Inside the Atomic Kitchen

Why are microwaves good but gamma rays bad for treating food?

by Frederic D. Schwarz

An article in this issue tells how the microwave oven faced many difficulties on its way to becoming accepted. One problem the article doesn’t mention is that both the technology’s name and its original trademark (Radarange) refer to radiation. There’s nothing unusual about a household device producing radiation, of course; a light bulb does that. But by the early 1970s anything associated in the public mind, however imprecisely, with “the atom” had come to seem sinister and dangerous. This explains why the laboratory process known as nuclear magnetic resonance became “magnetic resonance imaging” when used in medicine.

Why, then, did 1970s consumers rush to install an undisguisedly, even proudly radiation-creating appliance in their homes—for use with food yet? As with the light bulb, the answer is simple: It was useful. If the microwave hadn’t performed the near-biblical miracle of transforming leftover Chinese food into something edible, it could never have reached the point where users casually speak of “nuking” a frozen pizza.

The October 2004 issue of *Technology & Culture*, the journal of the Society for the History of Technology, contains an article about a less successful attempt to apply atomic technology in our daily diet: the irradiation of food for preservation. As James J. Spiller of the State University of New York at Brockport explains, in the years following World War II, subjecting food-stuffs to gamma radiation—essentially very powerful X rays—seemed a promising way to make peaceful use of radioisotopes by killing harmful organisms. In tests during the 1950s and 1960s the Army successfully prolonged the life of rations with irradiation, though it was too expensive to be practical. *Apollo 17* astronauts ate irradiated ham-and-cheese sandwiches while orbiting the moon.

For civilian use, though, the burden of proving irradiation to be safe was formidable. The Food and Drug Administration (FDA) classed irradiation as an additive, which meant that it had to be tested on animals at 100 times the normal dose. The decision was not as odd as it might seem, for while gamma rays do not remain present in food, they do create new chemical byproducts that might potentially be harmful. Since feeding a rat at 100 times its normal rate was obviously impossible, and since gamma radiation interacts differently with each food, gaining approval looked much more laborious than it was worth.

Eventually regulatory requirements were eased, and in the mid-1980s the FDA began approving irradiated foods. By then, however, the antinuclear movement was in full swing, and with the disasters at Three Mile Island and then Chernobyl, as well as heightened anxiety over arms control, the public was extremely wary of anything nuclear. One group took advantage of the confusion among food irradiation, nuclear power, and nuclear weapons with a pamphlet whose cover showed a mushroom cloud rising over a farm.

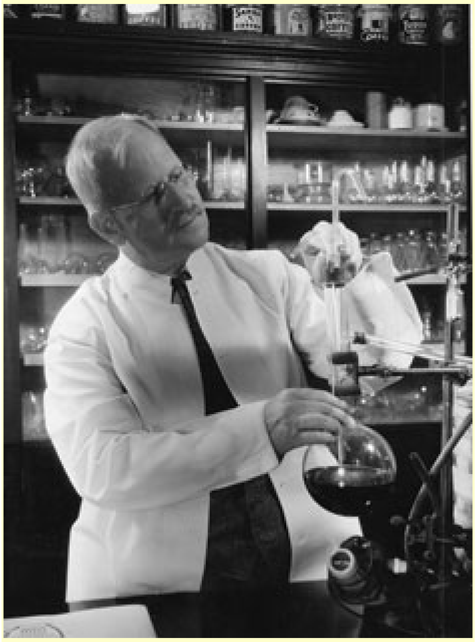
The anti-irradiation camp's biggest triumph was requiring irradiated food to be labeled with a biohazard symbol and the words *Treated With Radiation.* Advocates said this regulation merely helped consumers to make an informed choice. But sun-dried tomatoes are treated with a form of radiation that is known to be harmful to humans, yet they bear no label. And how appealing would a bag of carrots be if it said "Fertilized With Animal Feces," possibly accompanied by an appropriate graphic symbol? *Organic* sounds much more cuddly.

With irradiation, the solution may lie in similar linguistic sleight of hand. In 1985 Neil Neilson, the president of a company that made irradiation equipment, proposed calling irradiated food "picowaved." The idea was brilliant: *Wave* suggests a soothing day at the beach, and how can anything called "pico" be harmful? Unfortunately for the irradiation industry, this locution never caught on.

Will recurrent concerns over food-borne illness finally make the American public accept irradiation? As Spiller writes, "There are many indications that irradiated foods may soon be commercially successful…. But there were numerous signs of food irradiation's imminent commercialization during the 1950s and 1960s, too." Using electron beams instead of radioactive isotopes could make the difference, if the machinery can be made cheap enough. Irradiation may also work its way in through the back door, like genetic modification, which has become commonplace in ingredients like grain and canned goods, though it remains scarce in retail vegetable bins. Like the microwave oven, food irradiation may someday become so valuable that consumers forget their reservations. Or it may remain what it has been for 50 years—a promising technology stubbornly unable to overcome its heavy semantic burden.

The Academic Grind

MIT once had a laboratory to test coffee



Samuel Prescott, coffee maven.

Preserving food with radiation sounds very space-age, but in fact it was discovered before the first airplane flew. In 1898 Samuel Prescott, a professor of biology at MIT, subjected various foodstuffs to gamma rays and found that spoilage was greatly retarded. In another early triumph, he used bacteriology to extend the shelf life of canned goods. Prescott went on to become MIT's dean of science, and in that role he continued his career-long goal of applying scientific methods to the improvement of everyday life.

As another article in the October 2004 *Technology & Culture* explains, sometimes this quest took the form of scientifically determining how to make the perfect cup of coffee. Larry Owens, of the University of Massachusetts, writes that in 1920, with a $40,000 grant from an industry group, Prescott established MIT's Coffee Research Laboratory to evaluate the product's safety and find the most effective ways of brewing it. Lab workers fed rabbits enormous quantities of coffee and found their health unimpaired, though it must have made them even jumpier than usual. They also brewed coffee with a variety of techniques and had tasters evaluate the results. For the record, MIT’s researchers found that the drip method works best, preferably in a glass or ceramic pot; the water should be just below boiling; and the coffee should be freshly ground.

Under Prescott’s guidance, MIT continued its leading role in “sanitary science,” usually with a bit more microscope work involved, until his retirement in 1942. By then most of MIT’s biologists had come to consider the field an anachronism, and it was soon shunted off to a separate department.

The episode shows how much science changed between the turn of the century and World War II. In Prescott’s youth it had been entirely reasonable for an MIT professor of biology to spend his time perfecting candy and bananas and searching for “growth-producing rays” that would (as he predicted) “bring forth cows the size of brontosauri.” But by the end of his career the frontiers of biology had advanced far beyond the dinner table. Nowadays, developing the perfect cup of coffee is considered a job for a corporate laboratory, though MIT students do carry on Prescott’s tradition by researching coffee and other stimulants on an independent-study basis.