intense. It may exist separate from appetite, as, for example, when hunger forces the taking of food not only distasteful but even nauseating."

Between instinct and appetite there are thus differences and similarities. Instinct is the precursor which may lead to a development of appetite, but appetite is related to previous sensations (of taste and smell of food), whereas instinct assumes no previous experience of any kind. If we must set up connecting links we might say that, under certain conditions, instinct is the go-between bridging hunger and appetite. It was instinct that led Bo-bo, the hero of Lamb's dissertation upon roast pig, to feel the pig. When he had burnt his hands and licked them, the dawn of appetite appeared. Once it is aroused, once the mouth is made to water—not a figurative but a literal description of what actually takes place—the rest may be explained in terms of orthodox physiology. For, as Pawlow, the great Russian physiologist, has shown, appetite stimulates the flow of digestive juices, without which no food can be digested.

Incidentally, one of Pawlow's experiments bears upon the question whether appetite (and probably instinct) always manifests itself to benefit the individual. Once, when experimenting on a dog, he divided the animal's gullet in the neck and brought the two ends to the skin. Food taken in by the mouth thus passed down part of the gullet and then out into the open, without ever entering the stomach. But even under these conditions of sham feeding, with the hungry animal never really getting the food it needed and wanted, there was an abundant flow of gastric juice in its stomach—provided no

nerves were cut. The sight of the food and its taste in the mouth were enough to set up reactions in the dog's brain which gave rise to the flow of stomach juice, despite the fact that it was of no value to the animal.

Much of our modern knowledge of dietetics has resulted from such experiments on the lower animals. The very simplest type of living creature, the ameba, seems to be attracted to food and repelled by poisons. These unicellular organisms cannot be said to have any nervous mechanism, so that we must postulate their possession of either the "instinct" of the biologist or the "affinity" of the chemist. In insects an instinctive tendency is seen in such diverse activities as the construction of a honeycomb by honey-bees, the social economy of ants, the preparation for the pupal state by the larvæ of butterflies and moths, and the provision made by beetles and flies for a progeny they are never to see. The most exhaustive experiments have failed to show that any process of reasoning is involved. Given the insect and given the particular set of circumstances, we get an inevitable reaction; just as, given the proper conditions, certain elements or chemical compounds will react to each other. The intellect has apparently as little to do with such activities of insects as it has to do with the combining powers of the elements.

What is true of insects also applies, in so far as observations have been made, to the higher animals. Professor Mendel, of Yale, has published experiments to illustrate the choice made by rats and mice when offered two diets, one adequate and the other inadequate. The two diets were so prepared that they did not differ in outward appearance, in taste or in smell. In fact, their only difference was that one contained much protein and the other little protein. Under these conditions the animals selected a larger percentage of the richer mixture. But the really significant feature of the experiment was this: that

rats fed exclusively on the diet rich in protein fared no better than those that were allowed a free choice between a protein-rich and a protein-poor diet, whereas rats kept on the protein-poor diet failed to grow. From this one must conclude that, given an option of several types of food, the rat will make its selection in such a way as to receive an adequate supply of protein. "The outcome of this investigation," writes Professor Mendel, "shows that in their choice of foods, rats and mice make selections which are as a rule advantageous for their nutritive condition." This experiment, carried out under rigid laboratory conditions, is an excellent illustration of "instinctive" action. It leads to the supposition that the instinct of primitive man acted as a fairly safe guide in the selection of food, particularly where the food was plentiful and full of variety.

Somewhat similar results have been obtained by Professor Evvard, of the University of Iowa, in experiments on pigs. He is of the opinion that the instinct of these animals is a safer guide in selecting food for them than any man-made standards. This may be true if the choice offered be sufficiently varied, or if the foods themselves, though limited in variety, be rich in essential nutritive elements. But a situation may arise where neither of these conditions is fulfilled. Such situations have already arisen in certain parts of Europe. They affect not only animals but man; and it would seem that where the choice is between several foods, each poor in nutritive value, an artificial combination of them worked out in the laboratory of the physiologist may be an improvement over the free-selection method of the animal.

