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The Land Report

Agrarianism

The third of three special issues

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Above: Scott Jost, *Wahaub Prairie, The Land Institute, 1996*

Our Mission Statement

When people, land and community are as one, all three members prosper; when they relate not as members but as competing interests, all three are exploited. By consulting nature as the source and measure of that membership, The Land Institute seeks to develop an agriculture that will save soil from being lost or poisoned while promoting a community life at once prosperous and enduring.

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In Distrust of Movements

Wendell Berry

I am here today to give you my thoughts, and I must burden you as I have burdened myself with the knowledge that I speak from a local, some might say a provincial, point of view. When I try to identify myself to myself I realize that, in my most immediate reasons and affections, I am less than an American, less than a Kentuckian, less even than a Henry Countian, but am a man involved with and worrying about my family, my neighbors, and the land that is daily under my feet. It is this involvement that defines my citizenship in the larger entities. And so I will remember, and I ask you to remember, that I am not trying to say what is thinkable everywhere, but rather what it is possible to think on the westward bank of the lower Kentucky River in the summer of 1998.

Over the last 25 or 30 years I have been making and remaking different versions of the same argument. It is not "my" argument, really, but rather is one that I inherited from a long line of familial, neighborly, literary, and scientific ancestors. We could call it "the agrarian argument." This argument can be summed up in as many ways as it can be made. One way to sum it up is to say that we humans can escape neither our dependence on nature nor our responsibility to nature — and that, precisely because of this condition of dependence *and* responsibility, we are also dependent upon and responsible for human culture.

Food, as I have argued at length, is both a natural (which is to say a divine) gift and a cultural product. Because we do not live in the Garden of Eden, but must *use* land and water and plants and animals to produce food, we are at once dependent on and responsible to what we use. We must know both how to use and how to care for what we use. This knowledge is the basis of human culture. If we do not know how to adapt our desires, our methods, and our technology to the nature of the places in which we are working, if we cannot fit the farming to the farm or the forestry to the forest, so as to make it productive *and to keep it so*, that is a cultural failure of the grossest and most dangerous kind. Poverty and starvation also can be cultural products — if the culture is wrong.

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Though this argument, in my keeping, has lengthened and acquired branches, in its main assumptions it has stayed the same. What has changed — and I say this with a good deal of wonder and with much thankfulness — is the audience. Perhaps the audience will always include people who are not listening, or people who think the agrarian argument is merely an anachronism, a nuisance to be waved away, or a form of entertainment. But increasingly the audience also includes people who take this argument seriously, because they are involved in one or more of the tasks of agrarianism. They are trying to maintain a practical foothold on the earth for themselves or their families or their communities. They are trying to preserve and develop local land-based economies. They are trying to preserve or restore the health of local communities and ecosystems and watersheds. They are opposing the attempt of the great corporations to own and control all of Creation.

In short, the agrarian argument now has a significant number of friends. As the political and ecological abuses of the so-called global economy become more noticeable and more threatening, the agrarian argument is going to have more friends than it has now. This being so, maybe the advocate's task needs to change. Maybe now, instead of merely propounding (and repeating) the agrarian argument, the advocate must also try to see that this argument does not win friends too easily. I think, myself, that this is the case. The tasks of agrarianism that we have undertaken are not going to be finished for a long time. To preserve the remnants of agrarian life, to oppose the abuses of industrial land use and finally correct them, and to develop the locally adapted economies and cultures that are necessary to our survival will require many lifetimes of dedicated work. This work does not need friends with illusions. And so I would like to speak — in a friendly way, of course — out of my distrust of "movements."

I have had with my friend Wes Jackson a number of useful conversations about the necessity of getting out of movements — even movements that have seemed necessary and dear to us — when they have lapsed into self-righteousness and self-betrayal, as movements seem almost invariably to do. People in movements too readily learn to deny to others the rights and privileges they demand for themselves. They too easily become unable to mean their own language, as when a "peace movement" becomes violent. They often become too specialized, as if finally they cannot help taking refuge in the pinhole vision of the institutional intellectuals.

They almost always fail to be radical enough, dealing finally in effects rather than causes. Or they deal with single issues or single solutions, as if to assure themselves that they will not be radical enough.

And so I must declare my dissatisfaction with movements to promote soil conservation or clean water or clean air or wilderness preservation or sustainable agriculture or community health or the welfare of children. Worthy as these and other goals may be, they cannot be achieved alone. They cannot be responsibly advocated alone. I am dissatisfied with such efforts because they are too specialized, they are not comprehensive enough, they are not radical enough, they virtually predict their own failure by implying that we can remedy or control effects while leaving the causes in place. Ultimately, I think, they are insincere; they propose that the trouble is caused by *other* people; they would like to change policy but not behavior.

The worst danger may be that a movement will lose its language either to its own confusion about meaning and practice, or to preemption by its enemies. I remember, for example, my naive confusion at learning that it was possible for advocates of organic agriculture to look upon the "organic method" as an end in itself. To me, organic farming was attractive both as a way of conserving nature and as a strategy of survival for small farmers. Imagine my surprise in discovering that there could be huge "organic" monocultures. And so I was not too surprised by the recent attempt of the United States Department of Agriculture to appropriate the "organic" label for food irradiation, genetic engineering, and other desecrations of the corporate food economy. Once we allow our language to mean anything that anybody wants it to mean, it becomes impossible to mean what we say. When "homemade" ceases to mean neither more nor less than "made at home," then it means anything, which is to say that it means nothing. The same decay is at work on words such as "conservation," "sustainable," "safe," "natural," "healthful," "sanitary," and "organic." The use of such words now requires the most exacting control of context and the use immediately of illustrative examples.

Real organic gardeners and farmers who market their produce locally are finding that, to a lot of people, "organic" means something like "trustworthy." And so, for a while, it will be useful for us to talk about the meaning and the economic usefulness of trust and trustworthiness. But we must be careful. Sooner or later,

Above: Paula Chamlee, *from the series High Plains Farm, 1996*

Trust Us Global Foods, Inc., will be upon us, advertising safe, sanitary, natural food irradiation. And then we must be prepared to raise another standard and move on.

As you see, I have good reasons for declining to name the movement I think I am a part of. I call it The Nameless Movement for Better Ways of Doing — which I hope is too long and uncute to be used as a bumper sticker. I know that movements tend to die with their names and slogans, and I believe that this Nameless Movement needs to live on and on. I am reconciled to the likelihood that from time to time it will name itself and have slogans, but I am not going to see its slogans or call it by any of its names. After this speech, I intend to stop calling it The Nameless Movement for Better Ways of Doing, for fear it will become the NMBWD and acquire a headquarters and a budget and an inventory of T-shirts covered with language that in a few years will be mere spelling.

Let us suppose, then, that we have a Nameless Movement for Better Land Use and that we know we must try to keep it active, responsive, and intelligent for a long time. What must we do?

What we must do above all, I think, is try to see the problem in its full size and difficulty. If we are concerned about land abuse, then we must see that this is an economic problem. Every economy is, by definition, a land-using economy. If we are using our land wrong, then something is wrong with our economy. This is difficult. It becomes more difficult when we recognize that, in modern times, every one of us is a member of the economy to use the land (and the air, the water, and other natural gifts) on our behalf. Adequately supervising those proxies is at present impossible; withdrawing them is for virtually all of us, as things now stand, unthinkable.

