In Defense of Technology

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(Received for publication August 24, 1976)

ABSTRACT

High yields, efficient harvesting, sanitary and rapid processing, high quality distribution and retailing — factors which any country should be proud of. However, for some strange reason these are the very factors that are coming under attack by a vociferous group of individuals who seem bent on destruction of American Food Technology as we know it today. The reasons for the screams of outrage hurled at this Technology escape logical analysis. In this country today we have the potential to be the best fed people in the history of the world with the products at our disposal. Food is now not only nutritious, but it is safe, convenient, of high quality, flavorful, and presented to the consumer at a cost, relative to earnings, which is competitive with any other country in the world at any other time in history, or the present. It is a gross injustice for consumers to have their confidence in the safety and nutritive value of their food supply destroyed without presenting them with all the facts. Perhaps it is necessary to present all the realities of nutrition to the consumer rather than simply to mention nutrients. Perhaps it is time for science and technology to present the facts of an overpopulated-underenergized world to the American consumers who take for granted the food supply at their disposal without an understanding of the technology it involves. It is ludicrous to believe in the natural way. A morally responsible usage of technology, not a profit-at-any-cost technology is the way to solve the hunger problems of the world. This information must be conveyed to the consuming public as a part of a nutrition education if we are to have a well fed and healthy nation without paranoia about its food supply.

In the past several years, technology has been under severe criticism, attack, and innuendos of corruption, and even perhaps criminality. The establishment, which in the food industry means the agricultural production divisions, food processors, food distributors, and even food retailers, is under this cloud. As a result the consumer is becoming biased on the basis of information which does not represent actual scientific fact but value judgements and opinions on "what might be the case" or on expressions of concern about "trends" which do not really exist. The net result being, that the consumer is becoming more confused, more paranoiac, and more mistrusting of the very food supply which provides the potential for and choice of the best diet which the world has ever known. Public relations and press releases seem to be replacing more conventional scientific publication and peer review systems. The consumer is being injected with scientific certainty when scientist themselves know that there are few absolutes in science and certainty is simply a statement of possible risk-benefit and not certainty at all.

On October 31, 1975, the Honorable Richard O. Simpson, chairman of the U.S. Consumer Product Safety Commission said in a speech that "many regulatory decisions as well as congressional decisions involve extremely complex technical questions with an attendant high degree of technical uncertainty. Complicating this process, is a growing phenomenon where some technical experts appear to have joined those in other professions who agree that the 'end justifies the means' and are making public pronouncements of technical certainty on many social issues. On closer examination much of the certainty disappears, but by then the technical issues are so intertwined with the social goals that both the public-at-large and governmental decision makers face an extremely complex and time consuming process to sort out technical facts. Public concern and confusion is often the by-products of these misstatements or overstatements."

As a consequence of this general philosophy, government, industry, and science are taken to task, berated, pushed and pulled, and placed in an impossible situation. This situation demands scientific certainty where certainty can’t exist, it demands scientific answers for social, non-scientific questions and it demands decisions, restrictions, and impractical solutions on problems which have not been shown to actually exist. As Santayana has said, "trivial questions have easy solutions, but important questions may be insoluble."

WHY THE ACCUSATIONS?

Why is this accusatory phenomenon taking place? It may be blamed on antiestablishment feelings, work of consumer activists, general mistrust of the food industry, mistrust in government regulatory agencies, and perhaps a general misunderstanding of what chemicals are. Certainly there is a fear of chemicals, a "chemophobia," developing in our nation. This has led to the belief that any processed food is bad, that any food manipulated by man is bad, and that addition of any chemical to a food material is wrong. This concept is ludicrous at best because it must be recognized that foods themselves are simply chemicals, humans are simply chemicals, and that the only really scientific reason for eating is to replace the chemicals in the human body with chemicals from food. One can only conclude, therefore, that addition of chemicals to food material, as long as such
chemicals are safe, is at times a necessary and indeed fortuitous thing to do. At times, unfortunately, scientists proclaim that certain foods are bad for health and, therefore, the consumer should not eat them on the basis of very poor evidence. Generally, this involves a minority of the scientific community. Some consumer activists, certainly not all, claim that anything the food industry does is somewhat at fault for world starvation; a concept which escapes logical analysis.