We must, in this connection, bear in mind that there are times when instinct seems to lead an animal entirely astray, even though conditions hampering the faculty are known to be absent, and external circumstances seem entirely favorable. Why, for example, should the larva of the *Situris* beetle attach itself indiffer-

ently to the bee that enables it to develop, and to any hairy object of a similar kind? Why, to come to the highest form of animal, man, should the Japanese have selected polished rice for their diet and thereby contract a disease that causes nerve degeneration (beriberi), when they might just as well have eaten the unpolished variety and avoided the disease? These facts may be cited against the writers who argue that instinct always leads to the right selection.

III

If we trace the history of man back to the remotest time, when he was not exactly man, nor monkey, nor lemur, but some queer combination of all three, we may assume his diet to have been not very different from the diet of the monkey of our own day. The lemur-monkey-man probably lived largely on fruits and nuts, perhaps also on oysters and other shellfish, a little on insects, and occasionally on a bird or two. Hunger started him on his path of adventure and instinct guided him in his search. Occasionally instinct, not wholly perfect, would lead him astray, and then misfortune would befall him. This would prove an instructive lesson to others of his tribe, and for them thereafter instinct would be guided by experience. Here we witness the dawn of intelligence.

The diet of the lemur-monkey-man was passed on from generation to generation, and there is no reason to suppose that even during the fourth and last glacial period, when the Neanderthal man flourished—a matter of some 50,000 years ago—had his food changed considerably. So long as weapons were few, so long as fire was unknown, so long as the raising of cattle and the tilling of the soil were not practiced, man belonged to the hunted animals, and his food could hardly extend beyond the range of the monkey. The Reindeer man, flourishing between 35,000 and 15,000 years ago, developed the art of making implements, and during the Neolithic age, some 10,000 years back, certain animals

began to be domesticated. The Neolithic man probably stumbled on the art of milking, and experience must have led him to use milk as food. A rude type of agriculture—the origin of which is a mystery—led to the cultivation of wheat and barley; oats and rye seem to have come much later. Animal foods, such as meats of various kinds, probably became common only when man had established himself as a keeper of sheep and a tiller of the soil.

From now on, no radical changes in his diet are to be noticed. The people of biblical times, and many of the men and women who lived before the Industrial Revolution, ate much the same food, and even led much the same life that the Neolithic man did. Until quite within our own times, indeed, man lived on Nature's produce and was a healthy creature. Instinct had guided his remote ancestors in their search for food, and though with the progress of time, the intellect of man grew perhaps at the expense of his instinct, the former continued to urge him to eat what his forefathers had eaten.

But within the last hundred years or so, everything, our food included, has been revolutionized. Our foods are now "preserved, purified, polished, pickled, canned, extracted, distilled, concentrated, heated, dried, frozen, thawed, stored." How are we, particularly city people, to select what is good for us? Our instinct is not what it was, and even if it had remained with us, it is doubtful whether, with a choice of food that is daily becoming more limited for many of us, and with a supply that undergoes so many chemical processes before we eat it, instinct would be a very reliable aid. What are we to do?

There is a considerable body of opinion, growing from day to day, that holds that our gastro-intestinal troubles—our stomach-aches, our headaches, our constipation, and so on—are largely the result of eating this artificially prepared food. Whatever instinct is left in us has not, if this thesis be correct—and the writers of this article are of the opinion that it is—

guided us very wisely in our choice of newly acquired foodstuffs. Our instinct should have warned us against the preserved, the pickled and the canned; on the contrary, it urged appetite to encourage us in selecting the preserved, the pickled and the canned—so much so, that our mouth now waters at the very name of *delicatessen*.