But if we are concerned about land abuse, we have begun a profound work of economic criticism. Study of the history of land use (and any local history will do) informs us that we have had for a long time an economy that thrives by undermining its own foundations. Industrialism, which is the name of our economy, and which is now virtually the only economy of the world, has been from its beginnings in a state of riot. It is based squarely upon the principle of violence toward everything on which it depends, and it has not mattered whether the form of industrialism was communist or capitalist or whatever; the violence toward nature, human communities, traditional agriculture, local economies has been constant. The bad news is coming in, literally, from all over the world. Can such an economy somehow be fixed without being radically changed? I don't think it can.

The Captains of Industry have always counseled the rest of us to "be realistic." Let us, therefore, be realistic. Is it realistic to assume that the present economy would be just fine if only it would stop poisoning the air and water, or if only it would stop soil erosion, or if only it would stop degrading watersheds and forest ecosystems, or if only it would stop seducing children, or if only it would quit buying politicians, or if only it would give women and favored minorities an equitable share of the loot? Realism, I think, is a very limited program, but it informs us at least that we should not look for bird eggs in a cuckoo clock.

Or we can show the hopelessness of single-issue causes and single-issue movements by following a line of thought such as this: We need a continuous supply of uncontaminated water. Therefore, we need (among other things) soil-and-water-conserving ways of agriculture and forestry that are not dependent on monoculture, toxic chemicals, or the indifference and violence that always accompany big-scale industrial enterprises on the land. Therefore, we need diversified, small-scale land economies that are dependent on people. Therefore, we need people with the knowledge, skills, motives, and attitudes required by diversified, small-scale land economies. And all this is clear and comfortable enough, until we recognize the question we have come to: *Where are the people?*

Well, all of us who live in the suffering rural landscapes of the United States know that most people are available to those landscapes only recreationally. We see them bicycling or boating or hiking or camping or hunting or fishing or driving along and looking around. They do not, in Mary Austin's phrase, "summer and winter on the land." They are unacquainted with the land's human and natural economies. Though people have not progressed beyond the need to eat food and drink water and wear clothes and live in houses, most people have progressed beyond the domestic arts — the husbandry and wifery of the world — by which those needful things are produced and conserved. In fact, the comparative few who still practice that necessary husbandry and wifery often are inclined to apologize for doing so, having been carefully taught in our education system that those arts are degrading and unworthy of people's talents. Educated minds, in the modern era, are unlikely to know anything about food and drink, clothing and shelter. In merely taking these things for granted, the modern educated mind reveals itself also to be as superstitious a mind as ever has existed in the world. What could be more superstitious than the idea that money brings forth food?

I am not suggesting, of course, that everybody ought to be a farmer or a forester. Heaven forbid! I *am* suggesting that most people now are living on the far side of a broken connection, and that this is potentially catastrophic. Most people are now fed, clothed, and sheltered from sources, in nature and in the work of other people, toward which they feel no gratitude and exercise no responsibility. There is no significant urban constituency, no formidable consumers' lobby, no noticeable political leadership, for good land use practices, for good farming and good forestry, for restoration of abused land, or for halting the destruction of land by so-called "development."

We are involved now in a profound failure of imagination. Most of us cannot imagine the wheat beyond the bread, or the farmer beyond the wheat, or the farm beyond the farmer, or the history (human or natural or sacred) beyond the farm. Most people cannot imagine the forest and the forest economy that produced their houses and furniture and paper; or the landscapes, the streams, and the weather that fill their pitchers and bathtubs and swimming pools with water. Most people appear to assume that when they have paid their money for these things they have entirely met their obligations. And that is, in fact, the conventional economic assumption. The problem is that it is possible to starve under the rule of the conventional economic assumption; some people are starving now under the rule of that assumption.

Money does not bring forth food. Neither does the technology of the food system. Food comes from nature and from the work of people. If the supply of food is to be continuous for a long time, then people must work in harmony with nature. That means that people must find the right answers to a lot of questions. The same applies to forestry and the possibility of a continuous supply of timber.

People grow the food that people eat. People produce the lumber that people use. People care properly or improperly for the forests and the farms that are the sources of those goods. People are necessarily at both ends of the process. The economy, always obsessed with its need to sell products, thinks obsessively and exclusively of the consumer. It mostly takes for granted or ignores those who do the damaging or the restorative and preserving work of agriculture and forestry. The economy pays poorly for this work, with the unsurprising result that the work is mostly done poorly. But here we must ask a very realistic economic question: Can we afford to have this work done poorly? Those of us who know something about land stewardship know that we cannot afford to pay poorly for it, because that means simply that we will not get it. And we know that we cannot afford land use without land stewardship.

One way we could describe the task ahead of us is by saying that we need to enlarge the consciousness and the conscience of the economy. Our economy needs to know — and care — what it is doing. This is revolutionary, of course, if you have a taste for revolution, but it is also merely a matter of common sense. How could anybody seriously object to the possibility that the economy might eventually come to know what it is doing?

Undoubtedly some people will want to start a movement to bring this about. They probably will call it the Movement to Teach the Economy What It Is Doing — the MTEWIID. Despite my very considerable uneasiness, I will agree to this, but on three conditions.

My first condition is that this movement should begin by giving up all hope and belief in piecemeal, one-shot solutions. The present scientific quest for odorless hog manure should give us sufficient proof that the specialist is no longer with us. Even now, after centuries of reductionist propaganda, the world is still intricate and vast, as dark as it is light, a place of mystery, where we cannot do one thing without doing many things, or put two things together without putting many things together. Water quality, for example, cannot be improved without improving farming and forestry, but farming and forestry cannot be improved without improving the education of consumers — and so on.

The proper business of a human economy is to make one whole thing of ourselves and this world. To make ourselves into a practical wholeness with the land under our feet is maybe not altogether possible (how would *we* know?) — but, as a goal, it at least carries us beyond *hubris*, beyond the utterly groundless assumption that we can subdivide our present great failure into a thousand separate problems that can be fixed by a thousand task forces of academic and bureaucratic specialists. That program has been given more than a fair chance to prove itself, and we ought to know by now that it won't work.

My second condition is that the people in this movement (the MTEWIID) should take full responsibility for themselves as members of the economy. If we are going to teach the economy what it is doing, then we need to learn what *we* are doing. This is going to have to be a private movement as well as a public one. If it is unrealistic to expect exploitive and wasteful industries to be conservers, then obviously we must lead in part the public life of complainers, petitioners, protesters, advocates and supporters of stricter regulations and saner policies. But that is not enough. If it is unrealistic to expect a bad economy to try to become a good one, then *we* must go to work to build a good economy. It is appropriate that this duty should fall to us, for good economic behavior is more possible for us than it is for the great corporations with their miseducated managers and their greedy and oblivious stockholders. Because it is possible for us, we must try in every way we can to make good economic sense in our own lives, in our households, and in our communities. We must do more for ourselves and our neighbors. We must learn to spend our money with our friends and not with our enemies. But to do this, it is necessary to renew local economies, and revive the domestic arts. In seeking to change our economic use of the world, we are seeking inescapably to change our

lives. The outward harmony that we desire between our economy and the world depends finally upon an inward harmony between our own hearts and the creative spirit that is the life of all creatures, a spirit as near us as our flesh and yet forever beyond the measures of this obsessively measuring age. We can grow good wheat and make good bread only if we understand that we do not live by bread alone.

