WITNESS MAGAZINE

'IS IT OKAY TO CHANGE

WHAT IS A TREE,

WHAT IS A SALMON,

WHAT IS FOOD?'

VOLUME 84

NUMBER 5

MAY 2001

WITNESS MAGAZINE

CONTENTS

DEPARTMENTS

on the cover

Bluegrass, Jackson Road, WA

Photo by Don Kirby

VOLUME 84
NUMBER 5
MAY 2001

Since 1917, ***The Witness*** has been examining church and society in light of faith and conscience — advocating for those denied systemic power as well as celebrating those who, in theologian William Stringfellow's words, have found ways to "live humanly in the midst of death." With deep roots in the Episcopal Church, we are a journal of spiritual questing and theology in practice, always ready to hold our own cherished beliefs and convictions up to scrutiny.

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Senior Editor
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Camille Colatosti

Book Review Editor
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A Global Witness
Ethan Flad

Magazine Production
KAT Design, Camden, ME

Website Design
Jim Dugan

Controller
Roger Dage

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Office Manager
Alice Devine

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Offices: To reach Julie Wortman:
HC 35 Box 647, Tenants Harbor, ME 04860
Tel: (207)372-6396.
To reach Wes Todd:
118 Main Street, Thomaston, ME 04861
Tel: (207)354-7041
Subscription questions — Alice Devine:
PO Box 1170, Rockport, ME 04856
Tel: (207) 763-2990

Website: www.thewitness.org

Challenging a greedy world

I was troubled by the articles in the January/February issue of *The Witness* that addressed the Arctic National Wildlife Refuge (ANWR), especially the impact of development on the Gwich'in people. My troubled mind and heart stem from the statements of Steven Charleston, former Episcopal Bishop of Alaska, and Mark MacDonald, our present Bishop, who did not even mention another group of Christian indigenous people with a direct stake in ANWR development. I am referring to the Inupiat (Eskimo) people of the Arctic Slope. The Inupiat own 92,000 acres of subsurface mineral rights in the ANWR coastal plain.

My hope in writing this letter is to offer a complementary, rather than an adversarial, viewpoint to that raised by Bishops Charleston and MacDonald. Eight months ago I moved from Anchorage to Barrow at the invitation of Arctic Slope Regional Corporation (ASRC), owned by nearly 8,000 Inupiat shareholders, to accept the position of Corporate Staff Attorney. Barrow is a different world. Like the Gwich'in, the Inupiat derive up to 80 percent of their food from subsistence hunting and fishing, so they are highly motivated to protect the land. ASRC has pioneered innovative means to develop oil and gas resources in the fragile tundra ecology of the Arctic. Yet many Inupiat now feel "invisible" because their pro-ANWR development stance causes them to be "lumped in" with the oil companies and branded as "greedy Natives" by those who do not take the time to understand the complex legal realities of Inupiat life.

ASRC is one of 13 Regional Corporations formed under the Alaska Native Claims Settlement Act of 1971. The Regional Corporations were granted the mineral rights and the Village Corporations the surface rights to certain land selections within each Region. Because mineral resources are not evenly distributed throughout Alaska, ANCSA dictated that each Regional Corporation redistribute 70 percent of its annual revenue from resource development to the other Regions for the benefit of their Native shareholders.

Under ANCSA, the Gwich'in elected to take absolute title to their former reservation land and dissolved their Village Corporation. Thus, the Gwich'in have no obligation to share the wealth from their resource development with other Regions; and the Gwich'in are not entitled to share in the resource development of other Regions. The Gwich'in leased most of their land for oil and gas exploration; but no developable resources were found. Self-determination is a choice, and every choice has its consequences.

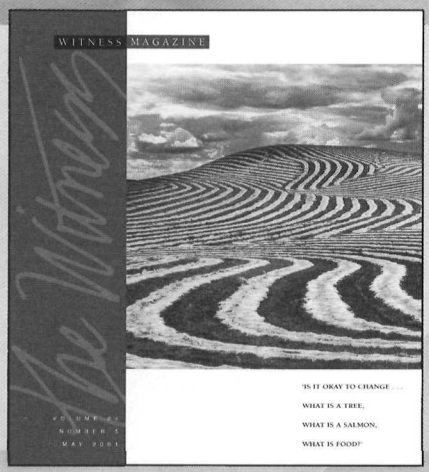
In the early 1970s ASRC raised concerns about the potential environmental impacts of oil development at Prudhoe Bay on the Caribou — the same concerns that the Gwich'in raise now. However, after over 30 years, ASRC's concerns about negative environmental impacts on the Caribou at Prudhoe Bay have not materialized. The Central Arctic herd has thrived and increased many times over.

If we are to cure the "radioactive legacy of imperialism" as Steven Charleston so eloquently advocates, then we must have the courage to support Native self-determination and take the time to understand the many viewpoints that exist within the Native community. And like our Bishops I report strong reason for hope. Heroic efforts are being made by the Gwich'in and the Inupiat to open and maintain constructive dialogue on the issues that divide them on ANWR development.

As people of faith in the dominant culture we can support the Inupiat and Gwich'in dialogue in prayer and by lobbying our elected officials to ensure that all Native voices will be heard on resource development issues.

Erin Rose, Esq.
Corporate Staff Attorney
Arctic Slope Regional Corporation
Barrow, AL

'All that we are, all that we have, comes from God and will one day return to God.'



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'A Global Witness'

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Entering into the GM debate

by Julie A. Wortman

THIS ISSUE on biotechnology and genetically modified (GM) food is full of questions, many of them prompted by last January's conference on "Genetic Engineering and Food for the World" co-sponsored by the Episcopal Church's Faith Ethics, Science and Technology Committee and the Cathedral Church of St. John the Divine. I attended that conference pretty confident that I'd leave with my biases intact — namely, that such innovations as genetically engineered or modified crops are the demonic creatures of the multinational agri-corporations who have developed them soley to increase profits without concern for their potentially negative impact on the health of the planet and the starving millions of the developing world.

As usual, I found that the truth is more nuanced — and confusing (to this non-scientific mind, at least) — than that. While mammoth multinational corporations were, indeed, behind the GM "green revolution," and while they have, indeed, focused their research on developments that would immediately benefit their own bottom lines, genetic engineering of crop plants might not be inherently a bad thing for ecosystems and for hungry people.

The operative word here is "might." And the big question is, as food scientist Marion Nestle pointed out in a conference workshop, who gets to decide if the risks to human and environmental health are acceptable? Even more fundamentally, who rightfully "owns" the very stuff of creation?

Somehow, up until now the public-as-stakeholder has been absent when answers to these questions have been given (by scientists working for Monsanto and other food corporations) — and accepted virtually without question by government regulators. Most notably, the churches and other keepers of cultural and social values — and seekers after justice — have been pretty much dismissed as having nothing of relevance to add to the lopsided conversation about what shape the globe's agricultural future should take. But a shift may be on the horizon. As a recent "Agriculture White Paper" issued by the Kansas Catholic bishops points out, "The great problems posed by the agricultural sector cannot be addressed as technical problems only. Nor can they be addressed as political problems only. They are, at their root, ethical problems."

So far, the ethical challenges to the rapid spread of GM foods have been raised most persuasively by the organic farming community. Food safety, of course, has been at the heart of organic agriculture's appeal — and, certainly, health concerns are a powerful reason to support the natural processes of organic agriculture. For me, though, the even greater draw of organics is the fact that when I support organic agriculture I am also supporting an environmentally positive ethic of regional and local food security and an economically just system of wage-cost relationships that values the intensive labor involved. Most organic operations, too, are small farms owned by people who have a personal stake in the quality of their communities' lives. And, where poultry, pigs and cattle are involved, the treatment of these "crops" is vastly more humane than in factory-farming contexts where both animals and land suffer unspeakable degradation, pain and suffering.

A measure of the success of the organic

Tallgrass Prairie by Steve Mulligan

community in making the benefits of its crops better known — and perhaps a measure of the failure of agri-corporations to respect consumers' right to know what they are eating — is that a British supermarket company, Iceland, has announced that, in addition to banning GM foods, it will invest more than $13 million to make organic produce available to customers at prices comparable to those of foods grown with pesticides. According to *Grist* magazine, Iceland has made deals to buy nearly 40 percent of the world's organic produce and it plans to invest $1.5 million in the British National Trust's farming program to increase the amount of organic farmland in Britain.

From a North American and Western perspective, the choices are there. And my intuition suggests that for people in developing countries, traditional agricultural practices are a fit with the ethic of sustainability and social/cultural/environmental health implied by organics. But what do I know? As Marianne Arbogast's sidebar interview with the U.N.'s Peter Matlon suggests, biotechnology may offer developing countries a fast-track to self-sufficient food production. Who can be against that?

But one thing seems certain. It is high time that people who live out of a faith in the goodness of creation — and a commitment to justice in every sphere of life — join in figuring out the answers. As Susan Youmans, of the Episcopal Church's Faith Ethics, Science and Technology Committee pointed out at last January's genetic engineering conference, we've all got a responsibility to try. ●

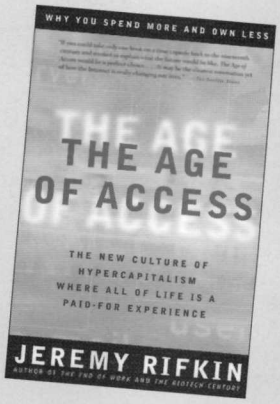
For more information on the Episcopal Church's Committee on Faith Ethics, Science and Technology check out <http://ecusa.anglican.org/science/>. Established in 1997, the committee is open to all Episcopalians interested in the interactions of Christian faith with science, technology and medicine. The Steering Committee is appointed by the Episcopal Church's Executive Council.

A note on the great photos: We've obtained much of the fine art photography in this and other recent Witness *issues with the help of Brooks Jensen at LensWork Publishing, which is devoted to "Fine Art Photography at Real People Prices." We're grateful. Check them out at <www.lenswork.com>; 1-800-659-2130.*

MEDIA REVIEW

Biotechnology & the emerging political economy

by Bill Wylie-Kellermann



Jeremy Rifkin, *The Age of Access*
(NY: Jeremy P. Tarcher/Putnam, 2000)

TWENTY YEARS AGO, Jeremy Rifkin was part of an action that disrupted a meeting on genetic engineering at the National Academy of Science. He and friends chanted, "We Will Not be Cloned!" Five years later he co-authored *Who Should Play God?* which title implies a certain theological take on genetic engineering. More recently, his *Biotech Century* (1998) has outlined a dire manifesto of the perils inherent and largely unexamined in the current biotechnological revolution.

Now, in *The Age of Access*, where he touches on biotechnology it is set in the larger context of "hypercapitalism" and the mechanisms of the new political economy. In a sense, corporate genetics are emblematic of that emerging economy. Rifkin identifies a rapid sea change in which the objects of market exchange are increasingly "weightless." By this he means not only the digital information in which they are encoded, but the very ideas, images, relationships, cultural material — indeed, experiences themselves. Property, in the sense of real estate or even owned commodities, comes to be secondary in this global scheme. It is the "access" to real estate or commodities or information or cultural images and experiences which is bought and sold, or better "leased" and "timeshared" in the market. "Intellectual property" becomes the coin of the realm.

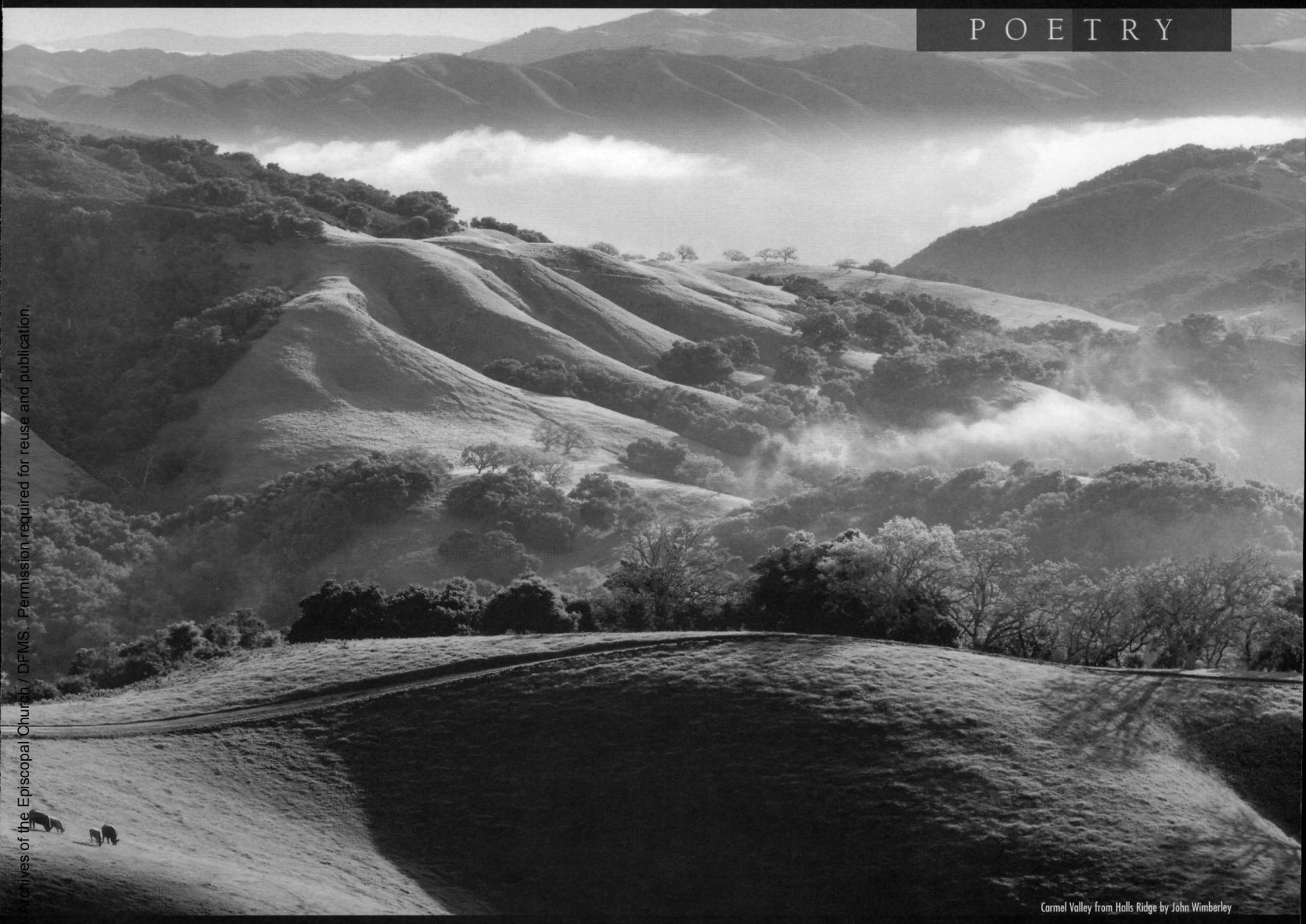
"Imagine a world where virtually every activity outside the confines of family relations is a paid-for experience, a world in which traditional reciprocal obligation and expectations — mediated by feelings of faith, empathy, and solidarity — are replaced by contractual relations in the form of paid-for memberships, subscriptions, admission charges, retainers and fees."