THE SYMBOLIC BLAMEE

Dr. Richard K. Sparks in a recent article in the *Phi Kappa Phi Journal* (9) stated "there seems to be increasing reasons for believing that a little recognized socio-cultural phenomenon is evolving within our society which may have a seriously destructive impact on various forms of our institutional life, including those dedicated to the propositions of higher education. While the manifestations of this particular form of social pathology can be observed and its effects are already apparent in some areas, the phenomenon itself has yet to be clearly described. For the present, the phrase, 'symbolic blamee syndrome,' comes fairly close to stating the essential nature of the condition. What is involved is an apparent growing tendency within our society to seek out vaguely defined symbolic representations which can serve as blamees for many of the uncertainties, frustrations, and tarnished illusions which seem to confront us at every turn. The symbolic blamee is purposely defined in the broadest possible terms and is always stated as a generality. This serves a number of purposes. First, by selecting a broadly defined blamee, it becomes almost impossible to determine exactly who is being blamed for precisely what. Second, by stating the blamee as a broad generality the possibility of a systematic response or retaliation is reduced to a minimum. Third, the use of a vague generally stated blamee injects an atmosphere of helplessness into a situation, relieves individual responsibility, and carries forward the implication that probably nothing can really be done anyway or, even if it can, someone else will have to do it. Some clear examples of the symbolic blamee syndrome are readily available. The dissident youth of the 1960's used 'the establishment' as a convenient symbolic blamee without in fact, ever feeling any real need to define the term. The successful launching of a 'movement' often depends on the selection of an appropriate symbolic blamee. One current movement, for example, which enjoys considerable support has selected the entire male gender as a symbolic blamee. Political parties, 'international money interests,' the 'corporate state,' big labor, even ethnic groups — in one way or another, all broadly based socio-cultural institutions have been or are likely to become candidates for the role of symbolic blamee."

I believe that this description of the symbolic blamee, is in part, the cause of the destructive criticism that technology is currently undergoing. The obvious question now arises as to how this kind of negativeness is to be handled. Certainly logical analysis of the problem is a little difficult because the symbolic blamee syndrome seeks to avoid logical and systematic analysis. However, technology cannot continue to be the "whipping-boy" for the activist in society.

TECHNOLOGY IS NEEDED

Clearly, the world would be in a very sorry state in its condition of overpopulation and underenergization if it were not for technology. We are faced, as scientists and technologists, with the problem of banishing hunger and malnutrition. It must be pointed out again and again with rational analysis that the solution to such a problem depends on how rapidly agricultural productivity can be increased, and how rapidly the technology involved with processing, storage, transportation, and marketing problems can be evolved. It must be emphasized that food processing has many goals, that perishable foods are preserved in a stable form that can be stored and shipped to distant markets all year round. It must also be pointed out that the basic preserving processes are canning, freezing, dehydration, salting, pickling, and freeze-drying. These are all processes which go on in the kitchen of the normal consumer. It must be pointed out that when a food material is cut, cooked, cooled, refrigerated, or handled in the kitchen, it is in fact being processed. Processing is simply a method to maintain food in an acceptable, safe, and nutritious form for an extended period. Therefore, when we speak of technology we speak of much more than just growing and eating food.

In this time of dramatic population increase and energy decrease the American public is living in the lap of luxury. Perhaps that is part of the problem of technology, perhaps scientists and technologists have done too good a job, perhaps the American public has come to expect luxury, a consistent and economical food supply never fearing for starvation or hunger. Foster and Foster (2) made a comment in a recent paper which I found most interesting: "I must admit that I, too, am disappointed, puzzled and sad. Why did we Americans become so complacent after World War II? Did we just get too fat and lazy? Because our way of life seemingly produced the highest standard of living for the greatest number of people in history we have assumed that everybody believes democracy and capitalism are the best systems in the world. But we have made very little effort to teach our young the basic principles of Americanism, either at home or in our schools. It comes as a shock to see on every hand the evidence that we have betrayed and neglected our children. Now we are seeing the result. A moral vacuum was there and those who would take over the system have been busy filling it."

