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European and American Views on Genetically Modified Foods

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Why is there a marked divide between Americans and Europeans when it comes to the cultivation and regulation of genetically modified (GM) foods? The United States, which has about 1.4 times as much cropland as the European Union, devotes almost 600 times as much to GM crops; the EU's total acreage of GM crops, mostly corn grown in Spain, adds up to less than the area of Greater London. This vast difference in production between Europe and the United States reflects their different attitudes toward genetically modified organisms, attitudes that affect consumer preferences and government policies, and that have important political implications for transatlantic trade. Differences in the ways that the two sides regulate GM foods are among the challenges for the ongoing negotiations to establish the Transatlantic Trade and Investment Partnership, challenges having to do mostly with European restrictions on genetically modified products from America.

But explaining this divide requires going beyond the usual discussion about whether Europe is irrational in its concern about the safety of genetically modified organisms (GMOs) and its insistence on precaution, or about whether America takes excessive risks for the sake of efficiency and profit. These are complex questions, and we can begin to understand how each side answers them only if we look to the underlying cultural and philosophical reasons for the differences between European and American approaches to GMOs—to the different attitudes toward food and eating, technological mastery of land, and the reliability of scientific experts, as well as to more deeply rooted differences in the ways agriculture is practiced on the two continents. Perhaps the most important of these differences concerns the value of local traditions, which Europe sustains in part by resisting innovations that might alter treasured ways of life.

Differences Take Root

Before describing the historical and cultural roots of the differences between European and American attitudes toward GMOs, it is worth

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saying a bit about what genetically modified foods are and the reasons they are grown at all. The term "genetically modified organisms" refers to organisms, whether plants, animals, or microbes, that have had their genomes manipulated to contain specific DNA sequences. There are many genetic modification technologies that can accomplish this, with varying degrees of efficiency. Breeding techniques have been used by farmers for millennia to select plants or animals with the best genes for their purposes—but breeding does not directly manipulate DNA in organisms; rather, it changes the prevalence of different kinds of genetic variants in the population. The first modern method for genetic modification employed recombinant DNA technology, in which enzymes are used to cut specific DNA sequences out of one organism's genome to insert it into the genome of another. The inserted DNA sometimes comes from related species, but can also come from unrelated species.

The first genetically modified plant approved for agricultural production was the Flavr-Savr tomato, which had been modified to produce less of the enzyme responsible for the softening of fruit as it ripens. First approved in the United States in 1994, production ceased in 1997 because of high production costs and poor sales. More successful GM varieties soon followed, but they have not been as conspicuously marketed to consumers and retailers as the Flavr-Savr tomato. Rather, they have been designed to appeal to farmers and marketed as more efficient and profitable than non-modified varieties. Because the traits of GM crops are not designed chiefly with consumers in mind, and because the most successful GM crops are plants like soybean and corn that are incorporated into processed foods more than they are purchased fresh by consumers, GM crops have not noticeably changed the ways most Americans buy, cook, and eat their food. And while GMOs have come to dominate the American corn and soybean markets, other staples, such as wheat or oats, are almost entirely GM-free. Other than a few varieties of zucchini and papaya, there are very few GM fruits or vegetables on the market, and only a single genetically modified animal—the AquaAdvantage salmon—has been approved by the U.S. Food and Drug Administration for human consumption. Nevertheless, according to one estimate, as much as 70 to 80 percent of the foods consumed in the United States contain some amount of GM ingredients.

Some of the most successful varieties of GM crops in the United States have been corn and soybeans designed to be resistant to glyphosphate, a herbicide better known by its trade name, RoundUp. The company that produces RoundUp, Monsanto, created genetically engineered varieties of corn, soybean, and a few other crops that would survive being sprayed by

the herbicide, allowing farmers to spray their fields extensively with the herbicide to destroy weeds.