So, how does genetic engineering figure into such an economic framework? Precisely and emblematically so. For example: When a farmer buys a certain seed stock, say, he or she is not buying the seeds so much as leasing the patented genetic code by which they are formulated. If the access fee is not paid in the next planting season, but the same seed stock is used, the farmer is in violation of the corporation's patent rights — is, in effect, stealing their intellectual property. Says Rifkin, "The elimination of the widespread ownership of the seeds of life and their concentration in the hands of a few companies mark a turning point in the history of agriculture. Like other fields, agricultural commerce is moving from a seller-buyer to a supplier-user relationship."

The same underlying relationship applies to virtually all of the uses of genetic coding. Where the DNA string is patented, be it a "natural" discovery or a "modified" creation, use of and access to that organism of biological process for medical or any other commercial purposes is precisely controlled. The Geron Corporation has a patent pending for human stem cells, those primordial cells from which individual human beings develop.

Playing God, indeed. In the theological economy, what is the greater idolotry (or blasphemy for that matter): To modify, manipulate, and design creatures genetically? Or to claim ownership of that image and pattern? ●

***Bill Wylie-Kellermann** is* The Witness' *book review editor and a* Witness *contributing editor.*



Carmel Valley from Halls Ridge by John Wimberley

In the day that the Yahweh God made the earth and the heavens, when no plant of the field was yet in the earth and no herb of the field had yet sprung up — for the Yahweh God had not caused it to rain upon the earth, and there was no one to till the ground; but a stream would rise from the earth, and water the whole face of the ground — then the Yahweh God formed the earth creature from the dust of the ground, and breathed into its nostrils the breath of life; and the earth creature became a living being.

And the Yahweh God planted a garden in Eden, in the east; and there the Yahweh God put the earth creature whom the Yahweh God had formed.

Out of the ground the Yahweh God made to grow every tree that is pleasant to the sight and good for food, the tree of life also in the midst of the garden, and the tree of the knowledge of good and evil.

— *Genesis 2:4-9 (NRSV)*

THE GM DEBATE

'Is it okay to change what is a tree, what is a salmon, what is food?'

by Marianne Arbogast

AS I WAS OPENING a new jar of apricot preserves the other morning, I noticed a flag on the label that reads: "NOW GMO FREE." The small print assures me that "every ingredient in this jar is certified to be free of genetically modified organisms." The issues surrounding genetically engineered (GE) foods have only recently begun to penetrate my awareness, and I hadn't bought the product for that reason. But clearly, the company considers it a selling point.

Labeling, in fact, is one of the battlefields where the controversy over GE foods is being fought out. Groups like the Safe Foods Campaign — which is calling for a moratorium on genetically engineered foods — are demanding mandatory labeling of all foods that contain genetically engineered ingredients. "The rapid advance of this technology has been accompanied by almost no federal safety testing or regulation," a Safe Foods Campaign flyer reads. "A January 1999 *Time* magazine poll found that 81 percent of U.S. consumers believe GE foods should be labeled, yet the FDA's most recent changes in its GE policy still do not require labeling or comprehensive premarket health and environmental testing."

The speed of the GE foods revolution — fueled by corporations that, while they claim to want to feed the world, might reasonably be suspected of wanting to feed their profit margins — should concern everyone, writes Jean English, editor of *The Maine Organic Farmer & Gardener,* published by the Maine Organic Farmer and Gardener Association (MOFGA). "When MOFGA proposed its first labeling legislation in 1993, not a single GE product was on our supermarket shelves," she writes. "Now, an estimated 60 percent of our processed foods contain GE ingredients, either corn or soy derivatives. Advocates of GE technology often argue that hundreds of thousands of Americans are consuming GE food every day, with no ill effects, so why worry?"

Here's why, she explains. First, if there were ill effects, either short- or long-term, how could we know their source, if GE foods are neither tested nor labeled? And second, the quantities we consume are destined to sharply rise. "The products now on the market are only the tip of the iceberg, or more accurately, perhaps, a molecule of the iceberg, of the brave new world of GE products that scientists in the laboratory are developing," English writes. "Each new product presents new and unique, and largely untested, issues of environmental impact, nutrition and food safety."

The FDA — and the food industry — counter that foods containing GE ingredients do not differ in any substantial way from those without them. Moreover, industry spokespersons say, labeling would cause consumers unnecessary alarm and impose significant burdens on producers — an argument that seems difficult to defend, since many manufacturers who export their products do manage to comply with more stringent European labeling rules.

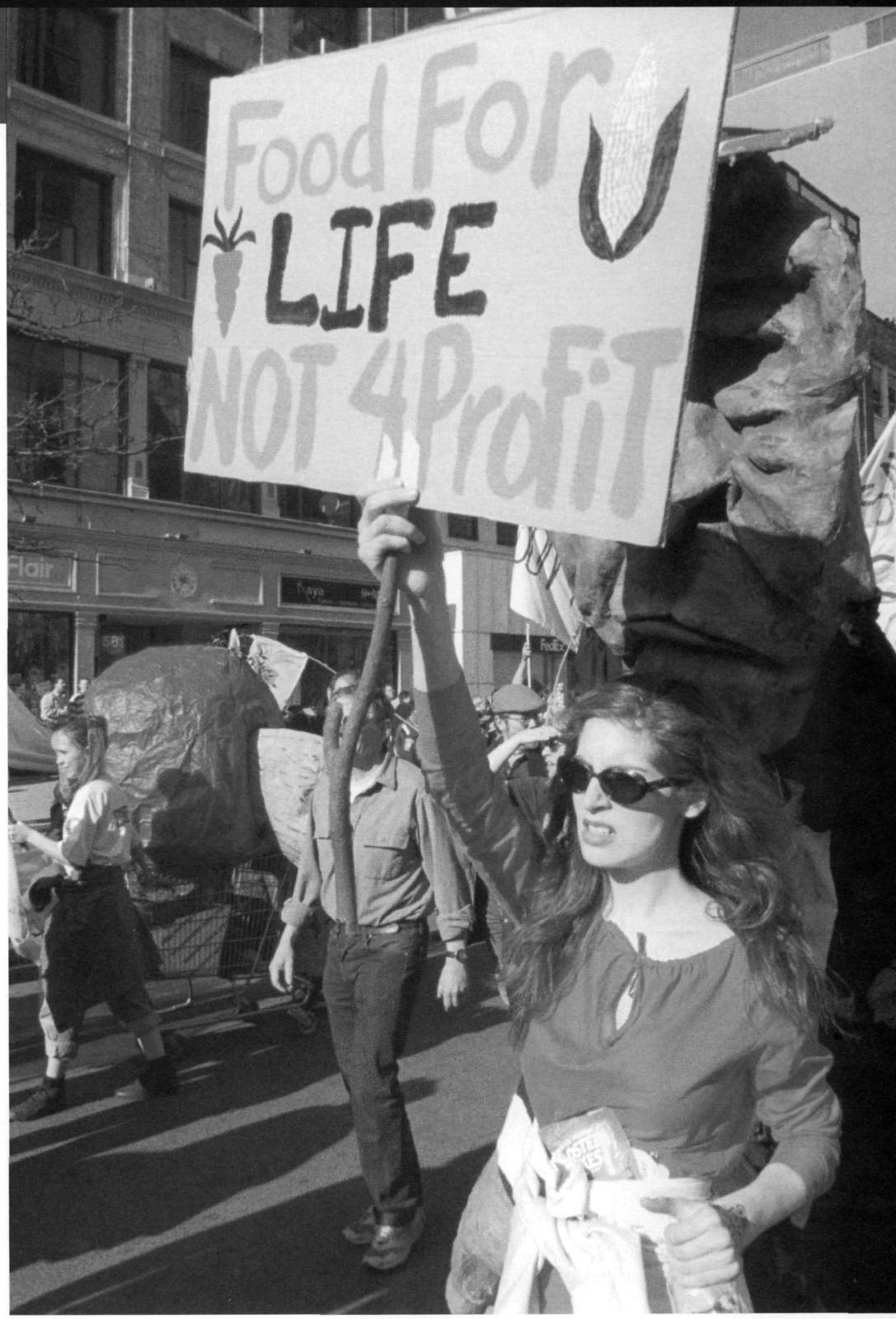
Those who demand labeling do believe that GE foods are substantially, and dangerously, different — in the risks they pose to human health and the health of ecosystems, in the economic and social impact they will have on people in developing countries, and in the fundamental questions they raise about the integrity of creation. As Seattle activist Craig Winters, quoted in *Science & Spirit* magazine, explains, "If genetically engineered foods were labeled, consumers would pay more attention and start asking important questions: What are our values? Is it okay to change what is a tree, what is a salmon, what is food?"

Human health risks

The first reason it may not be okay to make such changes has to do with risks to human health. Here, much of the concern is that we simply don't know whether GE foods are safe or not, or how genetic engineering might change the nutritional composition of foods; and the minimal testing that has been done on GE products has often been sponsored by the very corporations with an economic interest in promoting them.

The Safe Foods Campaign cites studies that have linked consumption of GE foods by rats to organ and immune system damage and stomach lesions. MOFGA's Jean English writes of Arpad Pusztai, a researcher for an institute in Scotland that had received money from Monsanto, who lost his job after going public with results of a study that documented malformed kidneys, spleen and brain tissue, as well as weakened immune systems and thickened stomach linings, in rats fed GE potatoes. Although his research techniques were criticized by the institute, they were exon-

In March 2000, over 3000 protesters marched to Boston's Hynes Convention Center, the site of a biotechnology conference called "Bio2000," to voice their concerns about genetically modified foods, corporate patents of genes and crops, and corporate control over food and health.



erated by an outside panel of scientists who said his conclusions were justified and recommended a moratorium on the sale of GE foods in Great Britain.

Another health concern has to do with the use of genes for antibiotic resistance in the genetic engineering process. These are not "target genes" for desired traits but "marker genes," which make it easy to test whether the desired gene has been successfully transferred. Critics claim that this could lead to increased antibiotic resistance in disease-causing bacteria — already a health concern of significant proportions.

GE foods also have the potential to trigger new food allergies. An oft-cited case is the insertion of a Brazil nut gene into soy by Pioneer Seed Company. Although initial animal testing seemed to indicate that the product was safe, further research concluded that the modified soy might trigger serious reactions in humans allergic to nuts. Moreover, when foods are modified to include genes from species not normally included in the human diet, unpredictable allergic reactions could occur.

Finally, critics of genetic engineering fear that it could change the nutritional composition of foods in unpredictable and potentially negative ways.

Supporters of genetic engineering view these risks as minimal, claiming that genetic engineering is more likely to increase nutritional value. And allergy sufferers might benefit if scientists are able to disable the genes that produce allergens.

Michael Jacobson of the Center for Science in the Public Interest — a consumer watchdog group that has spoken out

against everything from french fries to sulfites — wrote a recent column in *The Wall Street Journal* defending GE foods. "While biotechnology is not a panacea for every nutritional and agricultural problem, it is a powerful tool to increase food production, protect the environment, improve the healthfulness of foods and produce valuable pharmaceuticals. It should not be rejected cavalierly." While Jacobson is in favor of expanding safety testing and regulation, he is optimistic about the technology's potential. And his position illustrates one of the most confusing aspects of the controversy — namely, that GE advocates and adversaries often base their arguments on the same set of values.

Risks to ecosystems

This is particularly true in the assessment of the potential impact of GE crops on ecosystems. Advocates say biotechnology will lead to decreased use of pesticides, while opponents say it is likely to increase pesticide use. Advocates say it will allow the use of fewer toxic herbicides; opponents argue the reverse.

"Ecology is very complicated, and it's difficult to predict ecological outcomes," says Allison Snow, a biologist at Ohio State University who is studying the problem of gene flow from GE crops to related wild plants. "It's hard to say right now that there's any benefit at all [to GE crops] or a huge risk at all. Ecologists are probably a little more cautious, obviously, than people who are promoting the technology. Probably most ecologists who have thought about this and studied it would say, yes, there are some benefits, but there are some pretty serious risks that we need to watch out for."

Snow names three. One is the rapid evolution of pesticide resistance in insects that feed on crops engineered to contain a pesticide such as Bt — the *Bacillus thuringiensis* bacterium. Organic gardeners — who dust Bt onto crops as a primary pest control tool — are particularly alarmed that its widespread engineering into crops will produce strains of Bt-resistant insects — thus rendering Bt ineffective in any form.

A second risk is the possible effect of such crops on "non-target" insects. The monarch butterfly became a symbol of this danger after Cornell University researchers reported that pollen from Bt corn — engineered to produce its own pesticide — was toxic to that species. Other studies have reported that it can have toxic effects on ladybugs and lacewings, insects that benefit farmers by eating aphids.