My third condition is that this movement should content itself to be poor. We need to find cheap solutions, solutions within the reach of everybody, and the availability of a lot of money prevents the discovery of cheap solutions. The solutions of modern medicine and modern agriculture are all staggeringly expensive, and this is caused in part, and maybe altogether, because of the availability of huge sums of money for medical and agricultural research.

Too much money, moreover, attracts administrators and experts as sugar attracts ants — look at what is happening in our universities. We should not envy rich movements that are organized and led by an alternative bureaucracy living on the problems it is supposed to solve. We want a movement that is a movement because it is advanced by all its members in their daily lives.

Now, having completed this very formidable list of the problems and difficulties, fears and fearful hopes that lie ahead of us, I am relieved to see that I have been preparing myself all along to end by saying something cheerful. What I have been talking about is the possibility of renewing human respect for this earth and all the good, useful, and beautiful things that come from it. I have made it clear, I hope, that I don't think this respect can be adequately enacted or conveyed by tipping our hats to nature or by representing natural loveliness in art or by prayers of thanksgiving or by preserving tracts of wilderness — though I recommend all those things. The respect I mean can be given only by using well the world's goods that are given to us. This good use, which renews respect — which is the only currency, so to speak, of respect — also renews our pleasure. The callings and disciplines that I have spoken of as the domestic arts are stationed all along the way from the farm to the prepared dinner, from the forest to the dinner table, from stewardship of the land to hospitality to friends and strangers. These arts are as demanding and gratifying, as instructive and as pleasing as the so-called "fine arts." To learn them, to practice them, to honor and reward them is, I believe, the work that is our profoundest calling. Our reward is that they will enrich our lives and make us glad.

Above: Paula Chamlee, *from the series High Plains Farm, Adrian, Texas, 1994*

Breathing

Donald McCaig

I retired my eight-year-old Border Collie, Harry, from sheepdog trailing after a 600-yard uphill run when Harry collapsed. Turns out Harry's got a bad heart valve and when he's stressed Harry hasn't enough oxygen in his blood to think or attend or even walk straight.

Along with Harry's heart medicine the Virginia Tech veterinarians gave me a stern warning: no strenuous activity, keep this dog quiet!

But Harry is a sheepdog and sheepdogs are genetic workaholics and telling Harry "forget it," every time he asks, "We going to work today, Boss? Is this a work morning?" is intolerable.

For man and dog alike, there are things worse than death.

So I use Harry for light farmwork, here and there, bringing in the big flock for feeding, putting them out after they eat, nothing tricky or high-stress.

We've been lambing for two weeks and catch sleep in shifts. Anne woke me at 2 a.m. because a ram had climbed one fence and was destroying another to break through to the ewes. "I heard this twanging! " Anne said.

Harry's our only dog that'll work by flashlight.

Sure enough, the minute Harry and I stepped outside it sounded like a rock group smashing guitars. That ram was hitting the high-tensile fence, "KA-WHANG KA-WHANG."

And before Harry and I could get in front of him, Ram-O broke through and he and his new girlfriend ran into the night. There were eighty ewes in that field, many due to lamb momentarily; the rest aged ewes no longer able to bear and rear lambs. Seeing Ram-O disappear in the dark was like watching a serial rapist dropping over the wall of a nunnery.

It was pitch black, raining a little, and at the end of my flashlight beam I couldn't see anything but sheeting mist. Since dogs (and sheep) see better than humans at night, I switched the light off. "Harry, I need you," I said. When Harry was well away I turned the light on and headed for the barn lot.

At night you can hear their hooves before their eyes come into sight like bobbing, amber road reflectors. Sheep are terrified by the unknown, and by flashlight the familiar gateway looked dangerous to them. Harry kept working back and forth, turning on a dime just to hold them in the opening. When I switched off my light the gateway looked sheep-friendlier and they bleated through.

Gate cutting sheep is what it sounds like — you let a few slip through and slam the gate on others while Harry keeps up the pressure behind. I keep an eye peeled for Ram-O (he's the sheep with enormous horns). The braver sheep go first, next the medium-brave, until only a dozen timid ewes and Ram-O are still in the lot. Ram-O charges the gate, which I hold (barely) by throwing all my strength to it. Harry comes to my rescue and peels Ram-O away.

I latch that gate and run to our cutting chutes. The sheep have been through these chutes a hundred times, but by flashlight they look as safe as a slaughterhouse ramp and Ram-O is getting awfully cross. Ram-O weighs 350 pounds, has horns like a bighorn mountain sheep, and doesn't care to have any other animal stand between him and the objects of his desire. Horned rams can smash a dog against a fence, break bones, even kill him, and horned rams are not susceptible to reason. Ram-O lowers his head, paws the ground. Harry slides forward, crouched like a predator. Ram-O backs a step, another, bumps into a ewe. Oops. He charges. Harry jumps out of the way and nips Ram-O's hock and promptly gets right back in his face. Ram-O backs up, regroups, lowers his head. Harry shows many, many teeth. One inch at a time, lit by the flashlight, Harry backs that huge animal into the chutes.

When I close the gate, it's all over: ewes into one pen, Ram-O back with his pals. I'm about half whupped and Harry is panting hard. We've been at it for an hour.

Back inside the house, Harry laps a little water. He isn't coughing. The vets say the first sign of Harry's heart getting worse will be coughing. His lungs will fill with fluid and he'll try to cough it out.

I told Harry to get up on the bed next to me and laid my hand on his silky flank. In a few minutes he was asleep. It took me somewhat longer to fall off, listening to my dog's breathing.

The Folly of Trying to Repress the Agrarian Impulse
Thoughts while watching weeds push up through a shopping center parking lot

Gene Logsdon

In the spring of 1999, for the first time ever, urban people with no money to gain not only marched and demonstrated to save farmland, but raised a cool million dollars to make it happen. Although outside the local area the event passed without fanfare, it may in retrospect come to be hailed as a turning point in this cycle of history, the first indication that a largely urban society is beginning to understand that life is impossible without agriculture. The place was Yellow Springs, Ohio; the land they kept out of the hands of commercial developers was Whitehall Farm which lay invitingly right next to the town limits, in the center of a growing metropolitan area bounded by Dayton, Columbus, Springfield and Xenia. It was prime development land, all in one, luscious 940-acre chunk.

Yellow Springs (population 4,000) is not your usual midwestern village. Just getting a MacDonald's restaurant in town 20 years ago almost caused a local civil war. Officials of most rural Ohio villages favor "growth" — any growth, no questions asked — bowing in adoration before the myth that growth is always good for the local economy, except (cross yourself) growth in whorehouses and bars. But in Yellow Springs even the village leaders were suspicious of turning Whitehall Farm into another sprawl of houses and business places. The woman organizing a little army of demonstrators on the day of the sale reflected the crowd's mood: "When we drive outside the town limits, we want to see farmland, not a jam of strip malls and trash stores and houses that all look the same." Or as another person said and then vanished in the crowd: "Look, we're not stupid. We know that as long as population increases, there's going to be urban sprawl. But why can't there be places where people by mutual consent are willing to limit family size and spending to stop growth. If this is a free country why can't we foster a few no-growth communities?"

And so the lines of battle were drawn, one side asserting that commercial growth was a necessary and unavoidable fact of life, the other that there needed to be places removed from this necessity — especially since farmland acreage was continuing to shrink at an alarming rate. (Ohio loses 77 acres of farmland every day to other uses.) Money always settles conflicts about growth, and since commercial developers usually hold the high hand in these contests, they win. Yellow Springs understood that fact and so the people did not just stand around talking piously and doing nothing about the issue, but got to work earning money.