WE MUST SPEAK OUT

Personally I have a great deal of faith in our young. I believe that a great part of the problem has come from the desires of scientists and technologists to keep silent.
about the issues. It is easier for most of us to stay in the laboratory, to stay with students, and not to speak out. However, the time has come, when for the sake of continuing technology and the furtherance of plenty in our land, we must speak out, and we must be heard.

The Honorable W. S. Stuckey, Jr, said in a speech in June of this year (10) that "living in America is still the best bargain on earth. Between 1960 and 1973, the number of Americans living below the government's official poverty line dropped from 40 million down to 23 million!"

"Today, poverty-line income in this country is pegged at $5,000 for a non-farm family of four. How many realize this is higher than the average income in the Soviet Union!"

"The median income in America is over $12,000 a year. In terms of purchasing power per family, we are the number one nation in the world."

"Why does our country enjoy this level of affluence? I believe the answer to that question is directly related to something called free enterprise."

"In 1915, a phone call from San Francisco to New York cost $20. Today, it costs only $1.36. In 1915, $20 would have mailed 1,000 letters; but today it mails only 153. Private enterprise runs the telephone company; the government runs the postal service."

"The general accounting office recently concluded that it costs the Social Security Administration nearly twice as much to process a claim as it costs privately-owned companies to process a medicare claim."

"Garbage collection costs the average municipal agency nearly 70% more than it costs the average private firm to do the job."

"You have heard a thousand times that government can do it cheaper than private enterprise because the government doesn't make a profit, but that was the logic used by the man who killed the goose which laid the golden egg."

Congressman Stuckey then went on to quote a bumper sticker which he recently saw, "I saw a bumper sticker the other day which read: if you like the U.S. Postal Service, you'll love nationalized oil."

DECISIONS ABOUT TECHNOLOGY

Unfortunately, decisions about technology are not made today between industry and government agencies as they were 10 or 15 years ago. Today, we have an entirely new concept which pervades. That concept is predicated upon the voice of the crowd, the interpretation of scientific data by public relations and not scientists. As a result of this we are seeing social decisions that are being made by distorting science and an ever increasing growth of regulatory agencies to make these decision. To again quote Congressman Stuckey "10 years ago, the federal regulatory establishment was composed of 12 agencies which employed 60,000 persons and spent $860 million. But now there are 24 agencies which employ nearly 110,000 persons and spends nearly $4 billion."

"While Congress was enacting 404 laws in 1974, the federal bureaucracy turned out 7,496 new or amended regulations. This is 18 for every law...and they are just as binding as any law adopted by Congress. Many were for good and worthy purposes. But is concerns me that we have created in our government a branch which is beyond the reach of the ballot box...beyond the reach of the people."

I believe that there is a definite necessity for our regulatory agencies. I also believe that the regulatory agencies do their job as it is outlined. In fact, the regulatory agencies carry out the law of the land, which indeed is their charge. The confusion results from how the law of the land is currently decided in the area of technology and, in particular, food technology. We are seeing a vast public relations effort, not by science but by letters to the editor, by charges in the press inspired by editorial writers who know very little about science but are inspired by consumer activists who, in my opinion, do not in fact help consumers but hinder them. It seems to me that many of the regulations which are promulgated due to pressures from those who decry technology end up aiding the consumer activists because it gives them a purpose in life; indeed often creating new jobs in industry; indeed raising prices; indeed creating new grants for the researcher. The only person who suffers and suffers most from such a point of view is the consumer. The consumers who I referred to earlier as being confused and paranoic about the foods they eat.

Josephson (5) has summarized a rather dramatic account of over-regulation. In August 1973 the U.S. Consumer Product Safety Commission announced that research had shown that there was an association between some spray adhesive and chromosomal breakage and birth defects in humans; they then immediately banned and recalled the products from the market. The commission widely publicized a warning and asked those exposed to consult a physician. Members of the New York State Department of Health have recently surveyed medical genetic centers around the country and found that there were more than 1,100 inquiries at these centers alone and that more than 1,200 working days were lost because of the issue. More seriously, they found that nine pregnant women who were exposed to the spray adhesives elected to abort, and eight did so without undergoing diagnostic test.