American farmers have been more reliant on herbicides than Europeans, in part because Americans have moved away from the traditional practice of tillage, or plowing. Among its other advantages, tillage helps to destroy weeds prior to planting, making the use of herbicides less necessary. However, tillage also dries and compacts the soil, and in drier climates like those that prevail in the central United States, this can lead to extensive erosion, as witnessed by American farmers in the catastrophic Dust Bowl conditions of the 1930s. No-till farming and other kinds of conservation tillage, which involve less significant disruption of the soil, were first adopted in the United States in the 1950s, but only really caught on in the 1970s, following the development of herbicides and specialized planting equipment necessary to farm without plowing.

In most of Europe, growing conditions have not required the abandonment of the traditional methods of plowing that have been used for centuries. No-till farming is practiced mainly in southwestern Europe and some other areas where climate conditions make it more suitable, although it is very limited.

It is unclear what effect the creation of herbicide-resistant GM crops has had on the plowing practices of American farmers. But the rise of herbicide-resistant crops has contributed to the increased use of herbicides by farmers, which has, in turn, given rise to "superweeds" resistant to glyphosphate herbicides. And while European methods of heavy plowing are rooted in tradition, some environmentalists and scientists argue that farmers in Europe will need to reduce the tillage of their fields to preserve soil quality for future generations.

So the move toward herbicide-resistant GMOs is more explicable in the case of American farmers under pressure to reduce tillage for the sake of preserving soil quality; GM crops offer a convenient way to deal with the challenges posed by reduced tillage. Compared to previous methods of low-dose selective herbicide chemistries, farmers can now use a simple and forgiving weed-management system that requires fewer rounds of spraying, lower costs, and greater reliability. The persistence, despite the rise of GM crops, of the heavy use of agricultural chemicals in the United States can be attributed, at least in part, to the fact that broad-spectrum herbicides offer a level of convenience that diminishes the incentive to carefully control the amount of chemicals sprayed on the fields.

But the influence of GMO technology on farming has not only been to improve productivity; it has also helped to introduce a new economic

model of agriculture, one similar to that found in the software industry. The development of genetically modified seeds is a costly, time-consuming process that requires expensive equipment and first-rate researchers, and so seed companies have to ensure high revenue to recoup investments and to gain profits. This business of high volumes and low profit margins is supported by a strong intellectual-property-rights regime; patents on novel seeds ensure that companies can gain a return on their research and development costs. Revenues are collected through payments for licensed seeds, royalty payments from distributors, and sales of additional products such as matching pesticides, which are sometimes offered in package deals together with the core product. Some may argue that this leads to a more productive form of farming that benefits farmers, consumers, and biotech companies. Others might object that it is also a more mechanized, technological way of farming that is an affront to a traditional, bucolic vision of rural life. But in America farming has long been a highly pragmatic and large-scale enterprise. This is even more easily understandable if we compare the average farm size of about 35 acres in the European Union today to the average of 434 acres in the United States, while there are about six times as many farms in the EU. This means that, unlike in America, the average European farm is still very much part of a local community.

Culture and Agriculture

Over the course of centuries, Europeans have found ways of producing food in confined spaces and in varied and complex geological and climate conditions. Europe's many varying landscapes have made possible the development of culturally distinct communities and societies that could retain their individual traditions and idiosyncrasies while also conducting lively exchanges with neighbors. Unlike in America, the sense of geographic constraint in Europe helped to give rise to a view of agriculture as part of the beauty of a landscape that bore the imprint of age-old ways of life.

In the nineteenth and twentieth centuries in Europe, the man-made landscape became the focus of spiritual resistance against the growing technological and industrial mastery over nature that threatened to transform agriculture. This resistance was expressed already by the Romantics and their philosophical predecessors, who extolled the mystical powers of nature and found in the land a source of artistic inspiration. The idea of the land as a garden appears in the writings of Rousseau and Goethe, in the designs of landscape gardens by Hermann von Pückler-Muskau,

and in the art of J. M. W. Turner, Jean-Baptiste-Camille Corot, Caspar David Friedrich, and others. Nature both benign and powerful was seen as a liberating force, and an inexhaustible source of moral instruction and religious insight. Unlike the mechanically devised geometrical gardens of the aristocratic courts—a physical manifestation of the might of absolute monarchies over land—the cared-for landscape of the pastoral community was seen as a common home and a refuge from political strife.

