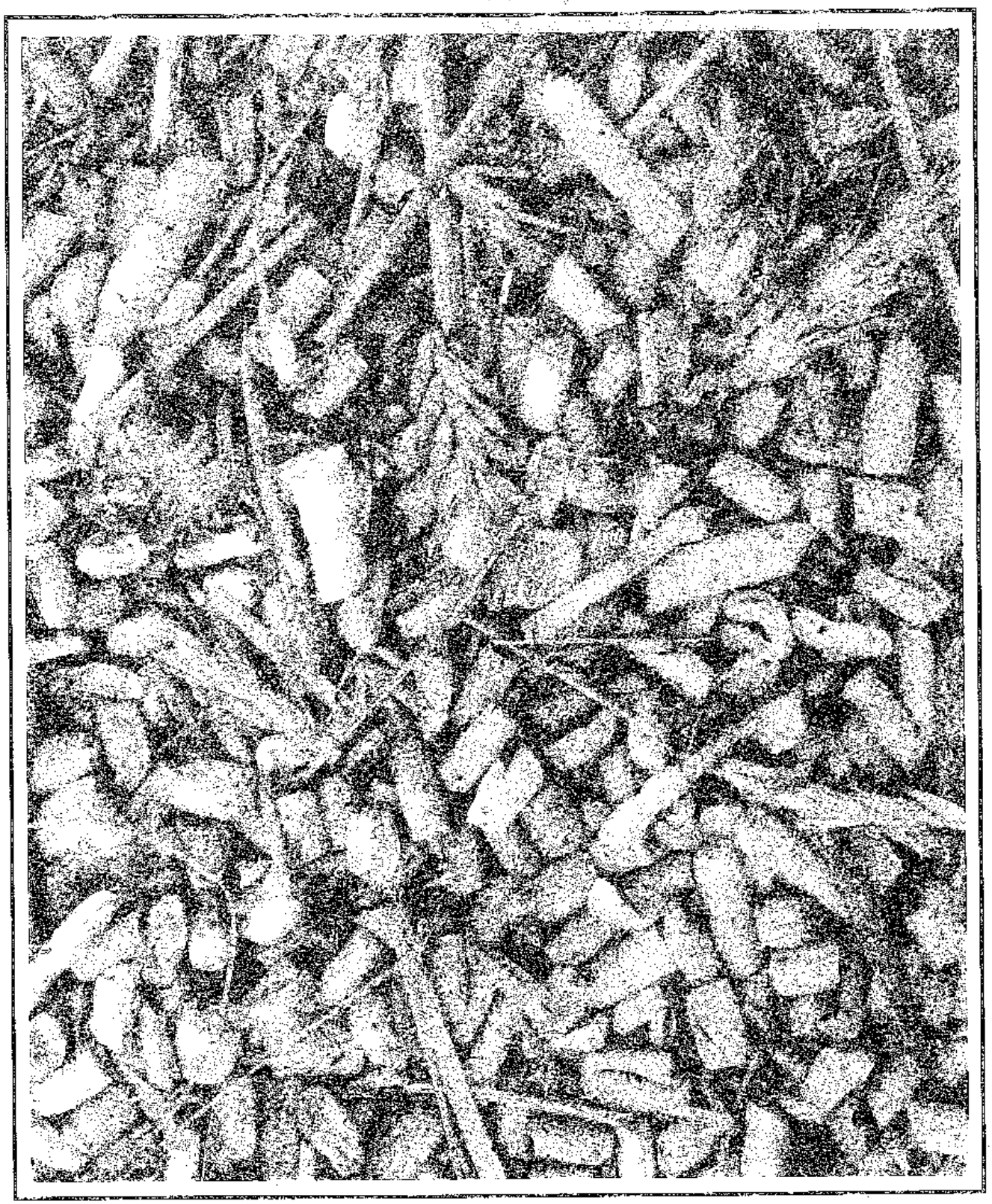

THE LAND REPORT

Summer 1992 Number 44

Contents

Number 44 Summer 1992

Photographs for this issue by Thom Leonard, Laura Sayre, Sara Wilson, and Volker Wittig.
Illustrations by Danielle Carré (p. 33), Hans Jenny (p. 9), Tracy Noel (pp. 35, 38, 39), Suprabha Seshan (pp. 13 & 14), & Jake Vail (pp. 6, 21, 23, 37).

On the Cover

Perhaps a view into an intern's dream, these are fruitcases of eastern gamagrass (*Tripsacum dactyloides*), a warm-season perennial bunchgrass related to corn. It is one of the perennial species that we are studying as we consider farming in nature's image--using the prairie as a model for a more sustainable agriculture.

In This Issue

Summer starts for some with the return of the dickcissels, for some with the solstice, and for us with the Prairie Festival. Prairie Festival was a microcosm of summer this year—half of it was sunny and mild, the other half wet. All of it strengthened the grassroots. Tonya Haigh writes about our 14th Festival on page 6.

The "New Roots for Agriculture" section of this *Land Report* is thicker than usual, wedding mycorrhizae to monsoons and ecology to agriculture. As Mary and Supi make clear, using nature as a standard for agriculture is a complex and complicated task, but Eugene Odum explains that there are several lessons already learned that await application. Marty Bender then discusses a few that we are pursuing on the Sunshine Farm.

Dana Jackson earned a master's degree from Harvard this spring. Two weeks later Wes Jackson earned a MacArthur fellowship. Donald Worster has dedicated *Under Western Skies* to the Jacksons and The Land Institute; Sara Wilson reviews it on page 25. Dana compares Harvard and Land experiences on page 32.

Wendell Berry paid us a visit this June, and presented "Sex, Economy, and Community." We are pleased to be able to present it to you, on page 34.