However, something has been left out of this story that is very important. Six months after the warning, the commission withdrew its ban because, in fact, it was unable to confirm the alleged teratogenic or mutagenic effects or any toxicity of these substances. This is where public relations and media pressures can preclude science. Science should not proceed via the press conference but must evolve through publication in scientific journals which have undergone the scrutiny of peer review.
**TWO MANY PROMISES?**

Perhaps science has made too many promises, perhaps we in the field of technology have allowed the consumer to believe that technology can solve all problems. If this is indeed true then we must let the consumer know just what it is that technology can accomplish and what it cannot accomplish. We obviously must have tests for safety, we obviously must proceed with good manufacturing processes while utilizing food additives in a sane, moral, and rational sense. We must never forget the lessons of thalidomide. However, we must do this based on factual evidence and not on suspicion.

Perhaps we should make it plain to the consumer that it is a fact that most nutritious foods are worthless if they are not maintained in an acceptable form. Nutrition, per se, is not the most important factor to the consumer and cannot even be considered as a single entity. The consumer must become aware of the realities of food production and the fact that nutrition must be considered within the framework of many other factors such as cost, acceptability, safety, availability, convenience, and quality.

It is true that nutrition as a generalized concept, is important to the consumer, however, it maintains this preeminent position only up to the point of purchase. At purchase, the other factors mentioned previously loom into the overall picture and predominate in the minds of most consumers. At this time of economic turmoil, who would argue the importance of cost. At this time of mistrust, who would argue the importance of safety. The psychological values in our society imply a demand for good flavor, acceptability, and quality. At this time of struggling for individual rights for the role of women in our society, who would argue the importance of convenience which liberates the cook from the kitchen.

**THEN AND NOW**

Since this is the year of the bicentennial, it might be enlightening to view these parameters in terms of what it was like in the year of the revolution and what it is like today.

Consider first acceptability, availability, and quality: in the days of the Declaration of Independence, Count Volney, and outspoken Frenchman, tells of “writhing under the effects of a breakfast of hot bread, half baked and soaked in melted butter, served with the grossest cheese and hung beef, pickled pork, and fish. At dinner they have boiled paste under the name of puddings, and the fattest are esteemed the most delicious; all their sauces, even for roast beef, are melted butter, or fat; under the name of pie or pumpkin, their pastry is nothing but a greasy paste never sufficiently baked. To digest these viscous substances they take tea bitter to the taste, in which state it affects the nerves so powerfully that even the English find it brings on a more obstinate restlessness than coffee” (11). Further, Count Volney stated that “for the good of the country, the government should launch an educational campaign for the improvement of eating habits” (11).

Consider the position today: “we tend to take many of the positive elements of our advanced state of technology for granted — and even make them the subject of criticism. We routinely expect that we can come home at night after a days work, walk into a well-stocked pantry, pick and choose exactly what we will have for dinner from the refrigerator, and have it ready in less than an hour. We naturally assume the courses we prepare and eat will be nutritious, attractive, and enticing to our taste buds. We expect that our meals will be enjoyable occasions, not just routine periods for satisfying biological needs” [Whelan and Stare, (12)]. You know it wasn’t always that way.

**Convenience and cost.**

Consumers today are insisting on being able to buy “instant,” “heat and serve,” and “ready-to-cook” convenience foods that grandmother never dreamed of. One of the reasons is the struggle for individual rights and the consequent fact that more women are taking jobs — 74 million of them today, and a projected 135 million in 2,000 A.D. (7). As a result they’re willing to pay for convenience built into the food rather than domestic help. This kind of convenience allows a household to eat a varied, nutritional, high quality diet. A result of technology.