It was a genuine grassroots people-project. There were some big donations, true, but also a lot of small ones, the money raised dollar by dollar with bake sales, car washings, local festivals and door-to-door solicitations. Led by local lawyers, government office holders, and professors retired from Antioch College (the heart

Demonstration at Yellow Springs early 1999. Photo by Gene Logsdon.

of Yellow Springs), plus many just plain angry and fearful citizens, the town established a Land Trust to act as a legal entity to buy the farm and place it under conservation easements in perpetuity. That meant the land could be resold only for farming or open space. It also meant that the Trust would have to raise enough money to cover the difference between what developers would bid for it at auction and its farmland value, so it could be sold back to farmers at the latter price.

Few businesspeople or experienced observers of farm preservation attempts thought the "Save The Farm" coalition had a ghost of a chance of success. The money needed seemed an impossible amount for a town of 4,000; some would rather have the land developed. They also had to find farmers willing to buy land that would remain farmland forever. (Most farmers piously lament developmental pressure on their farms but when they retire want to sell it to the highest bidder.)

To make a long story short (a detailed account of the land sale can be read in "Showdown at Yellow Springs," by this author, in *LandOwner*, Vol. 21, No. 6, April 5, 1999), the people did raise the money. Their lawyers, who also were buying some of the land to keep in farmland for themselves, simply outbid everyone else. The property sold for $3.2 million. The Trust had no trouble finding farmers to buy land under conservation easements for about $2000 an acre, with $1.2 million raised by the Land Trust covering the difference. Large cash grain farmers and small organic market farmers were eager to buy in fact. So another myth, the one that says farmers won't buy land in conservation easements, bit the dust.

But the showdown at Yellow Springs was very much the exception to the rule, at least so far. Whether it heralds a new attitude about farmland on the part of both urban and rural people remains to be seen. In the meantime, government is pretending to want to save farmland by pointing out the evils of urban sprawl. Although no one has stumped more vigorously for farmland preservation than I have, there is much in the current opposition to urban sprawl that seems to me to be fruitless or deceitful. First of all, how can society take the need for farmland preservation seriously when landowners are paid millions of dollars to take millions of acres out of production under the Conservation Reserve Program? How can people seriously believe those of us who worry about land loss when farmers are raising huge surpluses that drive down farm prices and drive farmers out of business?

Close investigation reveals that "urban sprawl" is the same thing that was called "rural development" 20 years ago, which was not rural development but industrial development in rural areas. Ironically, the same commercial, governmental and educational offices that trumpeted rural development now want to damn it as urban sprawl. An example of this turnabout is the huge Honda plant that spreads over at least a hundred acres of prime farmland near Marysville, Ohio. When the Japanese were throwing "developmental" money around like holy water, their sprawling, land-wasteful plant was hailed and hallowed by bank, political party, university, and the Farm Bureau, the mouthpiece of big agribusiness, as great "rural development." A company trying to do that today is accused of "urban sprawl."

Finding factory jobs for a wrecked rural culture is not rural development but rural dismantlement. But that didn't become apparent to mega-agribusiness until rural dismantlement began to compete with them, not just with small family farmers. Then rural dismantlement became urban sprawl and had to be contained to preserve the monopoly that industrial grain and meat factory investors enjoyed in acquiring more land. It was all right when mega-farmers could run the bid up on land beyond the reach of small farmers; it was not all right for commercial developers and private citizens

Above:
Greg Conniff,
Dane County, Wisconsin, 1995

seeking a homestead in the country to bid up land prices beyond the reach of mega-farmers.

But if, with small farmers gone, farmland is to be preserved by blocking off huge chunks of land exclusively for industrial food production (as some opponents of urban sprawl suggest), how is that farmland preservation? I think it's factory-farm monopoly preservation. Industrial food conglomerates, aiming to control food from seed to shelf, don't want competition in land acquisition and are taking advantage of naive advocates of farmland preservation to gain even more monopoly power. Moreover, they are themselves "urban sprawl." In fact, the expansion of large industrial grain operations and huge animal factories displacing farms and destroying rural communities appears to me as a kind of "urban sprawl" that is worse than strip malls and tract housing development. Huge hog factories, financed by urban money (even mutual funds) and operated by paid managers and ill-paid immigrant workers, are just more industrial urban development in the country.

The meetings held to discuss urban sprawl, which were last winter's agricultural college craze, revealed how divided and hypocritically society stands on the subject. The group most legitimately opposed to urban sprawl (as they were to "rural development") are family farmers who want to keep their land in their families forever if they can but fear that commercial development will bring property tax escalation forcing them to sell. Another group, large-scale animal factory operators, oppose urban sprawl (other than their own of course) not so much for tax reasons (since they get property and personal property tax breaks not available to small farmers), but because they know newcomers will make trouble for their stinking facilities. The third and most conspicuous opposition group, the ones that I say agribusiness manipulates for its own ends, are ex-urbanites who have already moved to the country and now wish to keep other people from doing the same.

Most older farmers, land investors and developers support urban sprawl just as they supported rural development, for obvious financial reasons. Farmers want to be able to sell out at the highest possible price when they retire, as I have said; developers want to buy land that is cheaper than property in town; and land speculators, seeking a balance to the nervous jitters of the stock market, want to be free to wheel and deal in land while raking in "Freedom To Farm" and CRP payments. *LandOwner* magazine reported last year that a wealthy Illinois farm couple stopped by the big Plummer land auction near Johnson, Kansas, while on vacation. On the spur of the moment they bought a 160-acre tract out of the estate for an "investment." Writes editor Jerry Carlson: "Their 'hobby' is collecting extraordinary farmland buys. They felt the quarter section they acquired for $65,000 would be a good investment. Their ten years of CRP payments will return $56,360."

The debate over urban sprawl seems to exhibit little realistic thinking on either side. There has been no discussion over slowing population growth, precluding any rational plans for saving farmland in the long term unless people are forced to live on algae in tenement housing and high-rise apartments. There has been no discussion over the mad, ongoing extension of highways over rich farmland. Little attention has been paid to the unavoidable fact that growing towns and villages must extend corporation lines into the countryside because they don't have any inner-city space to use more efficiently. There has been no proposal to stop government from acquiring farmland whenever it pleases for prisons, parks, research sites, hazardous and radioactive waste dumps, airports, or utility rights-of-way. Indeed, when Ohio State received, mostly as a gift, the 1500-acre Firestone estate near Akron two years ago, it had a perfect opportunity to practice what it was trying to preach at the meetings and sell that land (or lease it long-term) to young farm families at a reasonable price. Instead, the university sold the property for $12 million to a big-time developer who plans to subdivide it into acre and a half lots, what opponents of urban sprawl consider a "wasteful" use of land.

The best suggestion anyone has come up with so far is for the state to buy up developmental rights to farms in exchange for farm owners agreeing to keep the land in farming permanently, much like the citizens of Yellow Springs did. But as farmland preservation advocate and Ohio state legislator (as well as one of the few bonafide farmers on the Ohio Task Force for Farmland Preservation) Gene Krebs pointed out, such legislation has only limited application: "The math just doesn't add up," he says. At $1700 an acre for developmental rights, the average nationwide, even a program with a budget of $260 million a year, as has been suggested for Ohio, could buy development rights to only "an infinitesimally small amount of farmland."