A third risk is gene flow from GE crops to non-GE crops or to the crops' wild relatives. Not only would this make the presence of GE ingredients in foods impossible to prevent or control, it might also create "superweeds" from the crossing of herbicide-resistant GE crops with weedy relatives, increasing the need for chemical herbicides and threatening biodiversity. While gene flow from transgenic crops to weeds has not yet been documented, Snow says that it is happening.

"I would not say it's very common right now, mainly because corn and soybean and potatoes [the main GE crops in the U.S.] don't have wild relatives," she says. "It's only other crops like rice and squash and canola where this is starting to happen. I was just talking with someone who said that Tasmania wanted to be GM-free, but they had some field trials with canola that was genetically modified, and now it's all along the roadside and there's just no way they can get rid of it."

The possibility of stress-tolerant crops, which would need less water or fewer nutrients, opens up another area of debate. On the plus side would be less need for irrigation and fertilizers. On the downside would be the possibility of further agricultural sprawl into areas where farming had not previously been possible — desirable, perhaps, in very poor areas of the world, but ultimately damaging in others, leading to further loss of biodiversity. And, as with herbicide- and insect-resistant crops, gene flow could be a problem. No one wants stress-resistant weeds.

It's too early to assess which of the potential risks or benefits are occurring, Snow believes, though she agrees that the technology has moved ahead too fast.

"I think things should proceed a little more slowly, and government regulations need to be examined and re-examined all the time to make sure that they're keeping pace with what the industry is trying to sell."

Economic and social concerns

A colorful brochure titled "Global Harvest: Biotechnology & Imported Food" pictures lush green and golden fields, and women in developing world marketplaces brimming with grain and produce. The credit on the back names the source and their slogan: "Monsanto — Food, Health, Hope." Inside, the corporation recites statistics on growing population, life expectancy and global demand for meat, along with decreasing land availability and food resources. But Monsanto has the solution: Bioengineered crops will "enable farmers to produce more food at lower cost in sustainable ways and provide consumers with a more abundant, higher quality food supply."

Skeptics abound. For many, Monsanto's name is linked not with "food, health and hope" but with the infamous "terminator technology" which produces sterile seeds, forcing farmers to purchase new seed from the company year after year. Although, after massive public protest, Monsanto promised in 1999 not to commercialize these "gene protection systems," research and patent application has continued on such technology by other global corporations.

Ironically, "terminator technology" might offer an ecological advantage, in preventing gene flow to wild relatives or non-GE crops. But it illustrates a fundamental problem with

the use of genetic engineering in the developing world — the issue of control. Who will benefit if people in developing nations become dependent on global corporations for their food supply?

The patenting of genetic engineering processes and their products by multinational companies is an area of concern both for those who warn of the dangers of biotechnology for developing countries, and those who are optimistic about its potential.

"Patents and intellectual property rights are supposed to be granted for novel inventions," Indian doctor Vandana Shiva said in a recent lecture. "But patents are being claimed for rice varieties such as the basmati for which my valley — where I was born — is famous, or pesticides derived from the Neem which our mothers and grandmothers have been using. The knowledge of the poor is being converted into the property of global corporations, creating a situation where the poor will have to pay for the seeds and medicines they have evolved and have used to meet their own needs for nutrition and health care."

Shiva regards biotechnology as another stage in the process of the globalization of food, which — in the name of increased production — is destroying the biodiversity essential to the health of the earth and of the poor, who rely on a wide array of native plants to meet nutritional needs. In an article titled "A Blind Approach to Blindness Prevention," she challenges the apparent benefits of "golden rice," bioengineered with genes from daffodils to create a yellow rice high in beta-carotene, used by the body to produce Vitamin A. Although widely hailed as a "miracle cure" for blindness caused by lack of Vitamin A in the diet of children in poor countries, its production is part of a process that has destroyed traditional, natural sources of the vitamin, Shiva writes. "Sources of Vitamin A in the form of green leafy vegetables are being destroyed by the Green Revolution and genetic engineering which promote the use of herbicides in agriculture."

Moreover, rice production is water-intensive, unlike the production of native greens and fruits which produce Vitamin A. And excessive Vitamin A can be harmful.

INTERVIEW

Peter Matlon is Chief of the Global Program for Food Security and Agriculture at the United Nations Development Program

Marianne Arbogast: At the recent conference on genetic engineering and the world food supply in New York, you said that the "second generation" of biotechnology has the potential to impact developing countries in positive ways. How is this second generation different?

Peter Matlon: The first generation was basically driven by demands in industrial countries, so they were focusing on crops and on traits which were most appropriate for large-scale production by capital-intensive units in the temperate zones. But more recently a great deal of work has focused on crops that are more relevant for the tropics, and for the commodities which are produced and consumed by poor people, as opposed to wealthy people in the North, and on traits that are more relevant for resource-poor farmers. So you've got a lot of work now that has been done on sweet potatoes, on plantain, on rice, on maizes that are grown by African farmers.What they're now focusing on increasingly are those traits that would be useful for those farmers who simply cannot afford input — for example, virus resistance in beans and potatoes, insect resistance that is going into maize, nutritional work that has gone into the rices and probably some of the other cereals. Some people have said, look around, biotechnology has been around for more than 10 years and it hasn't helped any poor farmers; therefore, biotechnology can never help poor farmers. It's true that they've not yet helped poor farmers, but that is only because they were applying the technologies to different crops, different traits and different environments. And it has enormous potential to help resource-poor farmers in low-income tropical countries now.

M.A.: What about the problem of control by global corporations who own the patents and are seeking to profit from genetically engineered crops?

P.M.: Intellectual property rights are a big problem right now. Well over 95 percent of all biotechnological research in agriculture is being done by large multinationals. And they control property rights not only to most of the technologies, the gene sequences that have been identified or fabricated, but they also have expanded traditional intellectual property rights protection to the processes of the research itself. The means of integrating a gene into the sequences, means of characterizing genes and so forth — that's all been patented. So if people even want to do research, they have to have these tools, and to use the tools, they have to get licenses. And so automatically the companies begin to have control over what kind of research is done and where the products go. I've read a couple of articles that have suggested that the patent agents which were assessing patents were simply overwhelmed with the new science and did not understand it, and were granting patents on things which were very questionable.

It's almost as if somebody patented the hammer, and they didn't sell the hammer, they licensed it, so every house that was built with a hammer and a nail was still owned in part by the person who came up with that hammer. It's really gotten out of control. You're not just maximizing profit; you're creating exploitive rent.

There was a case where the U.N. had invested some 6 million dollars in supporting research that was being done in Mexico at the World Center for Maize Research. It was working with African maize germ plasm, attempting to incorporate the Bt gene (actually sets of genes) so that African farmers would have less loss of maize production due to stem bores. Most of the Bt genes which were available and the processes to incorporate these genes into the germ plasm were owned by a company, and so the project got licenses for research purposes from this company. About five years into the project, when some good progress was

being made, this company was acquired by another company. And that second company looked at all of its research licenses and decided to call some of them back in. I was reviewing this project in Mexico and while I was there we received a fax from this company saying that they're withdrawing the license, they do not want this material to go further into production stage, and we were to either send back all of the materials in which we had used their processes or incorporated their genes, or destroy it and provide proof of having destroyed it. We contacted probably the top intellectual property rights lawyer at Stanford's law school, and made it known to them that we weren't going to accept this sitting down, and we never heard anything more from them.

But we still faced the same problem in the sense that the center has a license to do the research, but it doesn't have a license to commercialize it, to have the products of that research go back to Africa to help the people they were being designed to help. This was two-and- a-half years ago, and subsequent to that, more discussions have taken place and they are working on a partnership that will enable that. But that was a case where very, very short-sighted profit motive was driving this company to completely undo five years of work.

M.A.: How do you think patent law should be changed?

P.M.: One of the things that I would take issue with is that patent law extends protection now to some 18 years. That might have made sense when there were steam engines, when it took time to get a product up and get it out. Well, the pace of technological change is so rapid now, to have an 18-year patent on a piece of biotechnology — on a process — doesn't make any sense, and instead of encouraging invention, which is the whole justification of patent law, I think today it's more likely frustrating invention, and certainly the application of the products of invention to the poor, who don't represent a very attractive market.

One of the ways that this could be overcome is through private-public partnerships, and we're seeing a lot of experimentation with that now. One way would be through what's called market segmentation; that is, where a multinational would give up the rights, give away free, pieces of its technology, in markets which are unlikely ever to compete with their major markets. For example, there's no way that Pioneer or Monsanto are ever going to be competing on yams in Africa, so you give that away. You give away biotechnology for maize among resource-poor farmers with a possible restriction that that maize can never be exported to countries that are the major markets for global trade. You make it available for subsistence crops free because there would be absolutely no competition, no reduction of profits, for the private firms. All of these devices are now being experimented with. I'm more optimistic that we'll come up with ways of borrowing technology at very low cost and applying it to crops that are useful for the very poor, than that we're going to see a revisiting of patent law.

M.A.: Is it U.S. patent law that is the relevant law, or is there some international law?

P.M.: Every country has its own patent law. Many of them mimic the U.S. patent law. But what firms can do is they take out a patent in the U.S., and they take it out in Egypt, and they take it out in Zimbabwe and so forth.

M.A.: Why would the government of a country like Zimbabwe grant a patent to a multinational corporation — just because they want them to be there?

P.M.: That's a good question. Part of it is simply that this is fairly new, and people really don't understand the implications.

M.A.: What do you think about other concerns that are raised about genetically engineered crops in developing countries — for instance, their ecological impact?

Since those who suffer from Vitamin A deficiency suffer from general malnutrition, the best approach would be to increase the food security of the poor, Shiva says.

Others, such as Peter Matlon of the U.N. Development Program [see interview, p. 11], also critique the patent system, yet believe that biotechnological innovations — liberated from the grip of global economic interests — can increase poor farmers' food security.

A December 2000 report of the E.U.– U.S. Biotechnology Consultative Forum stressed the need to look at the impact of biotechnology within the context of globalization.

"There is one global economic space, but there is no mechanism to ensure global equity," the report states. "Inequalities of capacity — lack of trained scientists, for example, or lawyers familiar with the intricacies of the international intellectual property system — perpetuate inequalities of societal wealth and well-being."

Though "we should not burden biotechnology with the full weight of these broader problems," the report argues, "we should not make decisions about biotechnology out of context. How biotechnology helps or harms the world, contributes to equity or reduces it, should be part of decision-making."

'The Great Yellow Hype'

Biotech corporations themselves appear to have heard this message, and are capitalizing on it with ad campaigns focused on the needs of the developing world.

In an article titled "The Great Yellow Hype," *New York Times* writer Michael Pollan suggests that the "unspoken challenge" in ads extolling the benefits of golden rice "is that if we don't get over our queasiness about eating genetically modified food, kids in the third world will go blind" (*NYT*, 3/4/01). Yet, he writes, "it remains to be seen whether golden rice will ever offer as much to malnourished children as it does to beleaguered biotech companies. Its real achievement may be to win an argument rather than solve a public-health problem." Even the president of the Rockefeller Foundation, which financed the initial research on golden rice, has said that "the public-rela-

tions uses of golden rice have gone too far," Pollan reports.

Still, others cite the potential medical uses of genetic engineering as an area of tremendous promise. Scientists have already developed potatoes and tomatoes that contain a vaccine against hepatitis B, and are working on inserting an anti-diarrhea gene into bananas, according to a story in *Science & Spirit* magazine (1-2/01). Such vaccines would be significantly less expensive and easier to store and distribute, advocates say. They would eliminate the risk of disease transmission through contaminated needles, and would offer a medical advantage by promoting the formation of antibodies in the intestinal tract.

Other ethical issues

Genetic engineering of food raises a host of other ethical issues. Animal welfare advocates point to ailments developed by animals who were bred with genes from other species (not to mention the huge numbers of animals subjected to biotechnological experimental research), and vegetarians do not want flounder genes in their tomatoes.

There are many, like Craig Winters, who question whether biotechnology represents an irreverent and ignorant tinkering with the sacred and complex processes of life. Many others object to the power of profit-driven corporations to make decisions that could have major, unforeseen impacts on the health of the earth and its people. And many are intuitively repelled by the idea of anyone holding patents on forms of life.

"This technology's not going to go away," Allison Snow says. "You can't un-invent all these things that people have discovered about genetic engineering. So the question is how fast should it proceed and how should it be used wisely for the public good?"

While others would debate whether it should proceed at all, and argue that "wise use" of biotechnology is a contradiction in terms, it is undeniable that the challenges posed by genetic engineering are here to stay. ●

Detroiter ***Marianne Arbogast*** *is associate editor of* The Witness.

P.M.: I would have four recommendations. First, there is a need for increased research on the environmental impacts of biotechnology. What are the risks? How does one manage these risks? I say that not because any large-scale damage has been done — not even small-scale damage has been done. There's very little evidence that any damage has been done to date. But it is true that we don't fully understand these complex ecosystems, and what the long-term ramifications might be. So, despite the fact that six national academies of science — the U.S., U.K., Brazil, India, China and Mexico — have basically said they've looked at the environmental risks and didn't find any convincing evidence of damage, they did call for more research to better understand this.

The second recommendation is to build the capacities in developing countries themselves in biotechnology applications and in developing biosafety systems. If we can build the capacity in developing countries in applying these tools, then they don't have to depend upon the multinationals, they can develop products themselves that really fit their consumers and their producers. They also need to have biosafety regimes put in. Very few developing countries have biosafety regimes in place, and those that do don't have the capacity to implement them very effectively.

