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Food and Knowledge

The need for food has always been a sharp goad to human intelligence. For untold ages, man has applied his wits to getting things to eat. All his acumen in this field will be demanded by the end of this century, when the world is expected to have 2 billion more mouths to feed . . .

☐ Food is so much a part of all existence that, unless they do not have enough of it, people pay little attention to what it is or where it comes from. To the urban North American sitting down to his Christmas dinner this year, it matters not at all the turkey he will eat is a descendant of a bird of the pheasant family dating back 40 million years and first domesticated by the Aztecs of ancient Mexico, or that he will be consuming a salubrious dose of potassium, phosphorous and iron along with his mashed potatoes. What matters is that there is good food and plenty of it, well-prepared.

But behind that traditional feast — and indeed almost any meal in the developed world today — is a triumph of human ingenuity. Take the turkey: it is many, many times heavier than its Mexican ancestor thanks to scientific breeding and feeding practices which, we are told, will soon result in a turkey as large as a pig. It reached our typical North American home through a combination of refrigeration and mechanized transport which a man of a hundred years ago would have regarded as miraculous. Another near-miracle of engineering was responsible for the electrical or natural gas heat with which it is cooked.

To those who will enjoy that meal, it is next to inconceivable that any of its components could ever be unavailable. There is, for instance, no question of not being able to buy potatoes because blight or beetle infestations have wiped out the crop. The supply of potatoes — and of all the other common vegetables of North America — is as reliable as it is plentiful. Modern methods of cultivation and disease and insect control have seen to that.

Then there is the cooking. Without giving it a passing thought, the lady of the house has at her command a stock of ingredients, equipment and expertise unknown to any but the premier master chefs of a century ago. The most difficult feats of culinary art in years past are now a matter of routine. By looking no further than the wrapper of the turkey, she can ascertain how long it should be roasted at what temperature, and, with a twist of a dial, she can summon up precisely that temperature. The spices she uses in the stuffing arrived on her cupboard shelves in good condition from the far corners of the earth.

In short, that housewife and her family are the beneficiaries of a fund of knowledge about how to raise and prepare food that has been accumulating since before history was ever recorded. The need for food — and palatable food at that — has always been a sharp goad to thought. It gave man his first weapons, and thus set him on a different path of development from his fellow creatures. It put him to work at gaining control of his world.

It might be said that science got its start when a cave-man noticed that a rhinoceros or buffalo bone he had used for fuel in his fire yielded a juicy

marrow that was easier to extract and tasted better than the raw variety. This probably led him to throw a chunk of meat in the fire to see if he got similar results. Or cooking may have been discovered by accident when a piece of meat dropped in the fire and a cave-man recovered it. Either way, the eating of it was an essay in scientific research.

Certainly it was a considerable scientific achievement when, something like 11,000 years ago, people learned how to extract food from what appeared to be wild grasses. Someone had to conceive the notion that the tiny, hard, starchy grains hidden within the rough seed cases of wheat and barley would be edible if they could be separated from the chaff. Even when the grain was extracted from the husks by toasting, it was too hard and dry to be eaten, so it was then ground into flour and mixed with water to make a kind of porridge. Later, whether by accident or design, it was found that this stuff was transformed into something more appetizing if it was flattened into a cake and laid on a hot stone beside the fire to make it solidify — and so there was bread.

A technological breakthrough into man's first power tools

According to Reay Tannahill in her most informative and readable book *Food in History* (Stein and Day, New York, 1973), the first known villages were formed around fields of wild grain in the Near and Middle East even before the wheel was invented. To save the toil of hauling the grain back to their distant caves, people had to stay together in one place. The social organism we now call the community then came into being, to be strengthened and refined when the villagers banded together to defend themselves against invaders who coveted their food but were less willing to settle down than they were. Thus hand-in-hand with the genesis of society came the genesis of war.