The most concerted effort by farmland preservationists seems to be to stop new homes from "sprawling" into the countryside. I find this unconscionable because most of this effort comes from people who have already moved to the country and wish to stop others from doing so. More importantly, a significant number of people moving into the country do so to farm on a small scale, or to raise huge gardens or specialty livestock, or to grow and perpetuate groves of trees. Often they commit their small acreages to "wildlife sanctuaries," increasing the diversity of wild plants and animals. This is an extremely beneficial type of "urban sprawl." In our county many such homesteads are acquired and built in the few remaining rural tree groves, saving them from the bulldozers of industrial corn farmers gone berserk.

Development plans that would "block off" acreages and reserve them exclusively for industrial farming would play right into the hands of the giant agribusiness firms and their drive to monopolize the food business. Such segregation would also repeat the mistakes that cities have made. Jane Jacobs, noted writer on city growth and development, argues in her latest book that human neighborhoods should be a little "messy," that is, they should avoid society's hell-bent preoccupation with segregating humans and human activities into neat, everything-in-its-proper-place kind of development. That leads to stagnation and decline, she maintains. All you have to do is drive through Detroit, as I did recently, to see what she means. Like so many other large cities that became domains of monolithic big business, this metropolis contains widespread areas that look as if they had been bombed and the process of cleanup still in progress. What remains are decaying hulks of buildings erected during the heyday of the auto industry — when the reigning philosophy was to zone everything into neat and proper places and use the automobile to move people from one neat and proper place to another.

The suburbs continued the "no mess" policy. A gas station and repair garage close to houses where they might be particularly useful, like they are in villages? Heaven forbid. Chickens in the backyard and vegetables on front lawns? How trashy. Backyard composters to turn food waste, leaves and grass clippings into valuable fertilizer? Might draw rats. Little factories mingled in with the homes? Might make a little noise to disturb His Suburban Highness on Saturday morning — although with the roar of lawnmowers, who could hear anything else? Factories — without a neighborhood of active, influential citizens, workers and owners *nearby* to enforce clean operation — become more and more careless about air quality control until the smokestacks belch not just on the ghetto people who have to suffer their proximity, but on the richer people in the suburbs as well. The rich people move farther away. As conditions become more inhuman, and as the economic gods demand yet more consolidation and expansion of production and sales, people flee nice neighborhoods for new ones on the (current) edge of the city, and the whole round of growth and decay repeats itself. Churches, always the last root of a community to die, tell the story. In the last decade over 50 of them have been abandoned in Detroit.

The same "development" now affects rural areas. Side by side, you can find yesterday's animal factories, now obsolete, with today's animal factories on their way to obsolescence. The schools and churches stand abandoned because the people who can afford to, move away, hoping to escape the stench of huge animal factories, the endless strings of trucks rumbling in and out of the factories tearing up country roads. Poor people must stay behind. They work in the animal factories and stay poor. The ghetto moves to the country. Emptied rural areas and emptied city centers of industrial exploitation start looking uncannily similar.

Ironically, it is urban people who are showing that this situation can't last, that the agrarian impulse can't be repressed. They are the ones moving to the countryside in unprecedented numbers, at least here in industrialized Ohio, to establish new kinds of farms in spite of and in defiance of the misplaced fervor to stop urban sprawl. Andrew Stevens, editor of the *American Small Farm* magazine, in an April, 1997, editorial urges a positive attitude toward so-called urban sprawl: "As farmers, you should be looking at your new neighbors as friends and potential customers for your products. Farms that have flourished in rural/urban fringe areas have done so largely because they cater to the preferences of nearby residents. They tend to be more specialized in producing high value crops, sell more products directly to consumers, are smaller and make more efficient use of resources."

But urban people are also bringing agrarianism back to the cities. Developers build subdivisions that look and function like yesterday's villages or neighborhoods. Gardens and home businesses are planned into the landscape, as are nearby retail and service shops. Some communities even utter the almost forbidden words, "neighborhood schools," again. New neighborhood houses of worship in the ghettoes, small and humble and unassuming, return in the shadow of the abandoned cathedral-like churches. A surge of market gardening and farmers' markets recalls those years not so long ago when thousands of tiny truck farms, using horse manure for compost in their hotbeds and coldframes, supplied their cities with vegetables and fruits nearly year-round. The term "urban farming" turns out not to be an oxymoron. Chicago is even encouraging animal husbandry as part of its urban farming projects. In the heart of Cleveland, in the shadow of skyscrapers, horses plow garden plots.

I think I hear a faint rustle under the blacktop of shopping center parking lots, under the abandoned animal factories of yesterday and those yet to be abandoned tomorrow. Not only are the weeds pushing up through the cracking pavements, making way for the trees, but the irrepressible agrarian impulse is pushing through too. As long as humans are free to follow their hearts, there is hope.

Clear-Cutting the Last Wilderness

Compromising the genomes of our major crops

Wes Jackson

In April of 1997, *The Economist* carried a story entitled "The Green Gene Giant," featuring Monsanto and its CEO, Robert Shapiro. This well-known St. Louis chemical firm announced that it was about to spin off its central source of income, the chemical division which was then yielding almost a third of its $9 billion in annual sales. Mr. Shapiro wanted to make Monsanto the "main provider of the agricultural biotechnology the world will need if it is to feed itself in the future without despoiling the environment." The company was already selling genetically altered soybeans, potatoes and cotton. Dozens more genetically altered products were in the works including corn, sugar beets, and strawberries. This was no minor economic venture for, as *The Economist* reported, "one estimate is that there will be a world market for genetically altered seeds of $7 billion in 2005." Monsanto had already been called the "Microsoft of genetic engineering." The price per share at the time of the announcement had risen from $14 in early 1995 to nearly $40. Shapiro and other top managers had "promised to buy a large number of Monsanto shares with an interest-bearing loan from the company." This means they could owe the firm money if things didn't pan out.

The faith of Monsanto's executives is not exactly a blind faith. Productivity in the recent past has come largely from improvements in some form of technology. Realized possibilities in irrigation, fertilizer, pesticides, plant breeding and more have combined to give us low-priced food for home use and a commodity for export to help offset our balance of payments deficit. Countless ecological and social costs attend our past successes and cheap food policy, but they are largely ignored and discounted, so few objected to Monsanto's plans.

It is worth remembering, however, that several other ships of promise in the area of crop improvement have come and gone leaving little of value in their wakes. In the 1930s great hope rested on the possibilities of polyploidy, a reality far more prevalent in plants than animals. A polyploid organism has more than the usual two sets of chromosomes. Early on there was a widespread belief that gigantism accompanied multiple sets of chromosomes. In some early examples that was the case. Available at about the same time was a chemical called colchicine which was discovered to break down the spindle apparatus which pulls the chromosomes to their opposite poles after they have divided but before cell division. Without a spindle, without cell division, a cell would display four sets of chromosomes instead of two. Giant plants were to become the wave of the future. The hopes never really materialized though the idea persisted into the 1940s before it quietly subsided.

Radiation genetics, the rage of the '40s and early '50s, came next. Simply stick seeds in a radioactive pile, causing them to mutate, grow out the seeds and wait for a super plant to appear. That era too subsided, came back in vogue in the '60s for a while, then subsided later. I'll explain the reason later.