Americans experienced a very different sense of space and landscapes. When the settlers disembarked in the New World, they found seemingly unlimited land and resources. In stark contrast with Europe, where farmers participated in age-old traditions and worked land that had been passed down through the generations, American pioneer farmers came to see the land as a wilderness to be tamed. As Frederick Jackson Turner recounted in his influential work *The Frontier in American History* (1920):

> The first ideal of the pioneer was that of conquest. It was his task to fight with nature for the chance to exist. Not as in older countries did this contest take place in a mythical past, told in folk lore and epic. It has been continuous to our own day. Facing each generation of pioneers was the unmastered continent. Vast forests blocked the way; mountainous ramparts interposed; desolate, grass-clad prairies, barren oceans of rolling plains, arid deserts, and a fierce race of savages, all had to be met and defeated.

The farm in early America was not the home to a settled people but a sign of the conquest of nature by mobile and entrepreneurial newcomers. From the beginning, therefore, farming has been associated by Americans with the need to win a livelihood from the wilderness, whereas in Europe it has been associated with the cultivation of a landscape to make a home within it.

In mid-nineteenth century America, the natural wonders of the frontier were depicted by the Hudson River school of painters and celebrated in the novels of James Fenimore Cooper. Partly because of the way agriculture was practiced by the conquest-oriented pioneers, farming was sometimes portrayed as an intrusion into the natural landscape, not a part of it, and still less the highest form of cultivating it. In the late nineteenth century, the preservation of untouched wilderness became an important goal for the American environmentalist movement, though others would emphasize the conservation of natural resources for human use. The divide between preservationists and conservationists was less significant in Europe, where cultivated land and wilderness were not so strictly separated.

These different attitudes toward agriculture and cultivation of land in Europe and America were reinforced in the twentieth century through the ways that each of the two experienced war. The shifting war fronts in Europe, together with famine, looting, and the wreckage of farmland in the world wars left deep marks on the consciousness of rural populations. In Eastern Europe, the destruction of the hinterland was followed by the communist confiscation of land and collectivization of agriculture, crushing once flourishing rural communities. After so much uprooting through war and communism, healing and reconciliation in Europe were only conceivable through efforts to help the rural population restore and retain a life of self-reliance and traditional culture. This European agrarian vision went beyond an idea of land cultivation or setting a level of necessary income; it also sought to ensure that the farmers would not be pressed out from their land by market forces.

In Western Europe, certain groups such as the Italian Futurists had fervently glorified technology as a means of establishing a more perfect, engineered society; social ills could be cured or prevented, they believed, with the help of faster, more powerful, and more efficient machines. The Futurists eventually became associated with Italian Fascism, just as similar movements elsewhere fed into National Socialism. But the wars crushed their techno-utopian dreams, confirming earlier criticisms of big industry that the obsession with speed, horsepower, and efficiency was a threat to traditional practices of farming and manufacturing, and to the peaceful rural life these practices sustain.

Twentieth-century philosophy in Central Europe, particularly that of Edmund Husserl and Martin Heidegger and their heirs, identified the modern cultural malaise with the tendency to objectify our natural surroundings and to exploit them, including through technology. This objectification, they argued, led to a radical fracture separating us from each other and from our given physical experience.

But whereas the wars instilled in Europeans a sense of technology's dangers, in Americans they helped to confirm confidence in scientific and technological progress. Large-scale industry had been crucial for Allied victory, especially in World War II, and whereas Europe needed to reconstruct its cities and countryside after the war, America, its mainland untouched, continued its high techno-industrial productivity, including in its food production.