The villagers had other competitors for food in addition to hungry human marauders. These were the wild animals that patrolled the fringes of the fields, eating up grain. In a classic exercise of human wits, people tamed these animals, which furnished them with meat, skin clothing and cooking vessels, tallow for lamps, dung for fuel, milk, butter and cheese.

The harnessing of domestic animals can be counted as a signal technological breakthrough. As Dr. Tannahill points out, "The goat, sheep and ox could be pressed into service as agricultural labourers, made to sow seeds, pull the plough, and thresh the ripe grain. The barnyard animal became, in effect, man's first power tool."

By then the world's first farmer had arrived on the scene — the man or woman who realized that a crop would be more productive and predictable if it was planted in an orderly fashion. This was probably preceded by the adoption of the essential agricultural practice of weeding — although in some cases weeds themselves, such as rye and tomatoes, were cleverly turned into domestic crops.

The world's first teacher also may well have originated with the dawn of agriculture. We can imagine a camp fire surrounded by primitive people communicating in grunts and sign language with a stranger who tells them about taming goats or planting grain, perhaps handing them a few seeds to try out. Archeological evidence suggests that the knowledge of farming spread quickly among the people who followed the cave-men. It could only have been carried by farmers and herdsmen seeking new land who passed on their know-how to those they encountered on the way.

The only thing that tasted worse than a mole was a blue-bottle fly

The spread of learning in general flourished with the rise of trade and commerce. As soon as agriculture became widespread, there were surpluses of food which could be traded for the food that grew elsewhere. The world's first businessmen were quick to catch on to this, and soon caravans and ships were moving restlessly about the ancient world trading food and other commodities. No

matter how hard they bargain, people who trade with one another exchange more than the items being bartered; they tend to pool the best of their cultures and technologies. Mankind's move into intellectual enlightenment was largely an indirect result of the trade that began with food.

"He was a bold man that first ate an oyster," wrote Dean Swift. Food has always stirred man's sense of adventure. Obviously some of his gastronomical experiments must have ended in failure; he was a bold man that first ate a mushroom, too, and he may soon have been dead. But over the centuries, by trial and error, people have succeeded in finding an amazing number of things to eat and drink, and ways of making them palatable. An assiduous researcher into what can and cannot be eaten agreeably, a 19th century Englishman named Dr. Buckland, reported that the only thing that tasted worse than a mole was a blue-bottle fly.

The trial and error approach to raising food gave rise to some very serious errors. The discovery of irrigation sometime after 5000 B.C. proved a great boon until farmers overdid it and leached too much salt from the soil; consequently vast stretches of formerly arable land in the Near East and Africa are deserts to this day.

But in the main, the story of food since ancient times has been one of intermittent progress. The early Romans observed that soil sown annually with the same crop became exhausted and started to let land lie fallow for a year. Central Europeans in the Middle Ages improved upon this system by introducing crop rotation, sowing one field in three with legumes that had the effect of restoring the soil. At about the same time an improved type of plough opened up land that could not be used for agriculture with the old ploughs.

The knowledge of how to produce more and better food expanded over the centuries. The science of agronomy may have begun when some unknown farmer found that plants grew better if he covered the seeds with humus or manure. Since then incredible strides have been made in getting more out of the soil by various means.

One of the giants of agronomy was a Canadian, Sir Charles Saunders, who in 1904 perfected what has been called "the most valuable plant in history". This was a variety of wheat called Marquis which ripened early enough to avoid the sharp frosts of the Canadian prairies. Saunders followed it up with other varieties that would grow in a cold climate. Thanks mainly to him, western Canada has become one of the world's great granaries.

The fate of the human race may depend on food expertise

In the current century the North American continent has taken on the role of the earth's chief provisioner. Recent advances in growing techniques, farm machinery and pest and disease control have spurred breathtaking leaps in productivity. The average North American farmer now produces enough food for something like 50 other people. That is about 10 times as much as he was able to supply 60 years ago.

