of the convention, and, if it is to be maximally effective in the election campaign, should not be announced until after the convention."

Handler told *Science* that after sending the 4 June letter, he called a member of the Humphrey staff and said that he did not want to serve at all. Humphrey aides say that they talked to Handler after receiving the letter, told him that they needed him at once, and not just after the convention, and that he agreed to serve, with announcement of his acceptance to be made before the convention.

In any case, on 3 July, Handler, in a letter ringing with statesmanship, took himself out of presidential politics. "I have become increasingly aware," he wrote to a member of the Humphrey staff, "that the organization of partisan groups of scientists supporting individual candidates for high political office threatens to generate serious rifts in the scientific community, 'dividing the house' as it were, whereas the issues which separate them are entirely external to science itself and indeed external to the application of scientific solutions to the problems of our nation. Accordingly," he continued, "I now consider the formation of such groups to be ill-advised and, potentially, a disservice to our society. Scientists, like all other citizens, are free to engage in political campaigns. But they should do so as citizens, with other citizens, not as scientists."

Handler added, "Should political campaigns continue to include such organized groups of partisan scientists, it is inevitable that national attitudes and federal support for science must also come to involve political considerations. Appointments of scientists to administrative posts in science-using agencies and appropriations for federal support of science will surely be influenced by the political activities of those concerned. And our nation will suffer. . . .

"Finally, I must record my personal position," Handler's letter continued. "In addition to all the considerations above, as chairman of the National Science Board of the National Science Foundation, it would be particularly inappropriate for me to be associated with the formation of Scientists, Engineers, and Physicians for any candidate. The National Science Foundation is essentially non-political. It would be a disservice to the Nation for me to jeopardize, in any way, the future of this agency by personally engaging in partisan politics on the national scene."

And that settles the matter: Handler is not working for Humphrey. Why did he undergo what appears to be a change of mind? Handler says that upon reflection he independently came to the conclusions stated in his letter. He says he did not discuss the matter with anyone, and emphatically denies that his decision was affected by expressions against political involvement currently coming from such elder statesmen as Frederick Seitz, president of the Academy, and Leland J. Haworth, director of NSF.

Meanwhile, the Humphrey camp, citing the many good works that the Vice President has accomplished in behalf of science and education, confidently proclaims great, though unspecified, support throughout the scientific and academic communities, and in anticipation of beating McCarthy, predicts that Humphrey will pick up the support that has rallied to the Minnesota senator.

Perhaps. But the scientists who have flocked to McCarthy did not do so because of his record on science and education; by any measure, Humphrey has an unbeatable record in those fields. Rather, they are acting out of revulsion toward the administration's Vietnam record, and Humphrey himself has said that he is not going to disavow a policy that he so ebulliently supported over 4 long years. If it ends up as a Nixon-Humphrey race, it is quite likely that some of McCarthy's scientists and engineers would go to work for the Vice President, but at present, political activism within the scientific community appears to be mainly in behalf of the McCarthy candidacy.—D.S.G.

Irradiated Food: FDA Blocks AEC, Army Requests for Approval

For over 10 years, the Army and the Atomic Energy Commission have been studying the preservation of food by radiation. They claim that exposing food to radiation greatly increases its shelf life, prevents spoilage, and kills harmful insects and microorganisms without loss of nutritional quality or flavor. And it is clearly established, they contend, on the basis of their decade of research, that irradiated food is safe for human consumption.

However, the Food and Drug Administration (FDA), which must pass on irradiated food before it may go on the market, is not so sure. This has led to another of the increasingly common clashes between proponents of new technology and the federal regulatory agencies charged with protecting the public welfare.

In mid-April, FDA refused to approve for human consumption irradiated canned ham that had been developed by the Army. The Army claimed that the ham could be kept unrefrigerated for several years and would be particularly valuable for supplying troops on the move. A large contract had been signed with a private corporation, Irradiated Foods, Inc. (IRRADCO), that was to produce the irradiated ham on a mass scale. But FDA was not convinced that the product was safe, and turned down the request for approval.