Quantitative genetics came next and with this trend came the increased understanding of the quantitative gene in the '50s and '60s. This era offered not a technological fix but a theoretical exercise for modeling the changes in phenotypes through breeding. The '60s also brought physiology and the importance of hormonal control. Each of these emphases added a wrinkle here and there, but nothing substantive. Finally, the '80s ushered in the molecular biology and biotechnology era — with a vengeance. In this climate of Gee-Whiz genetics the enthusiasm over the possible positive consequences surged. Thus Monsanto's stock value tripled from 1995 to 1997.

Some history may be useful here. One could argue that the modern era began in 1944 when Avery, MacLeod and McCarty published their results suggesting that DNA and not protein was the hereditary material. Nine years later Watson and Crick elucidated the molecular structure of DNA, and the world of biology *was* destined to change. Over the next 30 years we grew in understanding the nature of DNA, RNA, the code and protein synthesis. Public policy was in its infancy, but with more research that, too, was destined to change. A landmark meeting, which featured a physicist who started work as a policy analyst at the Office of Science and Technology Policy and an official from the Rockefeller Institute, took place in June 1982. These two invited a few other people of influence and power to a conference that summer at Winrock in Arkansas. The group concluded that the land grant institutions lagged behind in basic research and therefore desperately needed the new knowledge in biology. Funding was allocated to this new discipline. Biotech companies of various sorts began to pop up here and there. A few university professors began to quit their jobs for private firms. University salaries in these areas rose to compete.

Seventeen years have passed since 1982 and our biotech era is fundamentally different from Watson and Crick's world of 1953. But that different world in biology is still fueled more by promises than it is advanced by demonstration. It is fair to suggest that this is the way of progress. The promotional language is of two types. "New era in biology" trumpets one slogan. The other, a defense elicited when critics challenge biotech as being potentially harmful, claims this is "nothing new!"

So, what is my complaint? An examination of the language used to justify increasing the scale of the new technologies reveals a tone of industrial heroism. Heroic phrases such as "We must feed the world" ring out. The "we-must-feed-the-world" camp has Nobel Laureate Norman Borlaug whose award recognized his role in making what the press called the Green Revolution. Dr. Borlaug has openly derided various thoughtful and compassionate thinkers who have concluded differently about hunger, its causes, as well as about the approaches to the problem. These cautionary dissenters, in my view, are erroneously accused of opposing increased crop yields. This charge is unfair in that the cautionary camp mostly argues that the debate should have more to do with agronomic methods that are safe for farmers, farm workers, consumers and the need for a healthy habitat.

No one has toiled deeper and longer in the trenches in this discussion than my long time friend, Friend of The Land and board member, Angus Wright. Angus' book *The Death of Ramon Gonzalez* details the world-views of the two sides. He and many others (such as Deborah Toler and Peter Rosset of Food First, an organization in Oakland, California) have detailed and drawn attention to the social and health problems of Green Revolution technologies, and to the documented fact that these technologies "have lead to *declining* crop yields after prolonged use, in addition to damaging the environment and human health." When biotechnology is promoted as a way to feed the world it is supposed to quiet the protesters and provide a license for more technology of this sort in the name of humanity. The work of these people illustrates that the battle cry, "We must feed the world," uttered in the spirit of technological heroism, distracts us from more productive engagement with the problem of hunger and the need for increasing the food supply sustainably.

Harvard Professor Richard Lewontin, one of America's top geneticists, in a letter to me wrote the following:

> All this talk about the billions of people who are hungry and need to be fed is a deliberate confusion of the issue because it really has nothing to do with genetically engineered crops. If one looks at what is actually being done in the genetic engineering of crops and especially in transgenics, which is what we are talking about, the whole industry is not centered [on] increasing yields or resisting pests. What transgenics and other genetically engineered crops are about is introducing specialty properties and qualities into crops for industrial purposes. Palm oils are being put into oil seeds like soybeans and rapeseed. Monsanto has developed very special varieties of potatoes for potato chips that give the so-called "light" potato chip, and genes are being put into crops that resist particular chemicals, especially herbicides. *The number of cases where there is an actual attempt to increase the productivity of land, labor and input resources which would benefit the nutrition of people around the world are very few indeed.* There is a program to increase methionine in the protein of beans by introducing a gene from the Brazil nut, and I suppose one could say that the introduction of BT gene that gives direct resistance to an insect also would increase production. But aside from these isolated examples, we are really talking about work that is intended to produce a commodity for sale by a pharmaceutical company or

The Tallgrass On Fire

Paula V. Smith, 1995

First comes a smoke cloud on the vigorous wind,
the distant flames rising and closing in.
Ashes fall lightly in the stirring air.

And now the fire takes root, a wall of heat
fans up as a companion to the wind.
Burning grass wafted by the wind sifts down,
kindling new fires in each place it falls:

As several fires dart, widening forward,
their clouds of smoke and roiling tides of flame
mingle and draw apart,
many-veiled phantoms whirling a wild dance.

Curling flames flap and bend, one devouring another
rising, spreading, racing, following —
each wave of flame can overtake the last
as knotted grass-stems crack and split:

I wonder at how the wind-fed fire
can cross the golden field so rapidly,
leaving a world that seems empty of life;
even the stones are smoked to the blackness of sod.

But as the dead, dry grasses feed the flames
they shield the vital root-beds down below:
the dark and heavy blanket of their ash
will hold the warmth of spring close to the land.

> a seed company and that will not, in fact, increase yields. *The real work done for yield, for reduction in pathogen sensitivity, etc., is still being done by the normal procedures or, at most, by introducing genes from one variety into another even by genetic engineering.*

Professor Lewontin also answers the argument that such genetic transfer is necessary because the major crops lack the necessary genetic variation. He writes

> It is simply *not true* that there is not sufficient genetic variation in crops to produce the kinds of advances in yield and pest resistance that are needed. This is baloney. Virtually nothing is being done to exploit the immense amount of genetic variation present in, for example, local races of corn and soybeans that could be used to select all kinds of properties of plants (and I believe it is probably true in rice, too, although I do not have that information directly). The number of varieties in the world germ banks is now immense, [on] the order of 100,000, and little or nothing is being done to screen these accessions for the kinds of genetic variation that would be required for regular breeding programs or for intraspecific gene transfer.
>
> This entire business is a case of deliberately misleading by calling attention to world hunger and then using the techniques which are called for not to solve the problem of world hunger but to solve the problem of profit hunger. We need a strong reply that calls attention to the actual state of transgenics as it really is operating now in the world. We are certain to be greeted by the claim that all kinds of possibilities might exist with transgenics, but it is a lie to say that they are being exploited or [that] anyone is trying.