While the differences between America and Europe are somewhat simplified here to make the general outlines clearer, they do largely still hold true today. Certainly, some Americans, for instance the writer and farmer

Wendell Berry, have criticized the American trend of techno-economic management of land, and there has also been growing demand for local food in place of mass-produced food and for organic food that has been produced through less aggressive methods. But there is little reason to think American agriculture will be fundamentally restructured by these changes. And European agriculture too has shifted toward becoming a mechanized, chemical-intensive, and efficiency-oriented economic activity; it would be a mistake to romanticize the European farmer by portraying him as the principled man living in perfect harmony with nature. But limited space and resources, and the threat of war and regional clashes, have helped to sustain old agrarian traditions and local practices in spite of the general trend toward greater efficiency, and Europe still has a different conception of the farmer and of the idea of stewardship of land than America.

Three Arguments About GMO Safety

The different experiences of agriculture and technological progress on the two continents are part of the reason that European consumers have on the whole preferred traditional, non-GMO products and have been more skeptical than Americans of the practice of genetically manipulating food, despite the arguments usually made for why GMOs are safe for consumption. There are three arguments usually made for their safety: first, that they are "substantially equivalent" to existing foods; second, that the methods of genetic engineering are little different from those of traditional breeding; and third, that most scientists who study genetically modified organisms believe they are safe. It is worth considering how each of these arguments has been received in Europe.

The idea of "substantial equivalence" has guided much of the scientific deliberation on GMOs in the last two decades. It was first articulated in an OECD study in 1993 as the idea that the safety of GMOs can be assessed by comparing them to analogous conventional food products; today this approach still serves as the guiding principle for assessments of GMO safety, including in Europe. The European Food Safety Authority (EFSA), established in 2002, has a panel on GMOs consisting of about twenty independent scientific experts who review risk assessments by applicants seeking to demonstrate the safety of a GM product. The EFSA panel examines the genetically modified food for a range of possible toxins, critical nutrients (such as proteins, fats, carbohydrates, and vitamins), molecular characteristics, chemical composition, potential allergenicity, and potential environmental impact.

A point of criticism against the doctrine of substantial equivalence is that it does not take into account the ways that genetic engineering might result in unpredictable changes to the whole organism. Inserting DNA into one site in an organism's genome can result in insertional mutagenesis, a process in which other sites in the genome are disrupted. There is some disagreement among scientists about how dangerous insertional mutagenesis is for crop species. A 2006 review discussed high rates of mutations in genomes of genetically modified soybeans and warned that mutations of this kind "may affect the safety or performance of transgenic crops intended for commercial release" and that "risk assessments typically fail to effectively examine the genetic aspects of transformation." A more recent study found that the rate of mutation in genetically modified plants is significantly lower than the genetic variation naturally found between cultivars of soybeans.

Related to the idea of substantial equivalence is the notion that genetic modification is a simple continuation of the age-old art of selective breeding. However, as Harvard biologist George Wald argued in his 1976 article "The Case Against Genetic Engineering," the then-new recombinant DNA technology

> must not be confused with previous intrusions upon the natural order of living organisms: animal and plant breeding, for example; or the artificial induction of mutations, as with X-rays. All such earlier procedures worked within single or closely related species. The nub of the new technology is to move genes back and forth, not only across species lines, but across any boundaries that now divide living organisms, particularly the most fundamental such boundary, that which divides prokaryotes (bacteria and bluegreen algae) from eukaryotes (those cells within a distinct nucleus in higher plants and animals). The results will be essentially new organisms, self-perpetuating and hence permanent.

Research on GMOs in subsequent decades have mitigated some of the worst fears expressed in the early days of genetic engineering, but it is still true that, compared to selective breeding, genetic engineering is a more dramatic form of technological power that introduces genes from entirely different species, which have the possibility of interacting with the genome of the organism in unexpected ways.