If we turn our attention to races who still live in the midst of primitive surroundings, where the artificial has not yet displaced the natural food, we may learn an instructive lesson. The Arabs, for example, live largely on figs, dates, some vegetables and a little milk. Meat is rarely eaten, and their religion forbids them to drink alcohol. Despite the undescribable filth in which they live, they are far more immune to disease than Europeans. "Diseases of nutrition," writes Dr. Auzimour, a French army surgeon, "are almost unknown; ulcers and cancer of the stomach are very seldom met with; and if one comes across a chance case of diarrhea, it is generally because the sufferer has been eating too many melons. Appendicitis is very rare among Arabs, and is entirely unknown among vegetarian nomads. Gout and kidney gravel are also quite unknown." A fact that should arrest attention is that when these Arabs desert their dirty villages for the towns, and there live the life of Europeans, eating the food Europeans eat, they become as susceptible to disease as the latter. Their resistance therefore cannot be ascribed to the peculiarities of the race, or to the climate, but only to the food they eat.

Another, and equally instructive case is cited by Dr. McCarrison, an English physician stationed in India. "My own experience," he writes, "provides an example of a race unsurpassed in perfection of physique and in freedom from disease in general, whose sole food consists to this day of grains, vegetables and fruits, with a certain amount of milk and butter, and goats' meat only on feast days. I refer to the people of the State of Hunza, situated in the extreme northernmost point of India.

So limited is the land available for cultivation that they keep little livestock other than goats, which browse on the hills, while the food supply is so restricted that the people, as a rule, do not even keep dogs. They have in addition to grains—wheat, barley and maize—an abundant crop of apricots. These they dry in the sun and use very largely as food."

Dr. McCarrison has spent nine years among these people. The men have a magnificent physique. They live to a very great age and are astoundingly fertile. This combination of fertility and longevity is, indeed, their one important source of worry to them. A humane chieftain suggested to the doctor that instead of bringing the sick back to health again, he concentrate his attention on the construction of a lethal chamber to get rid of those too old to be of use to the state. With another of these tribes it was the custom, until quite recently, for the eldest son to put his two aged parents in a basket, carry them to the top of a hill, and then hurl them to death. Says Dr. McCarrison:

During the period of my association with these people, I never saw a case of dyspepsia, of gastric or duodenal ulcer, of appendicitis, of mucous colitis (a disease involving that part of the intestine called the colon), or of cancer, although my operating list averaged 400 major operations a year. While I cannot aver that all these maladies are quite unknown, I have the strongest reason for the assertion that they were remarkably infrequent. The occasions on which my attention was directed to the abdominal viscera of these people were of the rarest. . . . Among them the abdomen oversensitive to nerve impressions, to fatigue, anxiety or cold was unknown. Their consciousness of the existence of this part of their anatomy was, as a rule, related solely to the sensation of hunger. Indeed, their buoyant abdominal health has, since my return to the West, provided a remarkable contrast with the dyspeptic and colonic lamentations of our highly civilized communities.

In searching for an explanation of this difference in health between Indians and Europeans, McCarrison has traced it to diet. "The people [of Hunza]," he says, "live on the unsophisticated foods of nature: milk, eggs, grains, fruits and vegetables. I don't suppose that one in every 10,000 of them has ever seen a tinned sal-

mon, a chocolate or a patent infant food, nor that as much sugar is imported to their country in a year as is used in a moderately sized hotel."

Like the Arabs, the Hunzas live in the midst of anything but sanitary surroundings, and like them again, they contract gastro-intestinal disorders whenever they change to a more civilized diet. These facts are of the utmost importance, for they show clearly that despite unhygienic conditions, their unsophisticated diet keeps them free from the common ailments to which Europeans and Americans are subject. This, of course, is no argument in favor of filth; it is merely evidence that faulty diet may be an important causative factor in disease. Incidentally, it illustrates how faulty, or how latent, or how entirely absent instinct is in modern man.

Actual experiments with monkeys, carried out by Dr. McCarrison, give support to his views. Wild monkeys to the number of thirty-six were captured in the jungles of Madras and transported to the doctor's laboratory at Coonor. They were in perfect health and full vigor. Each of these animals was placed in a separate cage, and all were confined in the same animal room. One-third the number were fed natural foods (wheaten bread, milk, ground nuts, onions, butter, plantains and water), and the remainder on food deficient in one way or another: in some cases there was a deficiency of vitamins; in others, an ill-balanced diet was offered; in still others, the food was of the "natural" variety, but had first been sterilized. Says Dr. McCarrison:

Those that were naturally fed remained free from intestinal disease; those that were fed on deficient and ill-balanced food, and on sterilized food developed, within a short time in the majority of cases, diarrhea or actual dysentery (a disease involving the inflammation of the large intestine). Here, then, is an unequivocal instance not only

of the effect of faulty food in inducing a specific disease such as dysentery, but of the protection against it that is afforded by a natural and well-balanced diet.