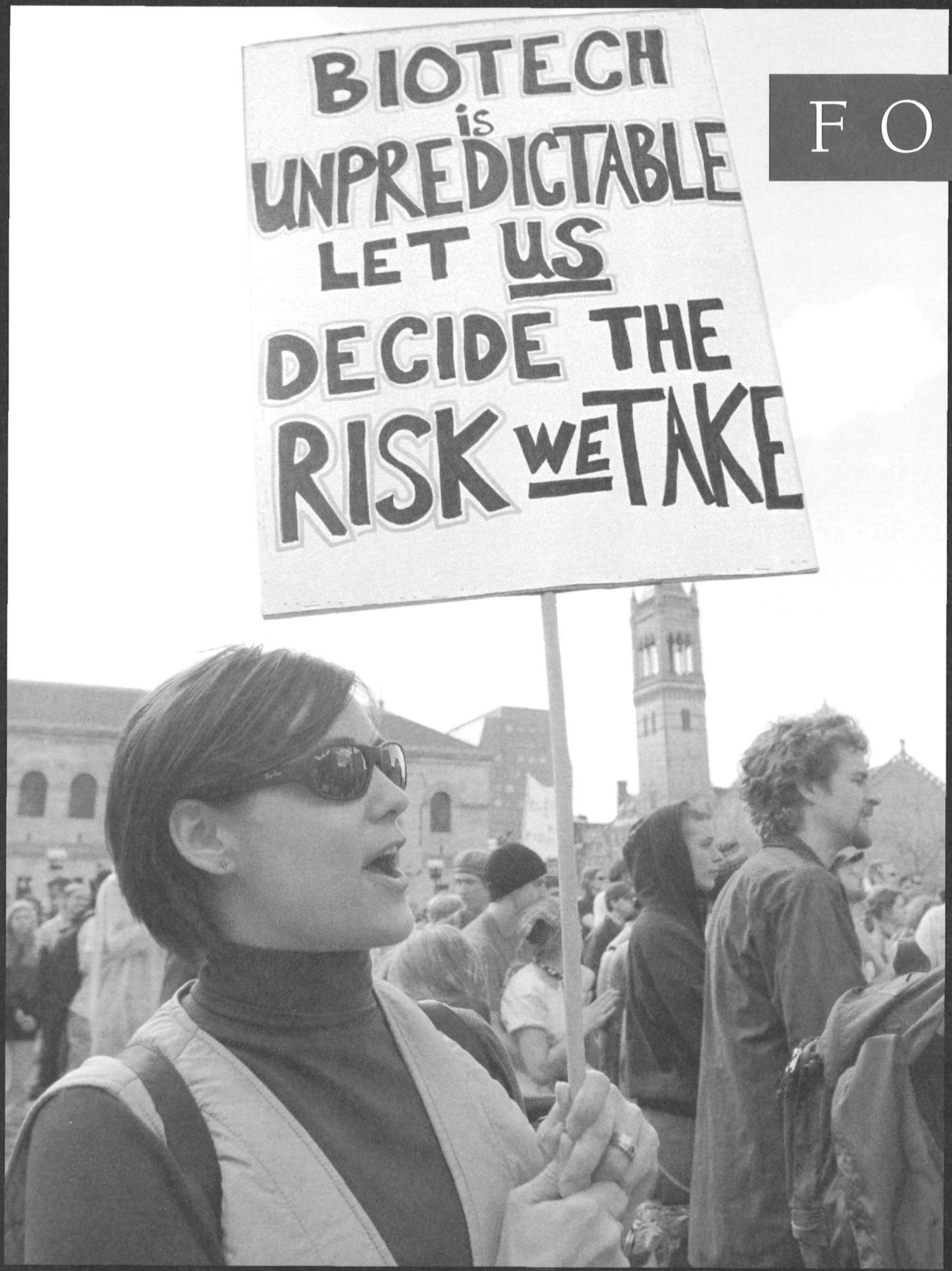
The third recommendation would be to increase investment in public research generally, particularly among the international agricultural research centers whose mandate is to produce global public goods. They do not seek any profit, they do research on crops for the poor. If we could increase their funding, then they would be able to do much more of the upstream research and develop new processes and identify new genes and actually do some of the genetic modification themselves, and make these products available free to developing countries.

And the fourth recommendation would be to increase the access by public research institutions to the biotechnology products and processes that are coming from the private sector — through public-private partnerships, market segmentation, revisiting patent law — and to come up with a new paradigm of enabling public research, particularly in developing countries, to get access to private-sector products and processes.

The problem is that funding generally has declined for agricultural research over the last 10 to 15 years, and that trend has got to turn around. If it doesn't we're just going to continue our dependence on the private sector in the North and, frankly, a lot of potential benefits will never be realized.

M.A.: Why has the research funding declined?

P.M.: Well, there's been a decrease in public funding of all development over the last 10 years in the U.S. and in Europe. Part of it's donor fatigue; part of it's just the belief that the private sector can provide the solution; part of it is frustration with the political and financial mismanagement in developing countries themselves. So despite the fact that we've got an incredible surplus, despite the fact that we've gotten the benefits from the Cold War being over, those funds are not being used for development purposes. And then, within development funding itself, there's been a declining share going into agriculture. In large part that's because, perhaps, the research done in the past has been too successful; we don't have a global food security problem, we've got more than enough food. The problem is it's being produced in the wrong countries, and probably the wrong crops. So there's more than enough food in the world to feed everybody, but that doesn't help a very poor farmer in Uganda or in Zimbabwe or in Nigeria who can't keep his family well-fed because he's not producing sufficiently. He doesn't have the income to buy surplus wheat from Argentina or Australia or the U.S. or Canada. So what we're arguing is, sure, you don't have a global food security problem, but you do have a lot of people who are food-insecure because they're in poverty. And if they happen to be farmers, then give them the means of increasing their income, and the best way of doing that is to increase their productivity, reduce their losses. And that, I think, is one of the promises of biotechnology. ●



FOOD

BIOTECHNOLOGY

Whose values, whose decisions?

by Marion Nestle

MY TRAINING is in molecular biology and perhaps for that reason I spend much of my time explaining food biotechnology to the public, and public perceptions of food biotechnology to scientists. On a superficial level, public perceptions are easy to explain. Surveys of consumer attitudes about food biotechnology date back to the mid-1980s; I have copies of the results of more than 20 such surveys, at least five from 2000. Some academics have constructed careers by asking people what they think about the topic, but I do not find the survey results very interesting. For one thing, the surveys all produce similar results. They report that, in theory, people believe that biotechnology can do good things for them and the world, but:

They don't understand the science,
They are afraid of science and biotechnology,
They don't trust the industry, and
They don't trust government regulators.

I do not view these results as surprising or inconsistent. The surveys are superficial because they do not address the underlying problem — that of Two Cultures. In his famous lecture on Two Cultures, C.P. Snow was referring to scientists versus humanists. He described "the gulf of mutual incomprehension" that separates people who think like scientists from people who don't, but with respect to food biotechnology, the gulf of mutual incomprehension seems especially wide.

When scientists talk about food biotechnology, they mention technical problems, safety and far-off visions of what the technology can do for the world's food supply. So do food biotechnology companies. This rhetoric is usually expressed as: "Biotechnology — and only biotechnology — can help the world produce the food necessary to meet the population needs of the 21st century."

Reality measured against rhetoric

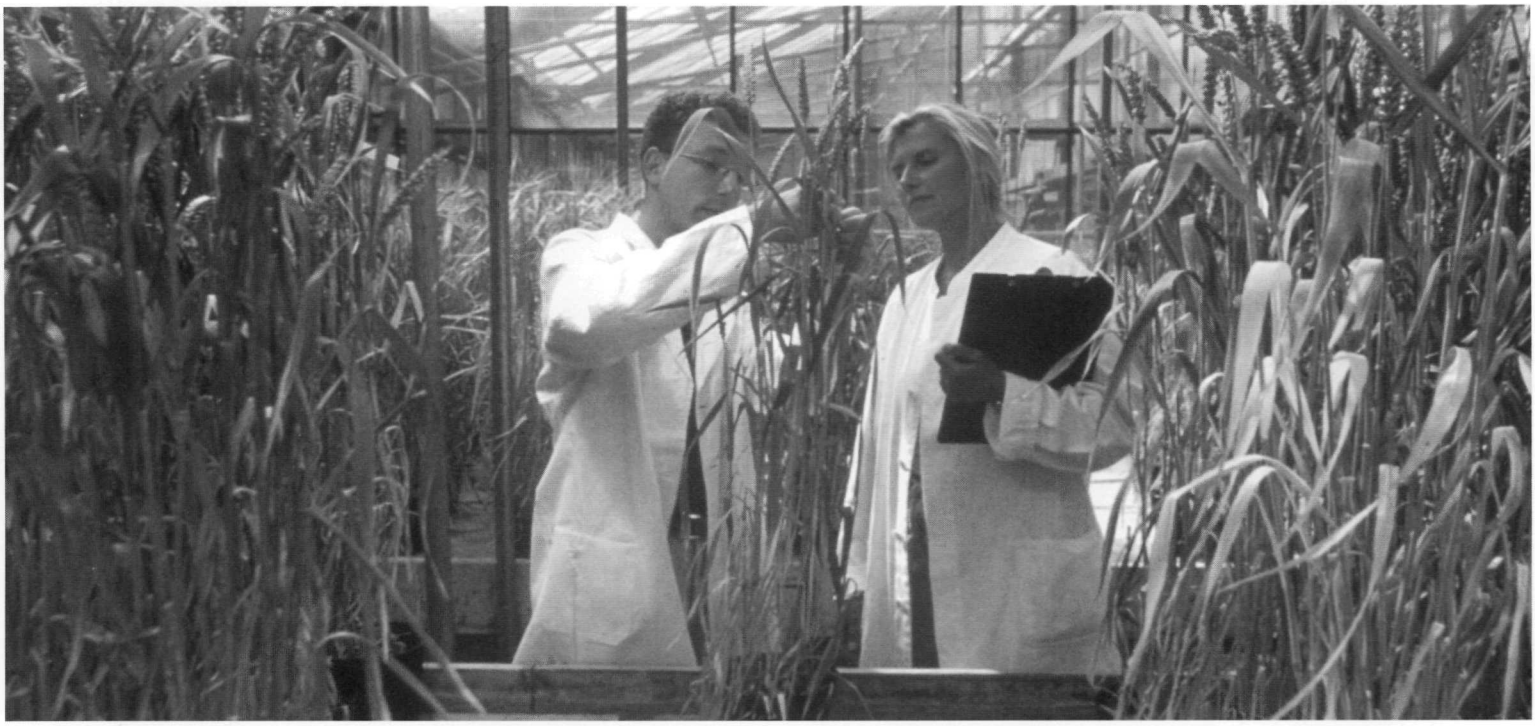
The rhetoric raises two sets of issues other than safety, although both sets bear on it.

The first set of issues has to do with the reality as opposed to the rhetoric: what the industry actually produces and who actually benefits. Food biotechnology in the U.S. began with Bovine Somatotropin, Bt Corn, and Roundup Ready soybeans, all of which have agronomic traits that provide demonstrable benefits for growers. Next, the industry produced foods with processing traits. The tomato with the reversed gene for ripening is the best example of such foods. Such traits produce demonstrable benefits for processors.

Only now is the industry beginning to develop foods with quality attributes such as improved nutrient content that might produce some benefit for consumers. The "poster child" for quality attributes is the Golden Rice enriched with beta-carotene that has received so much favorable publicity. It's been created, but is not yet on the market. I will have more to say about this rice shortly. At the moment, the public does not have much to gain from the genetically engineered foods that are available — not in price, not in nutritional benefit, and not in convenience — nor are people generally aware of evidence for benefits to the environment or to people in developing countries. The "utility" issue fully explains why people did not protest recombinant insulin and other drugs or cheese enzymes — most were demonstrably superior in quality and price to the products previously available.

Science: only one value system among many

The second kind of issue has to do with what I consider to be belief systems or ethical systems. Most non-scientists of my acquaintance view science as only one of a



Frommann / Iaif/IMPACT VISUALS

People may not understand science very well, but everyone knows when they are being disrespected.

number of value or ethical systems, any one of which might have equal if not greater validity, worth and importance. I can identify at least seven (somewhat overlapping) categories of such systems related to food biotechnology — not necessarily in order of importance.

1. Animal rights — This is a belief system that views as wrong such actions as injecting recombinant bovine somatotropin into cows in order to force them to make more milk.

2. Religion — This belief system is the one that led Prince Charles to say that he thought bioengineered foods took "mankind into realms that belong to God, and to God alone."

3. Morality — This category explains why people are concerned about the insertion of animal genes into plants, flounder genes into strawberries, and genes for human antithrombin into goats. The people I talk to cannot always justify why such actions do not feel right to them, but they clearly do not.

4. Natural laws — This category is analogous to religious values but it is secular; food biotechnology in some way violates the laws of nature. Questions about biodiversity, monoculture, and the monarch butterfly derive from this value system.

5. Social values — This belief system encompasses concerns about the effects of corporate agriculture on rural America, not only the effects of pollution on the environment, but also the emptying out of small towns as farm labor becomes more mechanized — the role of agriculture in American society.

6. Economic values — This value system views the effects of corporate agriculture from an economic standpoint and encompasses concerns about the the accelerating loss of small farms and small businesses throughout rural America.

Last, but certainly not least, is:

7. Globalization — This category reflects concerns about control of the food supply by faceless and unaccountable multinational corporations and is the one that led to protests against the World Trade Association in Seattle and against biotechnology companies in Boston.

All of these categories reflect the overriding feeling that food biotechnology corporations control decisions that are not necessarily in the public interest. Note that none refers directly to human or environmental safety. When people do talk about safety issues, I think that they really mean them as proxies for one or another of the seven

value systems I have just mentioned; people talk about safety because they have to. Scientists, federal regulators and — most of all — the biotechnology companies have dismissed value and ethical considerations out of hand and simply will not permit them to be discussed. Safety is the only issue that scientists, government officials and industry will permit for debate.

Safety issues — and rage

I saw this exclusion of other considerations during the time Joan Gussow and I served on the FDA Food Advisory Committee. In discussing whether or not the FDA should approve use of cow growth hormone, our committee was prohibited from considering anything other than human safety issues. Effects of the hormone on cows or on small dairy farms were irrelevant to the FDA's mandate and were excluded from the debate.

In my view, the narrowing of the discussion to safety issues has had two distinct effects. The first is to induce rage. I see people become furious when scientists tell them that science is truth, the products are safe, and nothing else matters. And scientists — particularly those working for biotech companies — make such assertions all the time. I have heard the head of one leading food biotechnology company say, "All we have to do to gain public support for food biotechnology is to educate the public that our products are safe." Such statements are shocking even to the heads of competing biotechnology companies. As I heard one of them say, "If I had your job, I'd resign."