Notwithstanding these theoretical criticisms of GMOs, the results of research into their safety has led the vast majority of scientific associations and prestigious research institutes on both sides of the Atlantic to affirm that currently available GM food poses no greater risk than conventional

food. The long list includes the EU's Directorate-General for Research and Innovation, the American Medical Association, the Union of German Academies of Science and Humanities, the French, Italian, and American academies of science, the Royal Society of the United Kingdom, and the World Health Organization.

This is not to say that there are no dissenters among scientists. In fact, a 2015 statement by three hundred independent researchers argued that "Claims of consensus on the safety of GMOs are not supported by an objective analysis of the refereed literature." In part because of the tension between a supposed consensus and the scientists who may challenge it, people who are concerned about the safety of GMOs often question the trustworthiness of institutions investigating GMO safety and the reliability of their assessments. For instance, some critics have argued that the EFSA scientists are not truly independent and have conflicts of interest that bias their assessments in favor of the GMO producers and that sometimes lead them to dismiss the results of other scientists' studies showing potential dangers of GM products.

A prominent scandal from the late 1990s (that is, before the establishment of the EFSA) involving Hungarian-born biochemist Árpád Pusztai illustrates why many skeptics do not trust the GMO evaluation process. Pusztai was the leader of a three-year publicly funded research program at Scotland's Rowett Research Institute investigating possible health and environmental hazards of GMO foods. The researchers examined potatoes into which an insecticidal lectin—a protein taken in this case from snowdrop bulbs—had been inserted to increase their resistance to certain pests. The scientists found that rats with dietary exposure to the crops developed a thicker lining of their gut mucosa in the small intestine, potentially limiting their digestive capacity over time and harming their immune systems.

Before the study was fully concluded, Pusztai discussed the preliminary results in a short television appearance in 1998, which triggered public outcry and demand for governmental action by many in Britain. Pusztai was suspended from the Rowett Institute, an action that led many, including Pusztai, to raise questions about how scientific institutions handle controversies related to GMOs. Some scientists, for instance from the Royal Society, argued that Pusztai's public announcement of incomplete experimental results was irresponsible, while his defenders argued that he was subject to a politically motivated cover-up. Pusztai's research, which was eventually published in 1999—an action that itself became controversial because of criticisms of the review process and the study's

design—hardly contained conclusive evidence that the GM potato caused harm to humans. But the scientific institutions entrusted with evaluating food safety might have done better to respond to his research and to use it as a starting point for further investigation, rather than treating his claims with such hostility. And it is understandable that Pusztai's complaint, for instance in a 2002 article, that scientists are often too financially dependent on companies that profit from certain research results, would make the public even more skeptical both of scientists and of producers of GM foods. For instance, Pusztai explained that the Rowett Institute had an agreement with the company developing the potatoes that if the product were to be commercially released "Rowett would share the profits of the enterprise."

It is worth remembering that this controversy occurred toward the end of the decade-long epidemic of BSE, or mad cow disease, a fatal neurodegenerative disease that affected both cattle and humans in the United Kingdom far more than in any other country, and in Europe more than on other continents. While this disease was unrelated to genetic modification (it spread through the use of contaminated animal products in cow feed), it severely harmed public confidence in the safety of the food-supply system. And certain government actions during this time, advised by scientific experts—for instance assuring the public that risk to humans was remote—led many to lose trust in established mechanisms for assessing health risks of intensive farming practices.

While a lack of trust in scientific institutions is part of what explains the European public's skepticism concerning GMOs, there is more to the debate over GM food than science. What is scientifically validated is not necessarily socially acceptable, as is evident from surveys that take consumers seriously, for instance the research of sociologist Claire Marris. Marris's work shows that while laypeople may have very limited knowledge of biotechnology—which they will often admit—honest conversations with them and intelligible questions about ethical conduct reveal that their understanding is often considerate and nuanced. What consumers demand is not necessarily more information, but a more trustworthy attitude from all parties, including biotech companies and public authorities, whose assurance that GMO foods pose no risks whatsoever sound to many people "disconcerting and untrustworthy," because new technical advances always involve risks and a degree of uncertainty. Furthermore, many of the consumers' concerns about GMOs do not stem from having erroneous information, and there is some evidence, Marris writes, that having more detailed technical knowledge about GMOs "makes people

more skeptical or polarized, not less." Policymakers and experts who would address unfavorable public opinion by more science communication forget that "public attitudes are largely shaped by institutional behavior, not by public relation exercises. Thus, instead of focusing on ways to modify public views in order to make them 'more rational,' institutions should perhaps pay more attention to their own behavior."