Please understand that neither Professor Lewontin nor I maintain there is no role for biotechnology, both now and in the future, to help meet humanity's requirements for food and fiber. Biotechnology can be used to speed up the evaluation of germ plasm. That is being done now and represents a great service to the breeder who still has to do the traditional testing. Even with all of this, the biotechnologist's role should be as a member of a team which includes the plant breeder and various sorts of ecologists. Biotechnologists should not carry the flag of biotech into the battle to feed humanity for some very good reasons. Of primary importance is the fact that alongside all our micro-technological sophistication there is much naiveté about what we might call the genome's ecosystem. Many molecular geneticists and molecular breeders actually believe that all one has to do is insert a gene of choice into some elite genotype of any of our major crops. They seem unable to learn or remember the hard lessons from even the recent past. Every conventional breeder knows that when one inserts new material into a genetic line, that line then must be tested against the real world. A few years ago, when corn geneticist and Iowa State University professor Arnel Hallauer suggested to some molecular breeders that they test after insertion of a new gene, the molecular breeders asked "Why?" Apparently they forgot or did not know of the experience with Texas male-sterile cytoplasm and the genetic restorer system developed and used in the 1950s and 1960s. The Texas male-sterile cytoplasm carried a gene outside the nucleus rendering any plant carrying the gene male sterile. Labor to detassel corn plants was greatly reduced, and breeders also had genes for restoring the fertility when needed. Yet even with the seductive labor-saving possibilities, corn breeders were cautious as they converted various lines to carry the Texas cytoplasm. They tested extensively to be sure they had the same lines, the same hybrids. The genes that restored fertility were introduced with the same level of conservatism. After conversion came more extensive testing. Well? It all broke down by 1970! The famous corn leaf blight which took nearly a third of the American corn crop, was the result — an episode that should sober any budding gene splicer bent on crop improvement with little or no testing.

What I have just described is a relatively simple example. The reality is far more complicated for most traits. All genes interact to some degree, and the traits that are *strongly* influenced by several genes working together will stand as a barrier to the gene splicer. Some traits (such as growth rate) are affected by many hormones, including episodal ones that are present for short periods of time in low concentrations. When their existence is known, isolation may begin, but if the genes are from widely divergent organisms, the new host may regulate these hormones in a way that is completely foreign to the implanted gene. For example, the same quantity of a particular hormone produced during development in one creature may yield a very different effect in another.

A gene is often separated into several pieces and located in widely separated places on the chromosome or even on another chromosome. While this is a tricky problem to overcome, it is no more tricky than isolating the various genetic components that regulate a particular gene in question. Once a complete gene and all of its regulators are isolated, there remains the problem of precisely incorporating the entire assembly into the genetic material of the recipient organism.

Let us assume that all these barriers have been overcome. We are now faced with a problem similar to what frustrated geneticists nearly 40 years ago, during the heyday of radiation genetics. The hope was that we could improve crops and speed up evolution by irradiating the germ plasm and then selecting the desirable products. That generation of geneticists and plant breeders soon confronted the same problem that troubled the *previous* generation of geneticists — who had believed that biological wonders could be pulled from the progeny of very wide crosses. The problem in question: how to get rid of all the variation they suddenly found on their hands, *and how to reoptimize the desirable traits against such a scrambled genetic background*. Even when the background of spliced-in genes is not so scrambled the problem of reoptimization remains. In other words, even if all the steps are successful up to the point where the spliced gene and its regulators from a distant plant family are transferred, an untold amount of breeding work remains before the genetic background is shaken down enough to accommodate the newly introduced trait and its regulators.

Breeding programs require patience, persistence, perseverance, hard work, fortuitous choice of germ plasm, and more. Dramatic yield increases in many of our major crops over the last 60 years, particularly in the case of corn as Professor Hallauer notes, have come from "evolutionary breeding methods, not revolutionary ones." From a conventional breeder's point of view, what we are seeing and hearing now are some more-or-less instant experts telling plant breeders how to conduct their work.

The Grassland

Paula V. Smith, 1995

In this place you will learn
to travel for days without the sight of trees
under the wide tent of sky.

After a life in forests, you will stand blinking
at this land overflowing with light and space,
unshaded grass and sky. The land ahead

opens to endlessness, and if you travel through it
far enough, the prairie opens you, too, giving a voice
to new ideas, shaped to fit the land.

The grassland stretches out to the world's edge
without a tree, without a sign
of human presence. Stands of wild grasses grow

and wave above your reach; it is a land
without shadows, without echoes,
except those cast by you.

Here distance cannot be measured with the eye:
a settler's camp might be a distant mansion,
a yoke of oxen mimics a railroad train.

Here you may travel from morning until night
making good speed, but on looking around
think yourself back at the very place you started.

You are here. The prairie stirs your mind
and calms your spirit, places you in the landscape,
makes you look great and small, moving and still.

You plan to break the sod, to build your cabin,
but at night
you dream of tallgrass standing in the fields,
flexing and bending, easily slipping
out of the grasp of the wind.

Worse, we find ourselves in an era when the products of biotechnology are being forced on us — the genetically modified organisms the Europeans are refusing to receive, for example. Professor Hallauer's worries thus are three-fold: (1) forcing-of-product, (2) disparaging comments by some biotech people about conventional breeders who question the efficiency of the new products at the expense of the conventional breeding methods, and (3) the naiveté about the need to test.

Back to *The Economist* article for a moment. The article states, "So far the vast weight of evidence is that the products of agricultural biotechnology are environmentally sound." This is a "business risk not a scientific risk." The "genetically doctored seeds are safe." These quotes assist in adding point to my advertised topic "Clear-Cutting the Last Wilderness: Compromising the genomes of our major crops." The public in general is wondering if these genetically altered *seeds* are safe for humans or livestock consumption. That's an understandable question but the wrong question for it is a bit like asking if the trees of a planted monoculture forest are safe to make 2 x 4's for houses.

Monsanto currently anticipates that the population will become increasingly suspicious of the health and safety of their industrial chemicals. Monsanto's leadership sees the writing on the wall, to speak. They are turning away from the *single molecule approach* to the *single gene approach*. But have they learned the lesson of Darwin as they turn to the employment of new biotechnologies? Have they really embraced the Darwinian evolutionary ecological worldview? I suspect that they have not. They have 29,000 employees and on a visit to Monsanto I asked two top ranking officials about their ecologists. No response. I pressed by asking if they had any employed. The question was also met with silence. We should not be surprised. Monsanto is a chemical company and biotechnologists of the modern stripe emerged enamored of chemistry more than biology, let alone evolutionary biology. Now, what is the harm, you may ask, so long as they are good scientists?

The harm from the wholesale employment of the new forms of biotechnology will come in the threat to the very architecture of the genomes of our major crops. I'll repeat and then I'll explain.

Monsanto is backing off from chemicals because of the public's worry about poisonous consequences to people and to ecosystems, especially agro-ecosystems. We should applaud them for this. What is being more or less ignored is that some of the same principles and

processes that govern an ecosystem, like a forest or a prairie, also operate with genomes. The genome is a miniature ecosystem. The genes within the genome interact with one another *and* collectively interact with the environment, all the way from the molecular and cellular level to the ecosystem at large. In other words, the architecture of the genome results from the context of the history of gene-carrying predecessors in times past. At the level we are talking about the world is grossly unknown, indeed unknowable. So much is subtle; so much is small effect. The multicellular life forms that have survived to the present feature gene assemblies with small effects. Large-effect genes represent a minority.

Commercial outfits like Monsanto are unlikely to be interested in selling the small-effect genes. *It is a bit like trying to sell the life of the soil.* There is nothing easy for sale there, nothing marketable there. How could the mycorrhiza or the soil invertebrates of a forest or prairie be harvested, packaged, and marketed? A company will patent and transfer genes they can readily identify and which will make big differences. Such a company can do that for a while because the "genius of the genomes" is in their design and can handle the various perturbations that come at them, including genes from long

Above:
Greg Conniff,
North Dakota,
1990

evolutionary distances — for a while! A forest can handle selective cutting with little change in the architecture of the forest. The forest can adjust and foresthood will prevail. The genome can absorb the shock of an alien gene even from very unrelated creatures, such as a bacterium or a virus. In fact it happens but at a slow rate. Even so, adapted recombinants must be sorted out over time, time that I suspect on the average for each trait is roughly proportional to the evolutionary distance between the entities and the amount of material being transferred. So absorb the shock it will, but in so doing the genome must adjust to all incoming traffic driven there by the biotechnologist. I use the word "adjust" because a genome doesn't just bounce like a spring. As that adjustment is made, small compromises are also made. If the human is the agent of change, those compromises will mostly amount to an increased dependency on the agent which induced them, *Homo Sapiens*.