People may not understand science very well, but everyone knows when they are being disrespected. Public response to assurances of safety is one of profound disbelief. And why shouldn't it be? People feel as though they are being experimented on, and they don't trust the experimenters — or their defenders — to be acting in the public interest.

The second effect of restricting the argument to food safety has been to focus attention on safety issues. People say: "Okay. You don't want to hear my concerns about animal rights, God's will and globalization? You only want to talk about safety? Fine. We'll talk safety. Let's talk about unintended consequences (witness tryptophan supplements), toxins, allergies, superweeds, Bt resistance, antibiotic resistance and — oh yes — monarch butterflies." Not one of these issues might make a scientist nervous — all are probable, but remote — but they contain just enough of a grain of truth to fuel debate and to discredit the credibility of any scientist or regulator who dismisses such concerns out of hand.

The passion that underlies the debates about safety, in my view, derives from the lack of opportunity to discuss the value and ethical implications of food biotechnology in a situation in which 50 percent of American soybeans and 35 percent of American corn grown last year was genetically modified. The public wants to talk about what those enormous percentages mean for them as individuals and a society. If all of this reminds scientists of arguments over nuclear power and irradiation, it should; the issues are quite similar and have to do mainly with who gets to make the decisions.

A basis for dialogue?

So, what is to be done? I think it's too late for easy solutions, but I do have some suggestions for steps that might help establish a basis for dialogue.

The industry needs to bring the rhetoric in line with reality and start producing useful products. I am not convinced that the beta-carotene rice is the best example — there are too many concerns about its cost, cultural acceptability, and bioavailability, let alone those related to the unbalanced use of beta-carotene itself. To explain: Beta-carotene is a precursor of vitamin A, not the vitamin itself; it must be split into two equal parts to be active. This requires an enzyme which, in turn, requires adequate protein in the diet. It also must be absorbed; both the vitamin and its precursor are fat-soluble, meaning that they require fat from the diet to be absorbed. Absorption also requires an intact, functioning digestive tract which also requires a diet adequate in calories and essential nutrients. Thus, it is not enough just to supply beta-carotene because its use requires a generally adequate diet, a clean water supply (so the digestive tract does not become infected), and money to buy the rice — all in short supply in countries where vitamin A is most deficient.

The industry must label its products. I've been on record since 1992 as saying that I think the companies were making a big mistake — what others have called collosal stupidity — when they opposed labeling. They are now paying the price in public suspicion, as are the regulatory agencies that went along with them. That is why the FDA is now playing "catch-up" and attempting to implement a voluntary labeling system. I say "catch-up" because we already have GM labeling: The supermarkets already sell products labeled "no-GMO" and "GM-free" and more are coming out all the time. Disclosure is a necessary first step in reassuring people that the industry isn't trying to hide something. Furthermore, the industry's argument that we should only label products, not processes, simply doesn't hold. The FDA permits process labeling — for example, irradiated, previously frozen, made from concentrate, and organic. All set a precedent for process disclosure.

My last is for scientists: I think scientists need to learn how to talk about science to the public. If scientists can't explain the technology in ways that anyone can grasp, they cannot expect people to believe a word they say.

It is critically important that scientists understand that not everyone values hypothesis-driven investigations and that many other values influence public views of biotechnology. Until people feel as though they have some control over what they eat, they are unlikely to respect the industry. The industry needs to respect such views as a basis for bridging the gulf between the Two Cultures and opening up avenues for more constructive debate. ●

Marion Nestle is professor and chair of the Department of Nutrition and Food Studies at New York University. She presented this piece in a workshop at the January 2001 conference on Genetic Engineering and Food for the World sponsored by the Cathedral Church of St. John the Divine and the Episcopal Church's Faith Ethics, Science and Technology Committee.

CONTRIBUTING TO

THE WEB OF LIFE?

An ethics of food biotechnology

by Jeff Golliher

HOW SHOULD THE CHURCH respond to information passed on by the Union of Concerned Scientists that in supermarkets today, corn tortilla chips may contain genetic material from fireflies, that potato chips may contain material from chicken, apple juice from silk moths, or veggie burgers from petunias? Without claiming specialized scientific expertise, is there a basis on which the church should be concerned? The answer is yes.

A hunger — and ecological — crisis

With the introduction of biogenetically modified crops into the global food system, a great deal is at stake for every living being, especially for the 800 million malnourished people who go hungry every day. Projected rates of future population growth will make this tragic figure even more severe. Increased food production and more efficient, cost-effective agricultural practices might be partial solutions to the worldwide hunger crisis. This is especially so in marginal areas where the land has been degraded and monetary and technological resources available for irrigation are scarce. In a technological extension of the Green Revolution of the 1970s, corporate promoters of genetically modified foods have made feeding the world their goal. This claim ignores the fact that today enough food is produced already to meet everyone's needs, at least minimally. So, it's not basically a question of quantity. Solutions to the food crisis are rooted as much in distributing existing food supplies equitably as they are in producing more crops.

The fact that equitable distribution is largely ignored while the genetic modification of plant crops is actively pursued points to less altruistic factors at work in agribusiness — the control of global markets in order to maximize profits. Public relations campaigns that proclaim the corporate mission of feeding the world, designed to ease the public's mind about the safety of genetically modified foods, divert attention from the deeper ecological issues involved and delay real solutions to the problem. For example, developing nations desperately need agricultural systems that are locally self-sufficient, rather than dependent on global agribusiness. Even if adequate land, water, energy and technological resources exist to support the development of large-scale agriculture, the consumers themselves would not have enough money to buy the food it promises. To make matters worse, people often do not have access to the land they need to support sustainable livelihoods, while the land itself is under the severe pressure of environmental degradation. As churches and governments grapple with difficult ethical decisions about the use of genetically modified foods in the years ahead, we must consider the primary ecological picture on which agriculture depends. The impoverishment of people is directly related to the impoverishment of the earth. In actuality, the food crisis is part of the ecological crisis, and the way the debate about genetic engineering takes place turns our attention from this most fundamental reality of our time.

The depth of the ecological crisis goes beyond our customary ways of thinking, and this has contributed to the making of the crisis itself. While ecology, a science of living systems, is relatively new, it provides a broad, holistic perspective on the earth as a web of life. The science of ecology and the ecological crisis challenge what we know and how we know it — about the relationship between facts and values, science and religion; about morality, justice and conscience, as well as non-violence and prayer, as ways of knowing and being. Issues of food and new biogenetic technologies cannot be adequately understood through the lens of a divided worldview — one that sees ecology and people as somehow different, separable areas of life.

The precautionary principle, food security and food safety

The debate about the testing, regulation and labeling of genetically modified foods is shaped primarily by the precautionary principle. The meaning of this principle is best understood in light of the Hippocratic oath which says, "First, do no harm."

School by Dan Burkholder

This is a good ethical standard related, I believe, to the principle of non-violence that has deep roots in spiritual traditions. The legal defense of basic human rights and consumer protection often depends on the precautionary principle and, for that reason, it should be affirmed and strengthened.

However, given the state of the global ecological crisis, the precautionary principle alone is not enough. We must also ask what contribution genetically modified foods and the industry that produces them are making to the web of life. Given the state of the planet, if we're not making things better, then we are probably making things worse.

Together with the precautionary principle, "food security" and "food safety" are two major concerns behind ongoing debates about the labeling of genetically modified foods. "Food security" refers to the goal of providing nutritious food for everyone, especially people who are hungry.

From a scientific standpoint, a food is considered safe if it does not violate the genetic integrity of organisms and ecosystems with regard to the flow of genetic information. A naturally occurring plant would resist genetic material from other biological species, for example, but not from plants of its own species. Biologically safe foods would not threaten food security in the ecological sense — the integrity of the food supply or of ecosystems that support it would not be compromised. So the crucial question is this: Could the modified genetic material of a plant "escape" into the larger ecosystems, and if so, would it be harmful? These are questions for which the scientific and agribusiness communities do not have assuring answers.

The claim that genetically modified foods are biologically safe is potentially misleading: Those foods are already the result of the compromised integrity of genetic material. Certainly, the assumption that they are safe is based on a contradiction, at least in our conventional use of language. The most obvious case here, which was discussed by Michael Pollan in *The New York Times*, is the New Leaf potato which includes the Bt gene as a pesticide. Is it a potato or a pesticide or both?

Owning life?

The genetic material of nature has been the common heritage of human civilization for 10,000 or more years, and the different ways that cultures have understood, classified, and used the web of life for survival is the most fundamental kind of sacred knowledge. The moral significance of patenting and "owning" forms of life are monumental issues here. Equally important is the issue of simply being able to know the names of plants and animals, their characteristics and properties, and how they interact in ecosystems. Human engineering along these lines is not something that amounts to a technological discovery alone; it reaches into the sacred itself. The precise moment in human history when we would most want people to reawaken their appreciation of the natural diversity which is the web of life is definitely not the time to introduce more hubris in our attempt to remake it.

The genetic modification of food, as well as new biotechnologies generally, has carried the marketplace at a pace far beyond the reach of effective governance, which in minimal, practical terms means regulation and labeling. But this is not really the major issue. Genetically modified food represents a development within our culture that still degrades and even destroys the web of life of which we are all a part. It will make little difference that regulatory principles and food labels issue the proper warning if the institutions driving the system are taking us in the wrong direction.

Think of it in terms of the increasing dependence of farmers on seeds owned and patented by global corporations. This amounts to the consolidation of power on the basis of genetic information within the seed itself. Increased pressure on indigenous, traditional and rural people toward industrial, monocultural production, and dependence on the corporations that govern it, means the loss of the cultural knowledge we need the most: the knowledge of biodiversity conservation by the people who practice it and know first-hand how local ecosystems work. The kind of knowledge most highly valued by the industrial system is knowledge of large-scale production. This has the unintended impact of destroying biodiversity and subsuming small-scale farmers and traditional communities into the market system. Marginalized peoples often do want this new knowledge; it might and sometimes does really help in the short-term, but they, like everyone else, are still caught within the same overall dynamic of choosing a course of action that leads in a destructive direction in the long-term.

It is, no doubt, very difficult for lawmakers to conceive of effective governance and regulation when the cultural and economic processes involved relate primarily to the maximization of profits and the control of a planetary marketplace.

Sacred knowledge

Some of the most basic questions about the relationship between people and the environment, stewardship and caring for the earth are at stake here — questions that the church has recently rediscovered in the last 20 years or so. The fact that here we are talking about a new technology as it relates to the food system makes the ecological significance of these questions all the more pertinent, because it is through food that we survive, and even more so, it is how God cares for us through the web of life.

All this leads us in the direction of radically reconsidering what sacred knowledge actually is. In the broad sweep of history, at least until the modern era, human knowledge has been holistically integrated to the extent that its overall purpose has been to maintain the web of ecological relationships that make human life possible and meaningful.

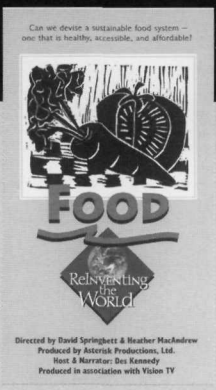
It is interesting and very revealing about the state of our ethical sensitivity, collectively, that only in the last 10 years, some scientists have engaged in a very serious debate about whether traditional indigenous peoples actually have ecological

knowledge. Much of the debate has been tragically distorted by stereotypic examples of indigenous peoples who may not respect the environment. Nevertheless, the debate as a whole has been equally distorted by racist images equivalent to the 19th-century, pseudo-evolutionary view that so-called "primitive" peoples do not have true religion. Terms such as paganism, animism, and so on were coined by the leading intellectuals of the time to categorize so-called "primitive peoples" as something less than spiritual. It was all part of the political and economic machinery of racism. Not much has changed, except today this political and economic machinery is being carried out in terms of science, food and ecological knowledge. Who really knows about ecosystems and how they work? Do we? By their fruits, you shall know them. But more to the point: Who really has the knowledge to feed people sustainably?

Traditional peoples do; organic farmers do. And the fact is that large, global corporations have the resources to do things on a very large scale. A coming together of the two, based on economically just partnerships, would be a really good idea. It would mean setting aside implicitly racist colonial attitudes and recognizing that the ecological crisis is real for everyone. For the church, this means deepening our faith in God by affirming and acting on loyalty not to economic institutions as our first impulse, but to the web of life. ●

Jeff Golliher is Canon for Environmental Justice and Community Development at New York's Cathedral Church of St. John the Divine and Program Consultant for the Environment with the Anglican Observer to the United Nations. This piece is adapted from a paper Golliher presented at the January 2001 conference on Genetic Engineering and Food for the World sponsored by the Cathedral Church of St. John the Divine and the Episcopal Church's Committee on Faith Ethics, Science and Technology.

REVIEW



by Jay McDaniel

FOOD

(A video directed by David Springbett and Heather MacAndrew; produced by Asterisk Productions in association with Vision TV; Grades 7-12, College.)

AS JESUS BROKE BREAD with disciples before his death, we can assume that the bread was made by someone he or his disciples knew, and that its grains were grown and harvested by someone in the immediate area of Jerusalem. We might even fantasize that he and his disciples gave thanks, not only to God, but also to the grower, the breadmaker, and the earth itself, which was the source of the grain. Their simple act of communion would then have been an occasion for them to feel close, not only to God, but also to other people and to the soil from which all life emerges. Through their thankfulness, God would truly have been present in the bread.

In our time it would be very difficult to have this kind of supper. After all, most of us do not know the growers and breadmakers. As we hold a piece of store-bought bread in our hands, we do not know the origins of the grains, what they were fertilized and sprayed with, how long they were stored, and how they were transported to the grocery store where we bought them. We do not know what the transporters were paid or how much oil-based fuel was used in the transportation.

Equally problematic, many of us are not troubled by this. If we are inordinately busy, we find it more convenient to buy food from the grocery store, or from fast-food restaurants, than to grow and prepare it. We tell ourselves that we are too busy "getting things done."

