on artificial heart devices, the behavior of prefabricated homes during earthquakes, and high-speed transportation of the future, including a cooperative look at a "magnetically activated train," according to the summit's final communiqué.

Under the rubric of the 1972 environmental agreement, both sides have now agreed to designate certain areas as "biosphere reserves" where baseline data on ecosystems will be collected and shared in cooperation with the Man and Biosphere Program of Unesco. This could lead to consideration of a biological preserve in the Bering Sea, straddling the U.S.–Soviet boundary line.

No new cooperative projects in space were worked out beyond the Apollo-Soyuz earth-orbiting mission scheduled for next July.

The Middle East. All but lost in the furor that surrounded the President's decision to sell nuclear power plants to Egypt and Israel was a series of broadly worded statements committing the United States to cooperate in science and technology with Egypt, Israel, Jordan, Syria, and Saudi Arabia. These accords merely say that joint committees will be set up in the future to work out specific projects. The Egyptian agreement, for example, calls for cooperation in medical research and training, agricultural technology, and general research and development, including space research—the last, one State Department official notes, "because everyone's interested in space."

For Israel and Egypt, the new accord is mainly diplomatic frosting on a long-standing precedent of cooperative research. (In Egypt, the United States already supports about $2 million worth of civilian research.) The statements, though, are expected to grease the bureaucratic skids for new projects on both sides.

For Saudi Arabia, which has no well defined R & D infrastructure, substantive projects may take longer to develop.

—ROBERT GILLETTE

Agriculture: FDA Seeks to Regulate Genetic Manipulation of Food Crops

Not so long ago tomatoes were soft, juicy, and tasted of tomato. Several varieties available in today's supermarkets are rubbery gobs of cellulose that taste of nothing. They are bred that way for mechanical picking. So far most genetic manipulation of crops has been for the benefit of the producer and, in the process, qualities of interest to the consumer, such as nutrients, have fallen by the wayside. The federal government has now moved to intervene, but from an unusual quarter and in a way that has stirred up considerable alarm within the plant-breeding community.

The government agent in this case is the Food and Drug Administration (FDA), and the legal basis for its intervention is its claim that food crops fall within the purview of the law governing GRAS substances, food additives that are "generally regarded as safe." President Nixon in his 1969 Consumer Message directed the FDA to review the safety of all substances on the GRAS list. The plant-breeding community was astonished when a year later the FDA made clear that the review would cover food products as well as food additives, including any products whose composition had been significantly altered through breeding or selection, provided that the alteration might "reasonably" be expected to change either the nutritive value or the amount of a toxic constituent of the plant in question.

The new regulation raised more questions than it answered. Which of the hundreds of new varieties of plants developed each year would be monitored for nutrients and which of the thousands of toxic substances in food products would have to be checked? How did the FDA define a "significant" alteration in the nutrient or toxic composition of a food crop variety? Would it be necessary to monitor every single new variety of chick pea, Brazil nut, and rutabaga?

To calm the sea of uncertainty raised by its action, the FDA sent out letters to industry officials to clarify its position further. For the purpose of the regulation, a 20 percent decrease in the content of a nutrient and a 10 percent increase in a toxic substance caused by breeding or selection would be considered significant, and would, therefore, have to be reported to the FDA.

A familiar pattern of government regulatory action was beginning to emerge, one which served unintentionally to exacerbate industry suspicions. The FDA would issue a regulation without a careful examination of the regulation's impact. Industry would react with alarm. The FDA would respond with a clarification which only raised additional concerns.

The letter defining a "significant" alteration in nutrient or toxic content left untouched the crucial question of which crops should be monitored and which particular substances should be measured.

The resulting confusion led to the formation of a joint industry-government task force in October 1972, 2 years after the FDA had first announced its radical regulation. According to members, the FDA task force has been plagued, since its inception, with an overly broad mandate and inadequate data upon which to base its recommendations. The group was told to develop criteria for choosing which products should be monitored. Frederic R. Senti, who retired as a senior administrator in the Agricultural Research Service last week after serving 2 years as chairman of the task force, called the mandate "prodigious." An industry member labeled the group's task "herculean," in view of the lack of knowledge in the field.

The task force was asked to consider the issue of toxic substances in food crops because of the FDA's concern over several recent incidents. According to task force member Alan Spiher, Jr., chief of the FDA's GRAS Review Branch, the practice of irradiating potato seed tubers to enhance yield had been found to cause a 60 percent increase in the toxic alkaloid solanine. A few years ago, another new potato

variety, Lenape, regarded as excellent for potato chip manufacturers, was withdrawn from the market as a precautionary measure because it was found to contain an increased concentration of solanine compounds.