When anti-GMO protesters talk about "Frankenfood," GMO advocates often interpret it as a hysterical reaction that blows the potential risks out of proportion, failing to hear it as an allusion to the deep ethical dilemmas that are inextricably linked to the promise of progress through mastery of living things. It is a reference to one of the primary motifs of the twentieth century—that technology by itself is no cure for social ills, and that its success and use for human flourishing depend on the extent to which our norms, conduct, and institutions are able to control it and ensure it is used well and wisely.

Precautions and Labeling

The general European sentiment about how best to ensure wise use of technologies that significantly alter living things may be summed up in a maxim by German philosopher Hans Jonas: "Act so that the effects of your action are compatible with the permanence of genuine human life." This "imperative of responsibility"—presented as a reformulation of Kant's categorical imperative—is one way to explain the sentiment behind what in German has come to be known as the "*Vorsorgeprinzip*" and in English as the "precautionary principle." Its function in policymaking is to place the burden of proof for the safety of a new product or process on those who wish to produce or import it, requiring them to demonstrate the absence of danger, and forbidding its sale and production until then.

This principle has been applied not only for cultural and historical reasons having to do with the failure in parts of Europe in the first half of the twentieth century to exercise precaution about manipulation of life, but also for political and economic reasons. The increasingly integrated market of the European Union has required the harmonization of all member states' regulations, and the removal of restrictions impeding the flow of goods, services, capital, and labor between them. One effect of this gargantuan task has been that in seeking common ground between the health and safety regulations of the member states, some more risk-averse than others, the most risk-averse countries have sometimes come to set the standard for the rest of the European Union.

Thus when the Single European Act went into effect in 1987, setting the aim of creating a single market for the union, it established that the European Commission "will take as a base a high level of protection" in matters concerning health and safety of both the environment and of consumers, and it further specified that action by the European community relating to environmental protection should be based on the principle "that preventive action should be taken."

Perhaps the most significant instance when the precautionary principle was invoked in Europe was in a dispute over GMOs in the late 1990s and early 2000s. In 1998, after the European Commission had authorized a variety of GM maize (corn) despite widespread public resistance, all new applications for GMO authorizations were blocked at some stage in the process, beginning what came to be regarded as the European Union's *de facto* moratorium on GMOs. A majority of member states signed declarations stating intentions to block any new authorization of GMOs and demanding that the European Union adopt a new legal framework to regulate them. In one such declaration, five countries called for new "rules ensuring labeling and traceability of GMOs and GMO-derived products" and stated that without these rules, "in accordance with preventive and precautionary principles, they will take steps to have any new authorizations for growing and placing on the market suspended." Another declaration, by seven more countries, also invoked the precautionary principle, stating that they would not authorize any GMOs "until it is demonstrated that there is no adverse effect on the environment and human health."

In 2003 the United States, Canada, and Argentina filed complaints with the World Trade Organization (WTO) to challenge the EU over its unofficial moratorium, arguing that it violated trade agreements. The WTO ruled in favor of the complainants in 2006, leading to the authorization in the European Union of a number of new GM plants for food and feed, including cotton, maize, rapeseed, soybeans, and sugar beet. However, each application for a GMO, whether for cultivation or for food and feed, faces considerable regulatory hurdles. Even once the European Commission has authorized an application, individual member states are entitled to opt out. Since national governments convey the mistrust of the public, by October 2015, nineteen of the twenty-eight EU nations had submitted requests to opt out of approving the cultivation of MON 810, a variety of GM maize produced by Monsanto and the only GM crop currently cultivated in parts of the European Union. An additional hurdle for the actual sale of GM products for food and feed is that the EU requires all products containing as little as 0.9 percent GMOs to be