Asterisk Productions has produced a 50-minute video that can help change our minds. The film is called *Food*, and it is part of Asterisk's "Reinventing the World" series. It features fascinating and hopeful examples of local communities in Brazil and Canada that have reclaimed the joys of locally grown and locally produced food, along with equally interesting interviews with food activists such as Frances Moore Lappe, author of *Diet for a Small Planet* and Rod MacRae, author of *Food for a Change*. In the course of these examples and interviews, the film asks:

How did we come to believe that how food looks is more important than how it tastes and whether it is nutritious?

How did the food become a commodity in consumer society, rather than a right?

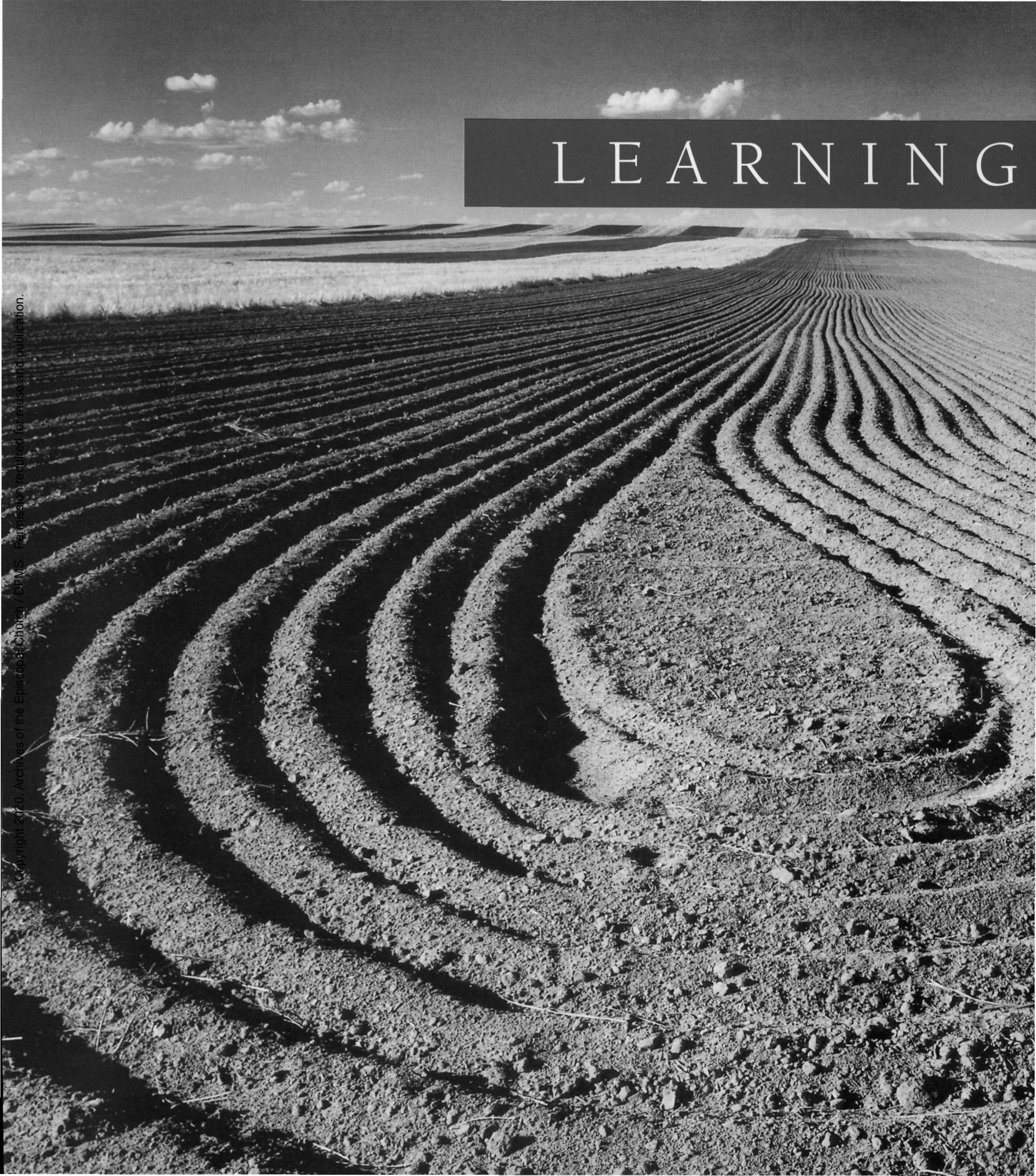
Why are there so many hungry people in the world, when there is enough food to go around?

How can the current food system be changed, globally and locally, so that healthy and affordable food is available to everyone?

In the latter regard, *Food* proposes that the needed changes depend on public policy alternatives at a governmental level, but also on consumer-driven changes that support local farmers. The latter include our support of (1) community-supported agriculture, in which citizens in communities buy from local farmers, sharing the risks and enjoying the product; (2) farmers' markets; and (3) business enterprises, such as one in Canada, where independent suppliers of food bring local products to the home.

For those who find food a sacrament and want to recover their connections with one another and the earth, this film can be a helpful educational resource. It can be used in adult classes in religious education, in the college classroom, and in study groups oriented toward a more just and sustainable world. In a world now driven by corporate power, *Food* might help us rediscover the wisdom of breaking bread together and including the poor and powerless in our communion. ●

Witness *contributing editor* ***Jay McDaniel*** *is author of* Living from the Center: Spirituality in an Age of Consumerism *(Chalice Press, St. Louis, 2000).* Food *can be obtained by contacting Bullfrog Films (Box 149, Oley, PA 19547; 610-779-8226; <www.bullfrogfilms.com>).*



Providing food, shelter and energy without degrading the planet

by Scott Russell Sanders

IN SALINA, KANSAS, first thing in the morning on the last day of October, not much is stirring except pickup trucks and rain. Pumpkins balanced on porch railings gleam in the streetlights. Scarecrows and skeletons loom in yards out front of low frame houses. Tonight the children of Salina will troop from door to door in costumes, begging candy. But this morning, only a few of their grandparents cruise the wet streets in search of breakfast.

In the diner where I come to rest, the average age of the customers is around 70 and the talk is mainly about family, politics and prices. Beef sells for less than the cost of raising it. There's a glut of soybeans and wheat. More local farmers have fallen sick from handling those blasted chemicals. More have gone bankrupt.

When a waitress in a leopard suit arrives to take an order from the booth next to mine, a portly man greets her by complaining that Halloween has turned out wet. "It's a true upset to me," the man says. "Last year I had 200 children ring my bell." The waitress calls him honey and sympathizes.

An older woman bustles in from the street, tugs a scarf from her helmet of white curls and declares to everyone in the diner, "Who says it can't rain in Kansas?"

At the counter, a woman wearing a sweatshirt emblazoned with three bears swivels around on her stool. "Oh, it rains every once in a while," she replies, "and when it does, look out!"

Here in the heart of Kansas, where tallgrass prairie gives way to midgrass, about 29 inches of water fall every year, enough to keep the pastures thick and lure farmers into planting row-crops. Like farmers elsewhere, they spray pesticides and herbicides, spread artificial fertilizer, and irrigate in dry weather. They plow and plant and harvest using heavy machinery that runs on petroleum. They do everything the land-grant colleges and agribusinesses tell them to do and still many of them go broke. And every year, from every plowed acre in Kansas, an average of two to eight tons of topsoil wash away. The streams near Salina carry rich dirt and troubling chemicals into the Missouri River, then to the Mississippi and eventually to the Gulf of Mexico.

Industrial agriculture puts food on our tables and on the tables of much of the rest of the world. But the land and farmers pay a terrible price and so do all the species that depend on the land, including us.

I've come to Salina to speak with a man who's seeking a radical remedy for all of that — literally radical, one that goes back to the roots, of plants and of agriculture. Over the past six or eight years I've bumped into Wes Jackson several times at gatherings of folks who worry about the earth's future, but this is my first visit to his home ground. Wes has been here since 1976, when he and his then-wife, Dana, founded the Land Institute, a place devoted to finding out how we can provide food, shelter and energy without degrading the planet. He won a MacArthur fellowship in 1992 for his efforts, and he has begun to win support in the scientific community for a revolutionary approach to farming that he calls perennial polyculture — crops intermingled in a field that is never plowed, because the plants grow back on their own every year. The goal of this grand experiment is to create a form of agriculture that, like a prairie, runs entirely on sunlight and rain.

To reach the Land Institute, I drive past grain silos lined up in rows like the columns of a great cathedral; they are lit this early morning by security lights, their tops barely distinguishable from the murky sky. I drive past warehouses, truck stops, motels, fast-food emporiums, lots full of RVs and modular homes; past a clump of sunflowers blooming in a fence-corner at the turn-off for Wal-Mart; past filling stations where gas sells for 85 cents a gallon. The windshield wipers can't

Wheatfield, Yoder, WY, by Don Kirby

The Land Institute

Wes Jackson displays experimental prairie crops at the Land Institute outside Salina, Kansas.

We hammer the soil, Jackson says, and then put it on life support.

keep up with the rain.

When pavement gives way to gravel, I pass a feedlot where a hundred or so cattle stand in mud and lap grain from troughs. Since entering Kansas, I've seen billboards urging everyone to eat more beef, but the sight of these animals wallowing in a churned-up rectangle of mud does not stimulate my appetite. The feedlot is enclosed by electrified wire strung on crooked fence posts made from Osage orange trees. In a hedgerow nearby, living Osage oranges have begun to drop their yellow fruits, which are the size of grapefruits but with a bumpy surface like that of the human brain. After the road crosses the Smoky Hill River, it leaves the flat bottomland, where bright green shoots of alfalfa and winter wheat sprout from dirt the color of chocolate, then climbs up onto a rolling prairie, where the Land Institute occupies 370 acres.

Wes Jackson meets me in the yellow brick house that serves for an office. It's easy to believe he played football at Kansas Wesleyan, because he's a burly man, with a broad, outdoor face leathered by sun and a full head of steel-gray hair. Although he'll soon be able to collect Social Security, he looks a decade younger. He wears a flannel shirt the shade of mulberries, blue jeans, and black leather boots that have quite a few miles on them. For a man who thinks we've been farming the wrong way for about 10,000 years, he laughs often and delights in much. He also talks readily and well, with a prairie drawl acquired while growing up on a farm in the Kansas River Valley, over near Topeka.

"I'm glad you found your way all right," he says. "Can't hide a thing out here on the

prairie, but you'd be surprised at the people who get lost."

When I admit to having asked directions at a station that advertised gas for 85 cents a gallon, he tells me, "The price of gasoline is a symptom of our capacity for denial. We pay for gas based on how much of it is above ground, not how much is left below. We ignore its real scarcity."

Wes and I sit at the kitchen table while coffee perks, a copy machine on one side of us, a wood stove on the other. The walls are lined with shelves bearing jars full of seeds. Every now and again I ask a question, but mainly I listen. Wes talks in a voice as big as he is, all the while fixing me with a steady gaze through wire-rimmed spectacles, to make sure I'm following.

He points out that our whole economy rides on cheap oil, which he calls "fossil sunlight," and nowhere is this dependence more evident that in agriculture. Natural gas is the raw material for anhydrous ammonia, which farmers spread on fields to compensate for the loss of natural fertility. We hammer the soil, he says, then put it on life support. We replace draft horses and hand labor with diesel-powered machines. We replace the small-scale farming of mixed crops with vast plantations of single crops, usually hybrids, which are so poorly adapted that we have to protect them from weeds and pests with heavy doses of petroleum-based poisons.

While cheap oil has accelerated our journey down the wrong path, we set out on that path long before we discovered the convenience of fossil sunlight, according to Wes. Our ancestors made the key mistake at the very beginnings of agriculture, when they started digging up the fields and baring the soil. The great river civilizations along the Tigris, Euphrates, Ganges, and Nile could get away with that for a while, since floods kept bringing in fresh dirt. But as populations expanded and tillage crept out of the river bottoms into the hills, the soil began to wash away.

"The Neolithic farmers began mining ecological capital," he explains. "That was the true Fall, worse than anything poor Eve might have done."

Wes knows his Bible, and he draws from history and philosophy and literature as easily as from plant genetics, the field in which he earned his Ph.D. at North Carolina State. At one point he quotes a famous phrase from the prophet Isaiah, then questions whether we're actually better off beating swords into plowshares. Wes is wary of swords, but also wary of plows. Where our ancestors went wrong, he believes, was in choosing to cultivate annual crops, which have to be planted each year in newly turned soil. The choice is understandable, since annual plants take hold more quickly and bear more abundantly than perennials do, and our ancestors had no way of measuring the long-term consequences of all that digging and tilling.

But what's the alternative? How else can we feed ourselves? Wes takes me outside to look at the radically different model for agriculture that he's been studying for more than 20 years — the native prairie. Because the rain hasn't let up, we drive a short distance along the road in his battered Toyota pickup, then pass through a gate and go jouncing onto an 80-acre stretch of prairie that's never been plowed. The rusty, swaying stalks of big bluestem wave higher than the windshield. The shorter stalks of little bluestem, Indian grass and switchgrass brush against the fenders. We stop on the highest ridge and roll down the windows so rain blows on our faces and we gaze across a rippling, sensuous landscape, all rounded flanks and shadowy crevices.

"This would be a fine spot for the Second Coming," Wes murmurs. After a pause he adds, "Not that we need saving here in Kansas."

The grasses are like a luxurious covering of fur, tinted copper and silver and gold. In spring or summer this place would be fiercely green and spangled with flowers, vibrant with butterflies and songbirds. Now, in the fall, Wes reports, it's thick with pheasant, quail and wild turkey. He and his colleagues don't harvest seeds here, but they do burn the prairie once every two or three years, and they keep it grazed with Texas longhorns, whose bellows we can hear now and again over the purr of engine and rain. Eventually the cattle will give way to bison, a species better adapted to these grasslands. From the pickup, we can see a few bison browsing on a neighbor's land, their shaggy coats dark with rain.