An FDA spokesman said that the rejection did not represent any "overall condemnation of irradiated foods." In fact, in 1962 FDA approved irradiated bacon, and it has also issued regulations —which is the way approval is granted —for irradiated potatoes and wheat flour. (Although quantities of these foods have been produced for military use, they have not yet been produced for the civilian market.) It appears that the rejection of the ham petition came about through a misunderstanding on both sides as to what would be acceptable data.

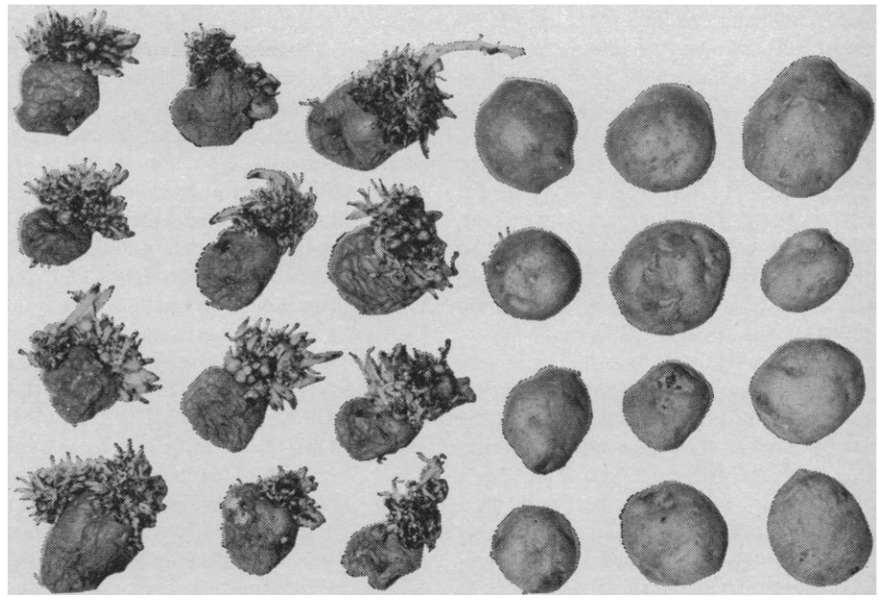
The Army—which has been involved in food radiation since the 1950's—submitted data from studies on feeding irradiated bacon and pork to rats, dogs, and mice as evidence that the ham was safe. Studies must be submitted for all

new food additives under the Food Additives Amendment of the 1958 Federal Food, Drug, and Cosmetic Act. Ham, in terms of curing, comes between highly cured bacon and untreated pork, an Army spokesman said, so that successful feeding studies on pork and bacon would indicate that the ham was safe. "We had made an agreement with FDA in the mid 1950's," Edward S. Josephson, associate director of Food Radiation at the Army's Natick (Massachusetts) laboratories, told *Science* last week, "that studies for like foods could be translated." Now he thinks it will probably be necessary to begin 2-year feeding studies on ham before FDA will approve the petition. "And we will have FDA looking over our shoulder," Josephson said.

New feeding studies still may not satisfy FDA. Former Commissioner James L. Goddard said that the feeding studies with irradiated pork produced several deleterious effects on the animals tested. In a letter to the director of the Natick laboratories (which has not been made public), Goddard reportedly cited reductions in life span, in numbers of red blood cells, in numbers of offspring, and in body weight in rats and mice which had been fed irradiated pork. This led FDA officials to consider reexamining the already-approved petition for bacon, but so far no steps have been taken.

Josephson said these claims were not justified. On FDA's request, he said, his office had supplied over 11,000 printed pages of data in support of the ham petition, some from feeding studies dating back to the 1950's. In some of those early tests, Josephson said, when irradiated food was still very new and untried, some of the effects that Goddard enumerated did actually occur. But with advances in the technology and changes in protocols for feeding studies, he said, these effects have been eliminated.