Ironically, though such incidents indicate that adventitious changes in the concentrations of toxic substances have occurred and may pose a potential hazard, task force members generally agree that too little is known about toxic substances to devise a systematic monitoring scheme. Of the thousands of naturally occurring toxic substances in foods, the vast majority are apparently harmless in the amounts in which they occur. Indeed, some essential nutrients are toxic at high concentrations. Many of the toxic substances protect the plant against disease or insects. Unfortunately, only in relatively few crops—potatoes, peas, and green beans —have such substances that serve this function but are also harmful to man been identified. Moreover, very little is known about the effect of these compounds in very low doses over long periods of time. In addition, many substances in food which may be toxic have not been identified. Monitoring for potentially dangerous toxic substances is more difficult than looking for needles in haystacks said one task force member. In the haystack case, at least, the object of the search is known.

Nevertheless, the task force managed to produce two recommendations on the toxic substance question; first, that glycoalkaloids in potatoes, one of the few known potential hazards, not exceed the range present in the currently widely grown commercial varieties; second, that breeders pay "special attention" to possible increases in levels of toxic constituents when using alien species in crop improvement programs.

Neither recommendation has generated much concern among plant breeders, since potatoes are already being monitored for glycoalkaloids, and since affording a potential occurrence "special attention" is far less expensive than guidelines calling for toxic identification and laboratory analysis.

What has stirred up controversy is the task force's proposals for monitoring and reporting the nutritional content of several major food crops. The task force decided that any crop providing at least 5 percent of the average national intake of a nutrient, or at least 10 percent of the mean intake for a specific regional, income, age, sex, or ethnic group, should be monitored. The group narrowed the nutrients to be checked to nine—protein, magnesium, calcium, vitamins A, B6, and C, thiamin, riboflavin, and niacin. One or more of them will be monitored, according to the proposed guidelines, in nine crops, which include white and sweet potatoes, carrots, tomatoes, dried beans, oranges, cabbage, peanuts, and perhaps wheat.

The task force itself is divided over whether and how the guidelines should be implemented. H. M. Munger, a professor of plant breeding at Cornell University, who represented the American Society for Horticultural Sciences on the task force, opposes their implementation. Munger evaluated the impact of monitoring breeding programs for cabbage, carrots, sweet potatoes, and dried beans. He told the task force that a majority of the breeders indicated the new regulation and guidelines would "impede" the progress of their breeding programs. Of the breeders he contacted, only 6 perform vitamin analysis within their programs, 17 have the capability within their organizations, and 19 lacked such testing capability. One very large seed company, which Munger declined to name, indicated that many of its vegetable breeding programs might be discontinued if nutrient monitoring became too expensive. Increasing the cost of such programs, he argues, also conflicts with the government's objective of encouraging a shift in the development of new plant varieties from government to commercial plant breeders. Munger argues that the guidelines may delay or reduce the introduction of new varieties. Moreover, monitoring is unnecessary in the first place, he claims, because he finds no evidence that the nutrient content of the four crops he evaluated has declined over time. In fact, for sweet potatoes and carrots, the vitamin A content has apparently risen because breeders have been emphasizing the beta carotene content of the products to enhance their orange color.

In defense of the group's guidelines, and the FDA's regulation task force, chairman Senti says that the action is in keeping with the trend toward greater government vigilance over the nation's food supply. Plant growers, Senti argues, have not been singled out for onerous regulation. The FDA's new controls in several areas, such as the voluntary nutritional labeling program, encourage the food industry to supply safer and more nutritious food products. Senti claims that we don't know what has happened to food varieties over the years because, by and large, neither the government nor the companies have been monitoring nutrient composition. "These guidelines will simply enable us to determine what is happening to the nutritional value of our food," said Senti. "It is a useful and reasonable first step."

The fear that these procedures are, indeed, merely a "first step" is the real source of industry's alarm. Breeders fear that this policy may ultimately lead to an FDA regulation that would incorporate increased concentrations of nutrients in raw foods as a primary objective of breeding programs. Such a requirement would add thousands

New Blood for National Science Board

Eight new members have been nominated by President Nixon to the National Science Board, the governing body of the National Science Foundation (NSF). The nominations are expected to be confirmed automatically by the Senate.

Two of the members who are being renominated after completion of one 6-year term are Norman Hackerman, president of Rice University, and Grover E. Murray, president of Texas Tech University. The other six nominees are: Jewel P. Cobb, dean of Connecticut College; W. N. Hubbard, Jr., president of the Upjohn Company; Saunders MacLane, professor of mathematics, University of Chicago; Donald B. Rice, Jr., president of the Rand Corporation; L. Donald Shields, president of California State University, Fullerton; and James H. Zumberge, chancellor, University of Nebraska, Lincoln.

The board, consisting of 24 members plus the NSF director sitting ex officio, is scheduled to meet in September to elect a chairman and a vice-chairman who will serve 2-year terms.—S.B.M.

of dollars to the cost of the development of new crops, and could lead to a complete reorientation of current breeding programs.

Plant breeders are now able to manipulate many different characters in a crop plant including its yield, resistance to disease and insects, ease of mechanical harvesting, processing, quality, color, flavor, and texture. The new FDA procedures would require that nutritionally deficient varieties be reported to the FDA, and that advertising reflect the extent of that deficiency. Breeders fear that such products, if the trend continues, will one day be barred by law from the market. Since a new plant variety may take 10 years to develop, at a cost of up to $1,000,000 (in the case of a complex wheat variety), the prohibition of such a crop variety could have a disastrous impact on members of the commercial plant breeding industry. Senti and Spiher claim that the proposed monitoring requirements would not be financially onerous for plant breeders.