Both Canada and the United States produce far more food than their populations consume; together they account for two-thirds of the world's cereal exports. But the food they produce is less valuable to the world than their knowledge of how to produce it. In the long run, the fate of the human race may depend on food-producing expertise.

This combination of skill and knowledge has already accomplished much to save people in the developing countries from a life of hunger. In the 1940s the Rockefeller Foundation of New York sent an agronomist named George Harrar to Mexico, a mainly agrarian nation which suffered from a chronic shortage of food. Working with an interdisciplinary team of agricultural scientists, Harrar set out to help Mexican farmers help themselves. Within a few years their work in plant-breeding, soil management, and crop loss control had brought about an immense improvement in agricultural yields. In the early 1950s Colombia and Chile adopted the Mexican program and experienced a similar rise in productivity. In 1955 an

ambitious program modelled on the one in Mexico was launched in India. From then on, the "Green Revolution" spread around a hungry world.

'Do not give a man fish, teach him how to fish'

In 1970 the work that began with wheat and maize was extended into rice with the founding of the International Rice Research Institute in Indonesia. Soon new strains of rice plants were introduced which multiplied yields by several times. Other research institutes have since been established in developing countries to deal with the cultivation of arid land, animal diseases and animal husbandry. Throughout the Green Revolution, the emphasis has been on adapting to local conditions and training local people in new methods. The western scientists involved in it have heeded the old Chinese saying, "Do not give a man fish, teach him how to fish."

Canadians have been active in the drive to provide more prolific and nutritious foodstuffs for future generations. In 1975 the Royal Bank of Canada's annual $50,000 award for contributions to human welfare went to two Canadian research scientists, Dr. R. Keith Downey and Dr. Baldur R. Stefansson, for their work in developing rape-seed into a reliable high protein food source. The results of their efforts in rape-seed breeding are now being successfully applied in various countries. "Their discoveries will be of increasing importance to mankind as world population increases," said the Chairman of the Royal Bank Award Selection Committee, the Honourable J. V. Clyne.

Although the Green Revolution has done wonders, no one pretends that it is the whole solution to the food problem which now faces humanity. By the end of this century, the world's population is expected to rise from 4 billion to 6 billion. To feed all these people adequately, huge new strides will have to be made in a number of fields.

The distribution of food, in the broadest sense of the term, is in need of a radical improvement. According to the *Goals for Mankind,* a 1977 study for the Club of Rome co-ordinated by Ervin Lazlow, the world output of grain is sufficient to give every person on earth an adequate diet. Yet as much as 40 per cent of the world population suffers from undernourishment. This is partly because people in the developing countries have too little grain while in the western world it is fed to animals to produce meat.

At a recent meeting of the World Food Council in Ottawa, Sol Lonowitz, Chairman of the U.S. Presidential Commission of World Hunger, called for a sharp re-ordering of international priorities to avert mass starvation in the balance of this century. "Because the world hunger problem is getting worse rather than better, a major crisis lies ahead unless a concerted effort is made to avert it," he said.

A major part of this campaign will be in the realm of technology, capitalizing on what is already being done to expand production. There is great potential, as well as great challenge, in boosting the productivity of under-utilized land in the developing countries up to somewhere near North American and European norms. Science may make it possible to open new lands to food production in the same way as Saunders once made it possible to grow wheat in the more northerly reaches of western Canada. It may also be able to draw vast "crops" from sources other than land.

But science alone cannot be expected to do the job. Sharp improvements will also be needed in international development, investment and trade practices. In the realm of political and social policy, there is a basic need for better population control.

The concerted effort to provide an adequate diet for all humanity obviously must be made; there can be no question of that in this age of international co-operation. This effort will tax human knowledge, intelligence and determination to the fullest degree. But if history is any guide, the food problem can and will be beaten. It is a matter of man applying as much and more intellectual energy to the subject of food in the future as he has in the past.

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