In every season the prairie is lovely beyond words. It supports a wealth of wildlife, resists diseases and pests, holds water, recycles fibers, fixes nitrogen, builds soil. And it achieves all of that while using only sunlight, air, snow, and rain. If we hope to achieve as much in our agriculture, Wes argues, then we'd better study how the prairie works. Not just the Kansas prairie, but every one we know about elsewhere, works by combining four basic types of perennial plants — warm-season grasses, cool-season grasses, legumes and sunflowers — all growing back year after year from the roots. The soil is never laid bare. The prairie survives droughts and floods and insects and pathogens because the long winnowing process of evolution has adapted the plant communities to local conditions.

"The earth is an ecological mosaic," Wes explains. "We're only beginning to recognize the powers inherent in local adaptation."

If you wish to draw on that natural wisdom in agriculture, he tells me as we drive toward the greenhouse, then here in Kansas you need to mimic the structure of the prairie. It's all the more crucial a model, he figures, because at least 70 percent of the calories that humans eat come directly or indirectly from grains and all our grains started as wild grasses.

For nearly a quarter-century, Wes and his colleagues have been working to develop what he calls perennial polyculture — as opposed to the annual monoculture of traditional farming — by experimenting with mixtures of wild plants. Recently they've focused on Illinois bundleflower, a nitrogen-fixing legume whose seed is about 38 percent protein; Leymus, a mammoth wild rye; eastern gama grass, a bunchgrass that's related to corn but is three times as rich in protein; and Maximilian sandflower, a plen-

tiful source of oil.

In the sweet-smelling greenhouse, we find seeds from these and other plants drying in paper bags clipped to lines with clothespins. The bags are marked so as to identify the plots outside where the seeds were gathered; each plot represents a distinct ecological community. Over the years, researchers at the Land Institute have experimented with hundreds of combinations, seeking to answer four fundamental questions, which Wes recited for me in a near-shout as rain hammers down on the greenhouse roof: Can perennial grains, which invest so much in roots, also produce high yields of seed? Can perennial species yield more when planted in combination with other species, as on the prairie, than when planted alone? Can a perennial polyculture meet its own needs for nitrogen? Can it adequately manage weeds and insects and disease?

So far, Wes believes, they can answer a tentative yes to all those questions. For example, his daughter Laura, now a professor of biology at the University of Northern Iowa, has identified a mutant strain of eastern gama grass whose seed production is four times greater than normal — without any corresponding loss of root mass or vigor.

More and more scientists are now testing this approach. After returning home from Salina, I'll contact Stephen Jones at Washington State University, a plant geneticist who is developing perennial forms of wheat suited to the dry soils of his region. I'll correspond with a colleague of Jones's at Washington State, John Reganold, a professor of soil science who predicts that with these design-by-nature methods, "soil quality will significantly improve — better structure, more organic matter, increased biological activity and thicker topsoil." I'll learn about efforts in the Philippines to develop perennial forms of rice. I'll speak with the director of the plant-biotechnology program at the University of Georgia, Andrew Paterson, who is also experimenting with perennial grains. I'll contact Stuart Pimm at the University of Tennessee, a conservation biologist who has reported in the journal *Nature* on Land Institute experiments that show that mixtures of wild plants not only rival monocultures in productivity but also inhibit weeds and resist pathogens while building fertility.

I'll contact all those people, and more, after returning home from Salina. But right now I'm listening to the fervent voice of Wes Jackson, who's lamenting that the U.S. loses 2 billion tons of topsoil a year to erosion. The cost of that — in pollution of waterways, silting of reservoirs, and lost productivity — is $40 billion, according to the U. S. Department of Agriculture. Wes estimates that only 50 million of the 400 million tillable acres in the U.S. are flatland, and even those are susceptible to erosion. The remaining 350 million acres — seven-eighths of the total — range from mildly to highly erodible, and thus are prime territory for perennial polyculture.

He flings these statistics at me as we drive into Salina for lunch at a Mexican restaurant. Maybe what set him hungering for Mexican food were the strings of bright red jalapeño peppers hanging in the greenhouse among the brown paper sacks full of seeds. Whatever the inspiration, Wes launches into his plateful of burritos with the zeal of a man who has done a hard morning's work. As we eat, a nearby television broadcasts a game between Kansas State and the University of Kansas. Checking the score, Wes explains, "My nephew plays for KU at guard, my old position." When he learns that KU is losing he turns his back to the TV and resumes telling me about what he calls natural-systems agriculture.

"The old paradigm," he says, "is the industrial model, which figures we can beat nature, make it dance to our tune, use up whatever we need and dump our wastes wherever's convenient. The new paradigm, the one we're following at the Land, believes less in human cleverness and more in natural wisdom. The prairie knows what it's doing — it's been trying things out for a long while — and so we've made ourselves students of the prairie."

Transforming perennial polyculture from a research program into a feasible alternative for the working farmer will require many more years of painstaking effort, Wes admits. Researchers must breed high-yielding varieties of perennial grains and discover combinations of species that rival the productivity of the wild prairie. Engineers must design machinery for harvesting mixed grains that may ripen at different times. Farmers must be persuaded to try the new seeds and new practices and consumers must be persuaded to eat unfamiliar foods.

In keeping with his mission, before we leave the Mexican restaurant Wes urges me to try the whole wheat tortilla chips. "They're a lot tastier than the cornmeal, don't you think?"

I try them and I agree.

It's still raining when we climb back into the pickup and as we drive into the countryside Wes keeps shaking his head at the black slurry pouring off the fields. "That's gold running away," he says. "Farmers are always worrying about money and right there's pure wealth just washing away. It takes up to a thousand years to make an inch of topsoil."He goes on to speak about the need for training farmers, a subject close to his heart. "The children in rural schools are one day going to be in charge of the 400 million acres of tillable land in this country. So they'll have the greatest ecological impact of any group." To help inform those schools — and help resettle the small towns in which many of those children will grow up — the Land Institute has created a Rural Community Studies Center in Matfield Green, a tiny settlement in the Flint Hills about a hundred miles southeast of Salina. "We want to bring the message of ecology to bear on the curriculum of rural schools," he says. "I want those young people to go to Kansas State, Ohio State, all the ag schools, and ask questions that push beyond the existing paradigm."

How well would annual monoculture perform if it weren't subsidized by inputs of petroleum and groundwater, and if it weren't allowed to write off the ecological costs of pesticides and herbicides and erosion? To answer that question, the Land Institute has

devoted 150 acres to the Sunshine Farm, a 10-year project for growing livestock and conventional crops without fossil fuels, chemicals, or irrigation.

The Sunshine Farm is where we go next, and the arrival of our truck wakes three dappled-gray Percheron draft horses from their rainy drowse in a paddock beside the barn. For the heaviest work there's also a tractor, but it shelters inside the barn and it runs on bio-diesel fuel made from soybeans and sunflower seeds. The farmhouse is heated with wood and all the buildings are lit from batteries charged by photovoltaic cells.

Six years into the study, data from the Sunshine Farm are providing a truer measure of how much conventional farming costs. Marty Bender, who manages the farm, explains, "We look at the energy content of all the crops and livestock that we produce, and we look at the inputs — fuels, feeds, stock, seeds, tools, labor. If you divide our outputs by our inputs, the ratio is comparable to what you see on Amish farms. And that tells me we're on the right track."

"When all the numbers are in," Wes predicts, "I'm sure the prairie's way will beat the pants off the industrial way."

Back in the yellow-brick office, Wes unrolls onto a table what he calls the Big Chart, which lays out a 25-year research plan. The boxes on the chart frame problems to be solved, and the arrows all point toward the vision of a sustainable agriculture that will overturn the mistaken practices of the past 10 millennia. It's a bold scheme. Already, scientists like Stephen Jones, Andrew Paterson, John Reganold and Laura Jackson have begun to work on pieces of the puzzle. With half a dozen full-time investigators and their assistants, plus eight student interns and five or six graduate students each year, the Land Institute operates now with an annual budget of $850,000, supported by foundations and private donors and the tireless labor of many friends.

This endeavor, now almost a quarter-century old, nearly died in infancy. As a young man with a family, Wes gave up a tenured position at California State in order to homestead in Kansas, then put every cent he had into starting the Land Institute. "Six months later," he recalls, "our only building burnt down, with all our books and tools. A great darkness came over me. It seemed like the world was telling me to quit. But if you're raised on a farm you're used to making things work. If you don't get it right the first time, you have another go at it. So we rebuilt."

To carry on the necessary future research, Wes calculates they'll need between $5 million and $7 million a year — not much money when you consider that estimated yearly loss of $40 billion from soil erosion in the U.S. This higher level of funding can only come with backing from the U.S. Department of Agriculture and even from agribusiness firms. "So far," he admits, "we've hit a brick wall at USDA. When you talk with them about learning from the prairie, following nature as measure and pattern, their eyes glaze over."

He realizes how difficult it will be to pry money from institutions whose philosophy of farming he so squarely opposes, but he relishes the challenge. "In America," he tells me as I prepare to leave, "we've got mostly two kinds of scientists — the ones who get us in trouble, and the ones who tell us what the troubles are — but very few who are looking for solutions. Here at the Land Institute, we're looking for solutions."

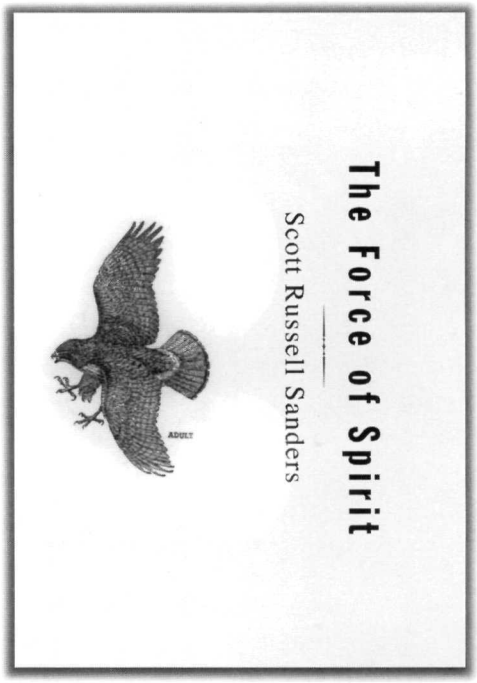
Before I go, I can't help asking him to explain how a Kansas farm boy grew up to become a visionary who's trying to revolutionize farming. He can't say for sure. His family's been in Kansas since 1854 (the year that *Walden* was published). His great-grandfather fought alongside John Brown at the Battle of Blackjack Creek, against proslavery hooligans from Missouri. His grandchildren are the sixth generation to live in the state. So he feels committed to this region for the long haul and he wants it to be a beautiful and fertile place well after he's gone.

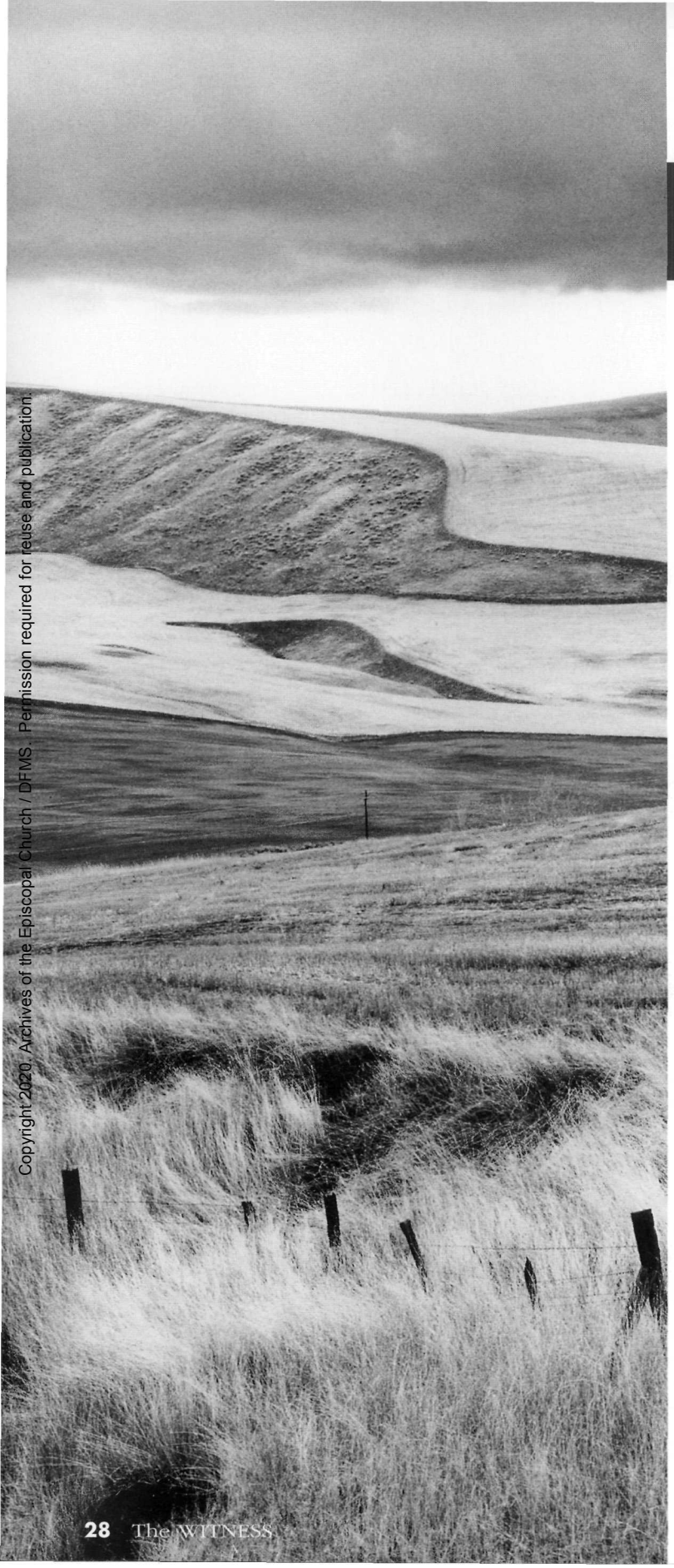
"It seems like, no matter what else I tried, I just kept thinking about the source — soil, water, photosynthesis, the things that sustain us." Is he hopeful that a durable form of agriculture will be found in time to feed the earth's swelling population?