The Atomic Energy Commission (AEC)—which, since 1960, has concentrated on low-dose radiation of foods (doses up to a few thousand rads), or pasteurization, while the Army has worked with higher-dose radiation, or sterilization—has also had difficulty in gaining approval for its irradiated foods. The AEC claims that pasteurization destroys harmful insects, molds, and sprouting on fruits and vegetables, and thus increases the wholesomeness and shelf life of these foods. FDA did approve petitions for irradiated potatoes and wheat flour (the irradiation eliminates sprouting and mold formation) but has rejected AEC petitions for oranges and strawberries. The strawberry petition was rejected because the AEC offered feeding studies on peaches as evidence that the strawberries were safe, a procedure which AEC officials say FDA had earlier agreed to. The AEC, therefore, is now conducting 2-year feeding studies on strawberries.



U.S. Army Natick (Mass.) Laboratories

After 275 days of storage at 55 degrees Fahrenheit, this is the way an untreated control sample of pungo potatoes (left) looked as compared to a group of pungo potatoes exposed to 15,000 rad of radiation.

The FDA—under Goddard, anyway—has been unwilling to accept data for one food in support of a petition for another. Irradiated foods are unknown quantities, FDA officials reason, and therefore they should be tested individually. The AEC and the Army, however, say that they have been conducting feeding studies for several years on 21 different foods chosen to represent all areas of the diet. The petitions submitted to FDA have been for foods similar in all respects to one or another of those tested. A food has been chosen to be submitted for approval, they say, because it is considered to have a greater health, economic, or commercial value than the similar one tested. Representatives from the Army Surgeon General's office, which has conducted many of these feeding studies, have said that the 21 irradiated foods tested are wholesome, safe, and nutritious. But FDA would still like to see data for each food for which regulations are sought. "We're beginning to think we may have chosen the wrong 21 foods," a spokesman for the Surgeon General told *Science*.

Do irradiated foods emit radioactivity? Do they adversely affect vitamins in the foods, along with the molds and bacteria? Are they really safe? These are the questions that FDA asks, and unless they are answered satisfactorily—and in the ham and strawberry cases FDA feels they were not—approval will not be given. Almost necessarily cautious and conservative, FDA simply follows the law, according to Alan T. Spiher, Jr., of FDA's Petitions Control Branch. "The law requires a positive showing of safety," Spiher says; "we cannot issue a regulation unless safety is demonstrated."

Goddard seemed to feel that the Army and the AEC have not been careful or thorough enough in establishing safety for irradiated foods. In a letter to AEC Chairman Glenn T. Seaborg at the time of the ham decision, Goddard called for a "more rigid adherence to established protocols" for feeding studies. He also said that it would be necessary to have a "more careful analysis of all available data than has been evident thus far." But in the letter to Seaborg he did not mention the deleterious effects on health of irradiated pork that he reportedly had mentioned in his letter to Natick. This has led many officials on both sides to conclude that even FDA felt that the report of such effects was not really

justified, or was taken out of context. Some officials believe that Goddard mentioned the health effects in order to stress the seriousness of the situation and the need for better data on feeding studies.

"In discussions we have had with FDA," Colonel Irvin C. Plough of the Army Surgeon General's office said, "the FDA officials have not seemed to have any real qualms about the safety of irradiated food. They would simply like to see it spelled out better."

The ham decision has had a severe impact on the entire food irradiation operation in both the AEC and the Army. The Army had planned to submit petitions for pork, chicken, beef, and shrimp, but now must wait until wholesomeness and safety protocols have been established for ham. IRRADCO has postponed construction of its meat irradiation plant, which had been contingent on FDA approval of the ham petition. IRRADCO had contracted with both the AEC and the Army, and was to have been the first mass producer of irradiated foods.

The AEC has recently added data to a petition for irradiated fish fillets, since some of the initial data were based on Army feeding studies which had been questioned by FDA. The AEC is also working to irradiate papayas and mangoes in Hawaii. Indications are that irradiation destroys seed weevils on the mango and would make that fruit eligible for export to the mainland. At present, because of the weevils, there is a quarantine on Hawaiian mangoes.