**Technology saves a tremendous amount of money.**

For those who wish to go back to nature and sell natural rather than additive bread, I would recommend an examination of Table 1 (7). Without preservations, 

**TABLE 1. Impact of removing additives on the cost of white bread**

<table>
<thead>
<tr>
<th>Cost factor</th>
<th>Additive bread</th>
<th>Natural bread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredients</td>
<td>5.40</td>
<td>5.17</td>
</tr>
<tr>
<td>Manufacturing cost</td>
<td>4.75</td>
<td>6.00</td>
</tr>
<tr>
<td>Selling and distribution expense</td>
<td>7.33</td>
<td>10.50</td>
</tr>
<tr>
<td>Grocer’s margin</td>
<td>4.75</td>
<td>4.75</td>
</tr>
<tr>
<td>Baker’s margin</td>
<td>1.72</td>
<td>1.72</td>
</tr>
<tr>
<td>Retail price</td>
<td>23.95</td>
<td>28.14</td>
</tr>
<tr>
<td>Difference</td>
<td>+4.19</td>
<td></td>
</tr>
</tbody>
</table>

Additional cost per loaf to consumer: +4 to 5 cents

Additional cost to consumer nation-wide: +1.1 billion

[a]From Melnick, (7)
pears and plums were also grown... frequently these fruits were left to rot or fed to hogs after daily needs were met, as preservation required pounds for pound of sugar it was costly” (it is interesting that the role of sugar in preservation, its safety as a calorie source, and the relative cost of sugar today are almost totally ignored by many who are interested in legislating our food supply). “Bananas, oranges, and lemons were known but were used only for banquets or special treats.”

Safety. Hazards to our food have been defined by Dr. Virgil Wodicka, former director, Bureau of Foods in the F.D.A. These hazards are widely agreed upon (3, 8) and may be defined as follows with the most important hazard listed first and least listed last:

1. Microbiological hazards
2. Environmental hazards
3. Malnutrition
4. Natural hazards
5. Pesticides residues
6. Food additives

It is interesting that food additives, the bane of the activists is considered by the experts to be the last in terms of danger to the American public. However, this kind of disagreement between scientists and sensationalists is not uncommon. It is particularly evident in the language used to described scientific or technological findings. An example of typical mistaken synonyms used by non-scientists in describing scientific terms is shown in Table 2.

<table>
<thead>
<tr>
<th>Scientists</th>
<th>Non-scientists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis</td>
<td>Facts</td>
</tr>
<tr>
<td>Theory</td>
<td>Discovery</td>
</tr>
<tr>
<td>Implications</td>
<td>Results</td>
</tr>
<tr>
<td>Suggests</td>
<td>Proves</td>
</tr>
<tr>
<td>Contributes to</td>
<td>Causes</td>
</tr>
</tbody>
</table>

aFrom Nutrition and Food Choices by Kristen W. McNutt and David R. McNutt, SRA (in press).

Consider the case 200 years ago (11) “tomatoes were raised as a garden ornament but seldom eaten as many considered them to be poisonous. Potatoes were known but not widely cultivated...it was believed that if a man ate potatoes every day, he could not live 7 years.” As well as these misbeliefs we all know that there was some truth in these beliefs. Potatoes containing large amounts of solanine could be dangerous and of course tomatoes were thought to belong to the family “deadly nightshade.” But there were other problems: food poisoning was rampant, malnutrition was rampant, people starved to death. They do not do that today. The gross deficiency diseases which we were so familiar with have all but disappeared. We don't even think or hear about them in North America today. Scurvy, rickets, beriberi, pellagra — who suffers from these today in America? It's interesting that as recently as 1955 a Canadian textbook written by Hiltz (4) stated “in many parts of Canada one child in every nine shows evidence of having had rickets. This is true notwithstanding the fact that prevention and care are so simple. There is insufficient sunshine in Canada to prevent rickets in children so it should be standard practice to give them daily some form of liver oil or concentrate.” I remember, with fond distaste, the codliver oil pill that I received, how much more safer and more desirable to receive this in a staple food product like milk. This is due to fortification, this is due to technology.

Fortification of food with nutrients is probably the area which would be singled out by most as having had the greatest impact on the health of the consumer. However, it is clear that technology has provided many other innovations for the nutritional benefit of the consumer.