labeled as containing genetically modified ingredients, facilitating consumers' preferences for GMO-free products. By contrast, U.S. regulations have been less strict, although many bills for labeling have been proposed at the state level. At the national level, President Obama recently signed into law a bill requiring labeling of GM foods, but the methods of labeling are not clearly specified, leaving room for obscure codes to conceal information; the details, including the specifics of which GM foods will require labeling, will have to be sorted out later by regulators. However, it is worth noting that some U.S. food producers, responding to growing demand among consumers and retailers, have voluntarily begun to indicate whether or not their products contain GM ingredients.

La Dolce Vita

Why then does precaution dictate Europe's regulatory framework for GMOs and seem to influence the choices of such a large portion of European consumers? At what point is the absence of hazard to health and environment sufficiently demonstrated for the precautionary principle to have ceased serving its function, especially when many major scientific bodies consider these hazards nonexistent or at least negligible? This brings us back to the role that precaution plays in Europe not merely as a policy tool for slowing the inexorable advance of technology (in case it is not safe and the experts are wrong, both of which are always possible), but also as a cultural disposition that serves to protect a precious way of life.

Europeans' attachment to traditional ways of producing and consuming food and the revulsion many feel toward American agri-giants like Monsanto dates back at least to the resistance toward globalization of food production through chains like McDonald's, which arrived in Europe in the 1970s and 1980s. In France, for instance, McDonald's put many local cafés out of business, provoked changes in restaurant layout and food preparation among French competitors, challenged conventional job security in the restaurant business, helped to deskill food-preparation labor, and led farmers to start growing Russet potatoes and bakers to start baking soft uniform buns. In 1999, protesting effects like these, sheep farmer and activist José Bové led a group of men in using axes, saws, and a tractor to destroy a new McDonald's under construction in southern France, in the process becoming somewhat of a national hero. The impetus for the protest was a trade dispute between the United States and the European Union, although not the one over GMOs. In response to Europe blocking U.S. exports of hormone-induced beef, the United States raised tariffs on

European luxury items, such as Roquefort cheese produced from sheep's milk, including Bové's sheep.

Other less destructive protests have also drawn attention to the wealth of local and traditional food practices that are at risk because of a globalizing economy. When in 1986 Carlo Petrini and his friends launched the Slow Food movement, it prompted a revived enthusiasm for *terroir* in food and wine—the highly particular environmental conditions that affect the distinctive qualities of a crop. The movement grew out of a protest—a public pasta feast—against the opening of a McDonald's in the Piazza di Spagna, one of the famous squares in the heart of Rome. Fast food gave rise to its own antidote. The movement has since spread all across Europe and the world and reaffirms a commitment to some of the sweetest things in life: the pleasure of homegrown food as it has been known for generations, the slow pace required for healthy food production and eating, and the joys of conviviality. All these are well known to anyone who travels to Europe and delights in its gastronomic hedonism.

The survival of regional food traditions, which both locals and tourists treasure, depends in part on the resistance to economic trends that homogenize food production and consumption. Critics of these trends, including opponents of GMOs, are not necessarily concerned with preserving the most "natural" types of food. This would surely be a pointless effort, particularly in this time after the Green Revolution that has dramatically increased the role of technology in agriculture worldwide. Instead, the European resistance to GMOs and certain other big-business food products is part of a larger attempt to preserve, against the pressures of industrialization, a certain type of hard-won knowledge, the local lore built up around food, and the relationships between producers and consumers necessary to sustain this knowledge. Part of the purpose of the Slow Food movement and of the reinvigoration of local markets is to reconnect producers and consumers not just through trade but through a loose and yet personal involvement in each other's well-being.