Almost all of the AEC's food irradiation research, development, and testing is contracted out to universities, industrial firms, or nonprofit foundations. But most of the Army's work on food irradiation is done at its Natick laboratories. There are two large radiation sources used—a 24-Mev, 18-kilowatt electron linear accelerator and a 1,250,000-curie cobalt-60 isotope source. Recently researchers at Natick labs have begun to irradiate foods at low temperatures, eliminating the off-taste that is sometimes associated with irradiated food.

The process—for either isotopic radiation or electron radiation—is not very complicated. The food is first heated to 150 degrees ("blanched" is the term used); blanching does not cook the food but only stops enzymatic activity. According to Ari Brynjolfsson, a nuclear physicist at Natick, this does not measurably change the nutritional value. Then the food is cooled to a low temperature, and this, Brynjolfsson said, protects the vitamins from destruction and retains the taste of the food. Then the food is exposed to radiation; various doses produce various effects. The highest-level radiation used kills spore-forming bacteria, other bacteria such as salmonella, and trichina, all of which are prevalent in meats. Without radiation, Brynjolfsson said, foods must be heated and cooked for such long periods, to rid them of these organisms, that some 20 percent of the nutritional value is usually lost. Radiation at low temperatures kills the harmful organisms without loss of the food's nutritional value, he said.

Several other countries are doing work with irradiated foods; Canada has approved potatoes and onions, and about five other countries have approved potatoes. The Soviet Union has reportedly approved several irradiated fruits and vegetables and is continuing research on radiating meats (beef, pork, chicken, and rabbit).

Proponents of irradiated food point to its advantages: long shelf life, high nutritional qualities, and freedom from disease-generating organisms. Josephson said that foods exposed to radiation would have advantages for underdeveloped nations, where, in some places, over 50 percent of the food produced spoils before it ever gets to the consumer. The amount of radioactivity in the food is negligible, he says; a steady diet of irradiated food would actually expose a person to less radiation than he is exposed to in walking down the street and breathing the air.

But FDA officials seem to feel that the Army and the AEC have not made sufficient effort to demonstrate that these foods are safe. In view of its wariness about food additives, FDA is particularly cautious about possible harmful effects of radiation. It is FDA's contention that each irradiated food must be shown to be safe, and that feeding studies must be conducted for each food for which regulations are sought. It may turn out to be quite a while before 4-year-old irradiated chicken will be gracing the American dinner table.—ANDREW JAMISON

Smithsonian: Art of Organic Forms

Until 31 July, the Smithsonian's Museum of Natural History is exhibiting a noteworthy collection of paintings which is, in part, predicated on the idea that a way to encourage public understanding of science is to emphasize its beauty. Philip C. Ritterbush, the originator of the exhibit, also hopes that it will enhance the aesthetic appreciation of science for those interested in the subject. The exhibit focuses primarily on 75 paintings and drawings which have been influenced by microscopic organic forms.

Ritterbush, the director of the Smithsonian's Office of Academic Programs, has written a book, *The Art of Organic Forms,* to complement his exhibit of the same name. The book is dedicated to G. Evelyn Hutchinson, Yale professor of Zoology, who has argued that the public should be more aware of the beauty of the items displayed in natural history museums.

The selection of relevant paintings borrowed from many collections in the United States was made by Ritterbush's assistant, Diana Hamilton, a recent graduate in biology from Bryn Mawr College. Ritterbush is also thinking of organizing an exhibit of paintings by scientists sometime in the future.

The paintings, which include the work of Paul Klee, Matta, and Leon Kelly, among others, have been well mounted by Lucius E. Lomax. In line with the Smithsonian's new philosophy of having its exhibits appeal to all the visitor's senses, an attractive 25-minute recording, including music by Erik Satie, is played in the darkened exhibit hall. Although Washington *Post* critic Wolf Von Eckardt condemned the playing of the recording ("I say it's Muzak and to hell with it"), he was generous in his other comments—"the sheer enjoyment and fascination of a remarkable and thought-provoking exhibit that does the good old Smithsonian proud." There is a possibility that some of the paintings in the exhibit will be displayed at the AAAS 1968 annual meeting in Dallas.—B.N.