The concept of fortifying food and/or water with nutritional chemicals may be said to have had its beginning in 1833 in South America when the French chemist Boussingault recommended addition of iodine to table salt to prevent goiter. This practice has been adopted widely in Europe and North America with tremendous success since that time. The history of fortification is impressive. Margarine fortification with vitamin A; vitamin D fortification in milk; the enrichment of bakery-produced white bread and family-used flour by addition of thiamine, riboflavin, niacin, and iron. Enrichment of degeminated cornmeal, corn grits, whole grain cornmeal, rice, pasta products, and, of course, fortification of cereals. Ascorbic acid fortification of many, but not all, fruit beverages and non-citrus juices proceeding. More recently, addition of the vitamins A and D to fluid skim milk, fluid low-fat milk, and non-fat dry milk has been initiated. There can be no question as to the beneficial effects of this technology.

MARKETING MECHANISMS

These are the promises of technology. Technology and science, however, cannot promise or absolve absolute safety, they cannot promise magic from food, they cannot promise strength and vigor from eating certain food materials to the exclusion of others. Perhaps it is time for the scientists and technologist to come grips with some of the marketing mechanisms used in this country. Certainly, food advertising, by and large, uses a very honest approach in communicating with the consumer. However, there is probably about 2% of the total advertising which could do with some cleaning up. This 2%, unfortunately, gives all food advertising a bad name. We should do away with it!

We should do away with the concept of industry promoting natural over synthetic. This gives an immediate economic advantage to a company but an immediate economic disadvantage to the consumer. It seems to stress that natural is somehow better than synthetic and seems to imply that what we are doing is somehow wrong. This must stop as well!

Consumers must be made aware of the positive aspects
of technology and the grammatical sleight-of-hand used to disclaim it. Table 3 shows a commonly used ploy, that of juxtapositioning sentences, to prove a point. This kind of writing must be logically analyzed by consumers and in fact, scientists must point out the existence of this kind of rhetoric at every opportunity. Table 4 is another example of the use of words to convey misinformation. The examples in Table 4 clearly show that the desired end of technology can be totally misrepresented by simply changing the connotation. We must convince consumers to read analytically. We must ask them to demand from the media such information as: What dosage? What kind of animal used? This might stop some of the problems that arise from banner headlines such as “Compound X Causes Cancer.”

Dr. Thomas Jukes, in a recent article, in Nature (6) discussed DES and its risk-benefit. “Indeed, folic acid was discovered as a result of the anemia in pregnant women caused by its deficiency, by Dr. Lucy Wills in 1931. The deficiency is still prevalent throughout the world, as noted by the World Food Congress in Rome, 1973. A continuation of the dietary lack of folic acid in pregnancy will be aided by NCI’s recommendation against consuming beef liver. The protective effect against cancer of this recommendation seems dubious.” This is a case where a consumer would have to eat tonnage ranges of liver over a lifetime to simulate the studies done with DES. The trade-off is perhaps a deficiency in folic acid. This must be pointed out to the consumer and the consumer must choose.

TECHNOLOGY MUST GO?

In the recent 1976 W. O. Atwater Memorial Lecture, Dr. Emil M. Mrak, Chancellor Emeritus of the University of California at Davis, made a striking plea to scientists to speak out, to talk to consumers, and to defend the technological way. It is critical that this be done. We are facing a time of gigantic upheaval. We have tried to please everyone and have pleased only a few. Rebellion seems to have run its course in some areas, but a far more serious rebellion is underway — the powerful upwelling of the spirit of the counter-culture. This includes not only anti-scientific, and anti-technological forces, but total anti-intellectual forces as well.

One answer to this would be to remove from the marketplace all convenience foods, bacon, ham, sausage, all processed foods including those canned and frozen. Ask the consumer to get back to nature and grow a vine ripened tomato in 2 ft of snow in the Midwest or northeast. This is not the answer. We cannot push technology back because we have an overpopulated planet that would starve. Scientist and technologist have always had a human, moral spirit which has been used to produce benefits for human kind. However, it must be remembered that science and technology cannot solve all problems. It cannot promise the world and keep its promise, however, it can indeed contribute to feeding and increasing the comfort of a vast mass of humanity without technology, would face the four horsemen of Apocalpyse — death, famine, war, and pestilence.

ACKNOWLEDGMENTS


REFERENCES