The American Seed Trade Association, the Crop Science Society of America, and the National Council of Commercial Plant Breeders have all officially protested the new procedures, arguing that even the current regulation and proposed guidelines are unnecessary and that they provide insufficient guidance on implementation.

Not all agriculturists, of course, are opposed to the new procedures. Task force member Stuart Younkin, vice president for agricultural research for the Campbell Soup Company, supports them. The National Canners' Association has so far taken no official position. Younkin's company, however, already monitors for many of the nutrients. Moreover, Campbell's is a food processor as well as a plant-breeding firm; processors tend to support the regulation and guidelines, because higher nutrient content in raw products is consistent with the FDA's voluntary program of nutritional labeling. The monitoring would take some of the pressure for greater supply of highly nutritious food off the processors and shift it to the growers.

Task force member Allen Trotter, a plant geneticist with the Asgrow Seed Company, says he believes the FDA acted precipitiously by taking action without a thorough consideration of the direct and long-term implications of the new policy on the plant breeders and their ongoing programs.

Several members of a National Academy of Sciences–National Research Council Task Force on Genetic Alteration in Food and Feed Crops agree with Trotter's assessment. The NAS–NRC task force was convened to study a variety of concerns, including the FDA's proposed action, to decide whether further study and consideration was warranted. The group has strongly recommended that a 2- to 3-year study be carried out, which would include many of the concerns raised by the industry. One academy member familiar with the task group's work and recommendations said that study would definitely include a cost-benefit analysis of the new regulations on breeders, especially the smaller companies, and the impact of FDA's new policy on the market supply and cost of food. A member of the NRC task force said it would be "inconceivable" for the FDA to implement its regulations before the NRC had begun its study.

Although the proposed guidelines have been widely circulated within the plant breeding community, they will not become official unless and until they are approved by the FDA Commissioner. If the task force guidelines are not endorsed, however, plant breeders will be left without guidance for the implementation of the FDA's vague regulation and the FDA will have to convene yet another task force to devise another set of guidelines for its implementation.

Most nutritionally oriented consumer groups have not yet reacted to the proposed guidelines, but Rodney Leonard, executive director of the Community Nutrition Institute, supports their implementation. Leonard believes that the monitoring system would provide vital information about trends in nutrient and toxic content of food needed to formulate rational nutrition policies. "The guidelines represent a healthy trend," said Leonard. He believes nutrition should be a factor plant breeders consider in their programs. "We should not be eating vitamin and mineral fortified cardboard," said Leonard.

Whether or not the FDA so intended, its regulation and proposed guidelines have opened up a new debate, one prompted by increasing public interest in consumerism and good nutrition.

—JUDITH MILLER

The author is the Washington correspondent for The Progressive *magazine.*

APPOINTMENTS

Edmund F. Ackell, vice president for health affairs, University of Florida, to vice president for health affairs, University of Southern California. . . . **Arthur J. Slavin**, chairman, history department, University of California, Irvine, to dean, College of Arts and Sciences, University of Louisville. . . . **Thomas A. Griffy**, professor of physics, University of Texas, Austin, to chairman, physics department at the university. . . . **Claes H. Dohlman**, vice president, Retina Foundation, appointed chairman, ophthalmology department, Harvard Medical School. . . . **Jerry R. Shipman**, graduate student, Pennsylvania State University, to chairman, physics and mathematics departments, Alabama A & M University. . . . **John T. Vaughan**, professor of large-animal surgery and medicine, Cornell University, to chairman, large-animal surgery and medicine department, Auburn University. . . . **Bernard H. Marks**, chairman, pharmacology department, Ohio State University, to chairman, pharmacology department, Wayne State University. . . . **Roy Wagner**, associate professor of anthropology, Northwestern University, to chairman, anthropology department, University of Virginia. . . . **Naim Khazan**, chairman, pharmacology department, Merrell-National Laboratories, to chairman, pharmacology department, School of Pharmacy, University of Maryland, Baltimore. . . . **Harlan Lane**, professeur en Sorbonne, to chairman, psychology department, Northeastern University. . . . **I. Robert Lehman**, professor of biochemistry, Stanford University, to chairman, biochemistry department, School of Medicine, Stanford University. . . . **Harry S. Soroff**, professor of surgery, Tufts University School of Medicine, to first chairman, surgery department, Medical School of the Health Sciences Center, State University of New York, Stony Brook. . . . **Kenneth A. Ames**, dean, School of Education, Gonzaga University, to dean, School of Education, St. Cloud State College. . . . **Lou Kleinman**, associate dean, School of Education, New York University, to dean, School of Education, University of Miami. . . . **Frederick P. Zuspan**, chairman, obstetrics-gynecology department, University of Chicago, to chairman, obstetrics-gynecology department, Ohio State University.