In this light, the European stance on GMOs is at heart conservative, in the general sense that it seeks to conserve the wisdom of local and national traditions from a kind of progressivist belief that history moves in linear fashion toward a future in which technological solutions, mass-produced and distributed worldwide through free trade, fix all problems even on the local scale, a kind of progressivism that is hostile to the democratic right to dissent. This European conservatism with regard to food is not anti-Americanism, but a resistance to a leveling of culture and to a disregard for local sentiments and age-old ways of life.

That Which Cannot Be Measured

In his book *The Case Against Perfection: Ethics in the Age of Genetic Engineering* (2007), Michael Sandel writes that "Breakthroughs in genetics present us with a promise and a predicament." While Sandel's focus is genetic engineering of ourselves, his observation applies also to the genetic engineering of our food, which involves a moral dilemma that scientific safety assessments alone cannot resolve.

The *promise* of genetic modification of food—besides some advantages of no-till farming under certain climate conditions—is the elimination of hunger and malnutrition worldwide through ever-increasing efficiency in food production. For instance, scientists have created specific seed varieties that will target pressing nutrition problems, like Golden Rice for Vitamin A deficiency and gluten-free wheat for celiac disease. However, non-GMO alternatives to some of these problems already exist, such as Vitamin A supplements that have been used with good success in developing regions—and according to the U.N.'s Food and Agriculture Organization, the world already wastes far more food than would be necessary to feed everyone. Nevertheless, to GMO advocates, the opportunities seem unlimited: from field crops and trees, to fruits and vegetables, to animals—all these could potentially be used for the benefit of a growing world population.

The *predicament* of genetic modification of food is how to decide when new innovations serve legitimate purposes and when they merely answer to the latest food frenzy or threaten other, more valuable goods. How can we know where the limitations are? What do we gain, risk, and lose when we intervene in evolutionary processes in a way that circumvents the usual feedbacks from nature in the development of organisms? Techno-progressivism offers no real answers to these questions because it does not allow them to be raised in a serious way: it holds that all technological changes are ultimately steps toward a better future, so concerns about limits are at most temporary obstacles, primarily about safety issues. This way of thinking is similar to what Edmund Burke called the "geometrical" politics of the French revolutionaries, according to which "all local ideas should be sunk" and replaced by a central and unifying goal, no matter the moral price we or our children will have to pay. This utilitarian reasoning, which takes into account only what is measurable—for instance, crop yield, pesticide resistance, nutritional content, market value—disregards the intentions and sentiments of those whose lives are affected. The social and cultural goods that are sacrificed, if they are considered at all, are just collateral damage compensated for by the gain in efficiency and profit.

The greatest of these goods that is usually ignored in debates over GMOs is tradition in the sense that Roger Scruton discusses it in *How to Think Seriously About the Planet* (2012), as a form of knowledge—not *about* something or about *how* to do something, but "knowing *what to do*, in order to accomplish a task successfully, where success is not measured in any exact or fore-envisaged goal, but in the harmony of the result with our human needs and interests." These needs and interests can include the beauty of a landscape shaped by traditional agricultural practices, the local particularities of food production and cuisine, and the relationships built up over generations between food producers and consumers. So when the discussion about whether or not GMOs should become culturally acceptable to European consumers considers only scientific safety assessments, the complexity of the issue has been reduced to what amounts to a simple geometrical problem.

As of this writing, the negotiations between the United States and the European Union over a Transatlantic Trade and Investment Partnership still meet with hostility in Europe, to a great extent because certain U.S. food products, including GMOs, might gain wider access to European markets. But the deeper the trench lines and the greater the focus on policy and science, the less we reflect on the larger questions about the meaning of stewardship of land and about the farmer's role in nature and in our societies. Historical experiences of land, personal attachments to and conceptions of a good life, culinary heritages—these are not considered relevant factors in debates among bureaucrats. But mutual understanding will depend in part on our ability to clarify for ourselves and for each other our allegiances to the land and our duties to our neighbors.