"We don't know how this is all going to turn out," he admits. "But the risky thing is to do nothing, to keep on going the way we've been going. No matter how dark the times, it's still worthwhile to do good work."

The next morning, as I drive east through even heavier rain toward my home in Indiana, the radio carries reports of brimming rivers and flooded roads across Kansas. The plowed fields I pass are gouged by rivulets and the roadside ditches run black with dirt. But where grass covers the land, there's no sign of runoff, for the prairie keeps doing what it's learned how to do over thousands of years — holding water, building soil, waiting for spring. ●

 Essayist Scott Russell Sanders teaches at Indiana University in Bloomington, Ind. His books include Hunting for Hope, The Paradise of Bombs *and* Secrets of the Universe. *For more information on the Land Institute check <www.landinstitute.org>.*





EXERCISING

— even in disputed areas

by Susan Youmans

WHERE DOES THE AUTHORITY come from to take a position on genetically engineered foods? This is a disputed, complex topic involving technical questions about science, regulation, law, trade and development. Yet some of today's practices challenge values we hold as people of faith — love of justice, reverence for creation, esteem for humility. Our religious vocation invites us to take this issue very seriously. But how to augment our vocation with the nerve and ability to develop a position? We can learn from other communities that have authorized themselves to learn and operate amidst dispute and technical complexity.

You may know the story of the leukemia cluster in Woburn, Mass., from *A Civil Action*. Anne Anderson, one dying child's mother, fiercely believed that something caused the leukemia. Bruce Young, her Episcopal priest, urged her to substantiate this or move on in her grieving. She learned where each sick child lived and put pins in a map for each home; all cases were in the same neighborhood. When the child's oncologist saw the map, he called the Center for Disease Control.

What occurred next has been described as similar to early public health research — "barefoot epidemiology." Anderson and Young ran an ad asking people with childhood leukemia in their family to attend a meeting at the church. Gradually, in addition to learning a lot about the causes of childhood leukemia, the families learned about the possible connections of the disease with the hazardous practices at a local tannery, now a plant where solvents were used to clean machinery and then poured out onto the ground.

When I first heard this story, in 1985, the struggle was considered to have been somewhat successful. I'd been involved with issues of production and use of scientific and technical information for 25 years, and I attributed the success to the fact that the citizens had used technical information. Then, in seminary in the early 1990s, I was led back to the story from a different direction. I had done field work at MIT in which I interviewed professors about what responsibility accrues from the power associated with having knowledge. One professor alerted me to a seminar in which the topic was citizens acquiring power through gaining their own

Wheatfield, Dufur, OR by Don Kirby

knowledge. I went, and heard the Woburn story again. It led to my reading much more about that struggle, spending many hours with Bruce Young, and meeting scientists and others involved.

Learning the science had not been the critical part of the citizen's success. They did read, and they presented extensively on the topic. But it was an alliance of knowledges that made the difference. At a crucial point they talked at a Harvard seminar, attended by chance by a professor who had a methodology — a statistical model — he was eager to try out. He teamed up with the Woburn families. The data collected was sufficient to claim an association between the water and leukemia, though his work was attacked by colleagues (who were later described by sociologists as industry-inspired).

But the momentum had been created. Anderson and Young testified at hearings where Superfund legislation was being reauthorized. Proceedings began which resulted in the Environmental Protection Agency requiring a clean-up. It was a victory in terms of remediation of the land, increased knowledge in the science of remediation, and identification of an additional cause of childhood leukemia (benzene).

A recurring pattern

What does the Woburn story have to do with our concerns about genetically engineered food? It shows a pattern that recurs in most struggles about the effects of technology:

1. Non-experts in a field learn both technical information and political processes.

2. They usually receive no credit for their perception or the homework they've done to understand the problem.

3. They learn that processes they expected to protect them, do not.

4. They find that, alone — that is, without credentialed allies — they cannot usually win these David-and-Goliath battles with entities of great economic clout.

5. With each other's support, they stand firm through severe emotional and physical hardship.

6. Public officials and scientists contradict the facts of their experience.

7. Those involved and their community split over the costs to the community's economic interests.

8.This battle about power and various kinds of suffering is fought out in terms of science and struggles to renew and strengthen public processes.

Environmental sociologist Phil Brown has described the experience of Woburn's activists as learning science, protecting their community, growing in self-esteem and making democracy work better. The success required the teaming of experience-based and expert knowledge, and a cauldron of trials for both sides. I have seen this pattern recur in many other environmental health struggles.

Failed struggle

I would like to tell a second story about people who fought and failed to stop installation of a cellular phone antenna in a historic church steeple very close to their homes and school. It took place in Lexington, Mass., in a neighborhood around a church where Emerson and Thoreau preached. In this controversy, the opponents of the antenna were what anyone would call intelligent lay people — middle-class, highly educated people. Some were parents at a private school located 100 feet from the church.

The proponents of the antenna, in whose steeple the antenna was to be installed in exchange for a "rental" fee, came from similar backgrounds as the opponents.

The corporation involved here was Nextel, a member of an industry that obtained national legislation severely limiting communities' powers to set limits on antenna installation.

The dispute here did not concern children already dying, but suspected consequences of long-term exposure to extremely low levels of radio-frequency-level electromagnetic radiation (the sort of exposure you would get if your bedroom window was 40 feet from a cellular phone antenna). As the risk is now gauged for radiation at this frequency, standards for setting safety limits are based on thermal effects, so anything less than the heating of tissue is below the level of the standard's focus. But research suggests that health effects occur at far lower levels of exposure — enough that many European countries are drastically reducing the level of exposure acceptable. And towns all over the U.S. are attempting to place moratoria on siting of antennas near residences, schools and hospitals, until more is known.

But interpretation of the research is the point. To establish risk, there must be a consensus on the biological mechanism of harm. Yet in this case, because the biological mechanism through which some effects occur cannot yet be precisely described, consensus at this point is impossible to accomplish. The church council took this as a basis for claiming that it was unlikely that the antenna would pose a risk.

In my 20s in graduate school I was married to a law student who told me about the legal concept of "the reasonable man" (or woman) as a standard for responsible behavior. The reasonable person is an "everyman" whose behavior is assumed to be reliable enough that the law protects him or her from being wronged. In the Lexington story the hypothetical reason-

able person is crucial. To that person, a question is not eliminated because a hurdle 25 years down the road can't be leaped today.

We as individuals must exercise the "reasonable human's" measure of responsibility about technically disputed areas. For instance, we must notice where the strong and the vulnerable are represented. We must notice, if scientific arguments seem to lead nowhere useful in an important conversation, what function they are performing in the dialog and for whom. We must think as a person would think when buying a car — suspending the social nicety of assuming that rhetoric is always being used for mutual benefit.

In Lexington, neighbors brought alternative scientific interpretations of research, as well as significant work in public health on the precautionary principle, to the attention of the church's parish council. From this, the church leaders might have been led to conclude too little was known to prove the installation safe. But years-long academic debates on risk were too many domains away from the work that scientists on the parish council had done. They considered applying precaution — or the precautionary principle — a bogus issue.

Lessons for the GE food struggle

These stories teach many lessons about how to proceed in the area of genetic engineering and foods.

First, build relationships with people in other fields of knowledge. In the field of genetic engineering and food, there are so many facets to discerning what questions churches should ask. For instance, it is relevant to understand the nature of current testing, regulatory structures, and how the effects of genetically modified organisms might impact ecosystems.

Second, don't avoid the complexity of the issue. When considering the genetically engineered foods issue, all of us come with many kinds of expertise, and we also encounter other areas where we are not experts. Use what you already know about how highly disputed technical issues unfold (e.g. in global warming, asthma as an urban health issue, incineration, nuclear waste, tobacco). Look for what is different in the genetically engineered foods controversy and then seriously pursue what stands out according to your knowledge and experience. (For me, for example, it is corporate claims for ownership of genetic information based on the concept of intellectual property. From my past work I know the meaning of intellectual property has been put into question in the decades since 1960, when information technology provided new ways to unhook content from form in publishing.)

Recognize the demands of being on new ethical territory. The church committee in Lexington, initially approached by Nextel for a "rental," never dreamed that this involved choices that perhaps exposed their neighbors to a possible, if disputed, health risk.

Churches have little experience with the dialog issues distinct to technical and scientific controversies — and no norms for what is appropriate in this dialog. In Lexington, a slide in a key discussion quoted a technical article, saying that the research reviewed showed that the cancer risk from long-term, low-level radiation was negligible. No one explained, nor did the audience understand, that in the technical parlance of the article, no general conclusion about safety was being made. Yet the laypeople were being invited to draw this conclusion.

Third, expect that really getting out there with your knowledge can be hard. A church in a nearby town invited two Lexington women to describe what they had learned about themselves from their struggle. When they arrived, they were peppered with questions, not given time to document what they knew and not taken seriously. They went home without covering their topic and feeling like failures. The following Sunday, members of the host church expressed chagrin that they had derailed the meeting's agenda by insisting too much on facts. As an evironmental scientist observed, "Opinions play a role when you are trying to get to some kinds of truths."

We are on both sides of the Lexington story and the GE foods debate. We need to apply carefully the chance we have to enrich our perspectives with new ideas and new allies. We must not kill dialog and relationship by failing to value our own and other peoples' opinion- and experience-based knowledge. ●

Susan Youmans is a member of the Episcopal Church's Committee on Faith Ethics, Science and Technology.

SHORT TAKES

Medicare or casinos?

Theodore Roszak, in a *Hope* magazine interview (Winter '01), disputes the notion that growing numbers of seniors will make Social Security unaffordable.

"Americans should realize that not only did we come to entitlements after every other industrial society in the world, but we still spend far less on entitlements — meaning, in our case, Social Security and Medicare — than other industrial societies, which are doing a very good job of competing with us in world markets. We are a rich society; we can afford vastly more than other countries when it comes to providing a dignified retirement for older citizens. ...

"A very telling set of facts is this: Medicare costs us 200 billion dollars a year. The people of the U.S. spend 630 billion dollars a year on gambling alone. Look beyond that at the way we spend money on professional athletics, entertainment, cosmetics, cigarettes, liquor. ...

"The idea that we cannot possibly afford an older society is not only economically untrue, but it's ethically absurd. It's as if we're saying that now that we have gained the gift of time, which is the grand product of two centuries of industrial development, we can't afford it. Longevity is not a cost; it's a benefit of solving other problems. Every time we find a way to improve nutrition, every time we find a way to bring babies into the world healthier, every time we stop teenagers from smoking, every time we pro-

vide more safety in the workplace or automobile, every time we conquer another disease, the result is longevity. It is a benefit we're willing to pay for, as you can see by the way we use our money on medical science, public health and research."

Exporting the U.S. prison model

Repressive prison trends that activists are confronting in the U.S. are spreading to other countries, Angela Davis says in an interview with *The Progressive* (Feb. '01).

"When I visited Australia a year and a half ago, I found that the largest women's prison there, which is outside of Melbourne, is owned and operated by Corrections Corporation of America, which is headquartered in Nashville, Tenn. It is not only the tendency to incarcerate ever greater numbers of people that one can see in European countries and Australia, but also the supermaximum prisons have been exported. There are supermaximum prisons in the Netherlands, South Africa, and even Sweden. The security housing unit, which is a particularly repressive formation originating in the U.S., has invaded their prisons as well."

Cuba, in contrast, offers a better model, Davis says.

"In Cuba, at least in the women's prisons I visited, the women — unlike women in the U.S. or in other countries — did not feel disconnected from the larger society. The effort to pay close attention to the U.N. standard minimum rules for the treatment of prisoners was very obvious. Perhaps the most impressive aspect of the system itself was the fact that prisoners were allowed to continue to work in their fields if their offense was not related to their particular profession. I talked to a woman who was a veterinarian, for example, and she continued to be a veterinarian in the prison. I talked to a woman who was a doctor, and she continued to be a physician in the particular prison where she was incarcerated. That in itself was interesting because it inverts the hierarchies of prisoners and guards. As the doctor, she was in charge of civilian nurses, for example, and was treated not as a prisoner, not as an inferior person, but rather as a doctor.

"Furthermore, people who work, and virtually everyone works who is in prison, receive the same wages and salaries as they would receive if they were working in the same job on the outside. It was a striking difference with respect to the U.S., where prisoners can receive as little as 10 cents an hour."

Monitoring of multinationals

A coalition of environment, labor and human rights groups is calling for new legislation that would require U.S.-based corporations to disclose information about their operations in other countries, *The Michigan Citizen* reports (3/3/01).

"U.S. law requires companies to disclose some basic information about their domestic activities, including what kind of pollution they emit or how many employees have been injured on the job.

"The coalition is currently circulating a proposal that urges members of Congress to draft new legislation that would extend these existing requirements to companies' overseas operations.

"'Communities and workers throughout the world have the right to important information about corporate practices that will have significant impacts on their lives,' said a statement by the coalition of more than 150 organizations including Amnesty International, the AFL-CIO and Friends of the Earth."

According to this proposal, U.S. corporations would be required to "reveal the environmental impact of products and operation, reveal details of all security arrangements with government or private firms, indicate whether or not they had a human rights policy, indicate whether they faced any charges of human rights violations, reveal the numbers of workers hurt, killed or handling hazardous material at each plant, and reveal the location of all plants around the world."

First Muslim holiday stamp

The first U.S. postal stamp honoring Muslim holidays will be available in October, 2001, *Church & State* reports. The stamp commemorates Eid-al-Fitr, a Muslim feast that marks the end of fasting for the month of Ramadan, and Eid-al-Adha, the festival of sacrifice. The campaign for the stamps was led by the American Muslim Council, which arranged for 3,000 Muslim children to send letters to the postmaster. The stamp features the Arabic phrase "Eid mubarak," which means "blessed festival," in gold against a blue background. ●

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The Witness

The Witness Magazine
P.O. Box 1170, Rockport, ME 04856

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