IV

Whether we take the view, as some psychologists do, that instinct has become "saturated" with intelligence, so that in highly civilized man it is now of little moment, or whether we agree with Metchnikoff that our instinctive actions have become perverted, largely owing to the consumption of alcohol, there seems to be general agreement that instinct in man is becoming less and less potent and accurate. Our intellect, which has largely displaced it, cannot serve us as well in the selection of food; for though one of the characteristics of this intellect is that it builds on the accumulated experiences of the past, the food we eat today is vastly different from the food we ate in the past. Moreover, it seems plausible that the requirements, for example of a New York City clerk and a Minnesota lumberman, will show degrees of difference. Scientific experimentation must therefore come to our aid. It must point the way towards determining the extent of the harm done by the consumption of artificial foods. It must suggest such combinations of different foods as will provide for the varying needs of the organism. Given a limited supply—such as prevails in most of Europe, in all of Asia, and among the very poor elsewhere—how much of each type, and what combination of the various elements, will bring the maximum return to the human machine? Our instinct will not tell us; the food fadist misleads us; the politician and the legislator are ignorant. Our hope lies in the scientist of the laboratory, with his rats and mice and guinea-pigs, and in the dietitian and clinician at the bedside.

TESTIMONIES

BY L. M. HUSSEY

I

Fundamentalist

FRANKLY, I find all talk about the antagonism of religion and science nonsensical. There is no such antagonism. Time was, of course, when I shared this common prejudice. When I first began my studies for the ministry I was actually afraid of the scientific branches in my arts course, biology especially. It makes me smile now when I remember how I used to go to my knees every night praying that I might learn nothing to shake my faith. But the fact was, as I came to see, that these scientific studies really reinforced faith. Take for example the laws of heredity, Gregor Mendel and so forth. There's nothing unscriptural in them. Why, I admit them to be true. You can demonstrate scientifically that this old world is not going to be made over in a day. A man has hereditary impulses he can't escape—another way of speaking of the Old Adam in him. Scientific fatalism. Calvin recognized it. Just remember this: through the laws of heredity science shows that the world has very little chance of becoming perfect. And that's just why Our Lord has promised to come again. The Second Coming is a scientific necessity. When He comes He will set aside all these laws and establish His Kingdom right here on earth. That's the only hope of perfection. Yes, I positively believe in science.

II

Suburban Pastor

You say you can't understand just how the Christian man is saved. Brother, I can show

you! The soul of man is just like this peanut that I'm holding between my fingers. Half an hour ago, when I was walking downtown, I saw this peanut lying with a lot of trashy stuff in the gutter. It looks pretty dirty doesn't it? You wouldn't believe there was anything worth saving in it, would you? Brother, it's only the shell of the peanut that's dirtied. You see, I crack it open and the kernel's sound and clean. I'm eating it now. It's the same way with God Almighty and the soul of man. The soul of man is like a lost peanut. It wallows in the gutters of sin and is fouled. Then the Blood of the Lamb dissolves away the dirty husk, cracks it open, and a pure kernel remains, acceptable to God the Father.

III

Praying Brother

Don't try to tell me what's the matter with the world. I don't want to see your statistics about this and that. Statistics are bunk. The whole trouble with the world right now is that people don't go any more to their Heavenly Father in prayer. In the old days good Christian men and women knew how to pray. Now they've forgotten. That's why the world is full of trouble. There's no trouble you can't ease by Christian prayer. I'll tell you an instance. One afternoon I was standing in the railroad station waiting for a train. I saw a shabby looking man pacing up and down with deep trouble in his face. The Lord moved me to speak to him. "Pardon me, friend," I said, "but you seem to be in trouble. Is there anything I can do?" "Yes sir," he answered, "I am in trouble. I got word this