This is not new to humanity. This is the way we have interacted with our domestic crops beginning with the first few cuts of selection 10,000 years ago. It is the reason that eventually all our crops and livestock became dependent on *Homo Sapiens*. As the agents of domestication, we created a dependency for humanity. Now *Homo Sapiens*, variety *corpo-technologicus* is creating an ever narrower dependency. In such a manner these corporate disrupters of coherent context create problems for which they will sell future bandaid equivalents as solutions to a broader systemic disorder. It is faster treadmill on top of another treadmill. *In such a manner capitalism expands its markets.* The major threat to the life forms affected by some forms of biotechnology will not visit us in one year or five, but in 20 and 50 years. That threat will come from a created dependency on the need to keep the treadmill going with an assiduousness equal or greater to what agriculture has required of us since its invention eight to ten thousand years ago.

The positioning of most alien genes into a crop's genome will likely yield only short-term benefits. Dr. Don Duvick, Friend of The Land, a friend of mine, and former Vice President in charge of Research at Pioneer Seed Company, has noted that such genes eventually respond as though "tar has been smeared over them," which is to say that eventually the background of the genome shifts and effectively isolates and inhibits expression. But in so doing, I think it is safe to say that we are compromising the self-regulating resilience of a nano-ecosystem by forcing that system, meaning the genome, to adjust its architecture.

In forestry, as the value of the products of trees goes up, more and more of the best trees are cut and the criteria for selection is drastically changed. I understand that old-growth redwood *is* more resilient to decay than new-growth. But with the old-growth gone, new-growth redwood will do. At some point conventional economics dictates that it makes more sense to clear-cut, that is abandon discrimination, and take it all. At this point, in the interest of board feet, the loss of foresthood is complete. The incentive to plant a monoculture of the most commercially desirable trees increases. The fisheries, agriculture, anything downstream in the watershed and elsewhere are now dislodged to some degree from a former set of relationships. The total economic benefits of the former ecosystem in the watershed can never be adequately calculated. In a similar manner the economic benefits of the architecture of the genome can never be calculated.

From Jamestown on, trees on this continent have been understood as assets for building homes and other accommodations for the human enterprise. The ecological benefits which ultimately have economic benefits have been ignored. It is the still-intact wildness of the genomes of our major crops and livestock which stand behind the domestic traits that sustain us.

After the clear-cut of the forest it is not uncommon to see a near-monoculture planted as a replacement. Timber companies stand to make a lot of money in the short run on fast-growing trees, but it is during the ecological unraveling, as we diminish the ecosystem's services, that we in one way or another say "Uh-oh!"

With recent developments in biotechnology we are dealing more aggressively with evolution at the smallest level on the biological scale. The irony here is acute. Many evolutionary and conservation biologists understand the need to respect ecological/evolutionary processes at the forest or prairie ecosystem level, but they lack adequate appreciation for ecological integrity at the genome level.

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There have been other heydays loaded with promises that went unfulfilled. Our ability to invade and reorder the genome is rooted in technologies developed for specific purposes: to elucidate the nature of the hereditary material and how it works. We have made important strides, but still know only to a very small degree the interaction of DNA with its products and other components within the cell. Therefore, if biotechnology is the flagship commissioned to lead the fleet of other food producing technologies, we are certain to lose the battle to sustainably increase the food supply and not just because the flagship is loaded with genes for industrial oils and light potato chips.

The naiveté of molecular breeders about the need to test, and test, and test some more after genes are introduced will cost more than the company which introduces the genes primarily because those products are being forced on us.

Finally, clear-cutting at the molecular level, the clear-cutting of the genomes of our major crops making them overly dependent on *Corpo-technologicus,* will force future geneticists to study the exits, none of which are likely to be painless.

There is a better way, a less expensive way, a Darwinian-evolutionary-ecological way: Natural Systems Agriculture, which acknowledges that the cultural and technological realities are one with the biological, especially in agriculture.

I could end my examples here but perhaps you are wondering if biotechnology has a role to play in our research in Natural Systems Agriculture. It does. If we can move the genes for perennialism in wild grasses into the annual crops in that family (for example, corn, wheat, sorghum, and rice), it seems unlikely that the architecture of the genome will be much disturbed. In a certain sense, the grass family can be seen as one big genetic system. With time, patience, and the breeder's repeated testing, after the biotechnologist's introduction and using the conventional techniques of the breeder, the technology can be employed more safely than importing genes from another family such as the legumes. According to my friend Dr. Charlie Sing, a professor in the Department of Human Genetics at the University of Michigan, we know "that the human genome has a very large amount of genetic material [with] a viral origin. Estimates are that a significant percentage of our genome is simply integrated viral information." But that integration has happened over millions of years, not over a decade or a century or even a millennium. I am delighted that we humans are part virus, but I would not have wanted us to get that way instantly or even within a few hundred years.

Even so, by endorsing biotechnology at this level are we validating what can easily become a slippery slope? That is something to worry about. But all slopes are not equally steep or evenly greased. This means that we climb the steps with caution, eyeing the slope, the potential slipperiness and opportunities for safe exit. This sort of technological assessment invites numerous questions: How many people are going to be involved? At what level of culture? What are the chances of backing out if things go sour? Who makes most of the money? To what extent is dependency created? And perhaps the most important question of all: What are the potential consequences for both ecosystem and human health? On the other hand, we need to worry about a deeply fundamentalist position of saying "No" to all new brands of biotechnology … for fundamentalism usually takes over where thought leaves off.

Rhizomes

Paula V. Smith, 1995

I.

Anchor and balance for the waving sea
of grasses bending in the prairie wind,
a silent force is working underground:
engines driving the prairie from beneath,
inches below and only inches deep.

Invisibly below, the grass advances,
stems growing outward, under the land,
rising, spreading, racing, following —
sending forth new culms and rootlets
from the ends of tips and nodes.

All that is prairie sleeps in this old hammock,
the rugged fabric of a dense earth layer
threaded all through with interwoven rhizomes,
not deep, not fixed, but vital, always in motion:
a cradling web for all that breathes above.

II.

Rising from fine black soil,
we roam and interweave our stems with flowers:
larkspur, wild strawberry, candlewick, violet,
prairiesmoke, windflower.

Gathering and spending ourselves
we can hold back the erosion of the land
offering shelter to the grassroot dwellers
pouring strength upward into the breathing flesh
of animal life —

until the season's dying and decay
sends us back down to grace the underworld,
hoarding and fattening the fine black soil,

III.

Those who put roots into the fine black soil
and choose to stay through flood, fire, drought and ice
know that the wild stock is waiting.

Along the tracks
of the first railroads to cross the land
in patchy remnants by old rural roads,
in family graveyards and in unploughed corners

old grasses stand tall to assert renewal,
ready to reclaim their former holdings,
to re-stake an ancient claim.