--JV

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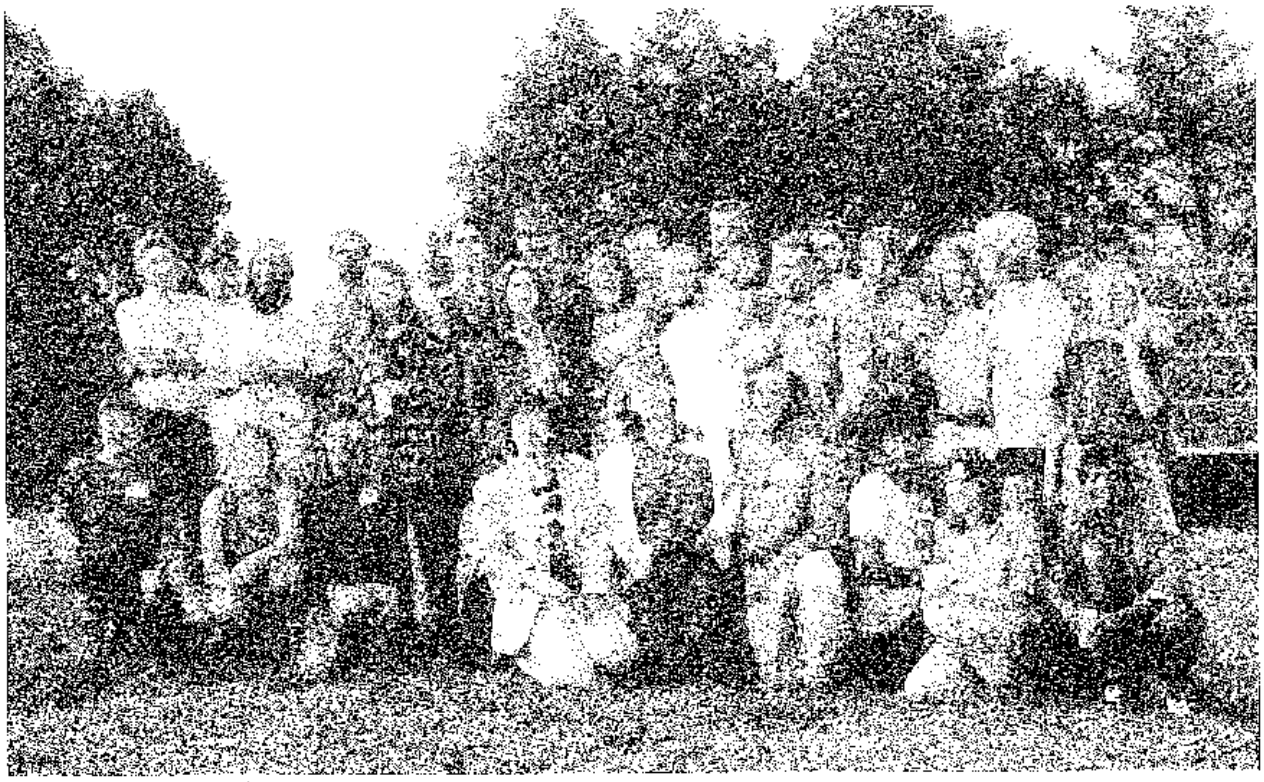
At The Land

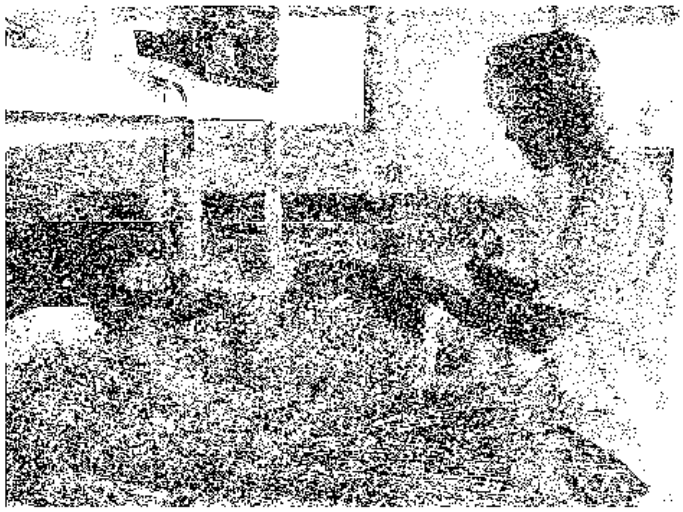


On the Friday evening before Prairie Festival, current and former interns gathered for home-made ice cream and homegrown strawberries. Standing, from left to right: Vern Stiefel, '85; Rob Peterson, '86; Mark Slater, '86; Guy Grigsby, '86; Corey Samuels, '92; Ted Schuur, '92; Ruby Tilton, '90 honorary intern; Ray Epp, '89; Pamela Cubbage, '89; Jake Vail, '88; Tom Clemetson, '88; Doug Dittman, '87; Colin Laird, '89; Brooks Anderson, '89; Jeff Brown, '78; Doug Romig, '90; Michelle Mack, '91; Chad Hellwinckel, '92; Tonya Haigh, '92; Sara Wilson, '92. Kneeling, l to r: Emily Pullins, '92; Berni Jilka, '89; Tracy Noel, '90; Jean Stramel, '81; Laura Sayre, '91; Darryl Short, '92; Volker Wittig, '91; Ann Zimmerman, '84, and Supi Seshan, '92. (Also present but not pictured: Kathy Collmer, '90; John Craft, '77; Kelly Kindscher, '79; Dana Price, '84; and Willow, '83.)

Potatoes, tomatoes, and corn on the cob from The Land Institute's garden grace our dinner plates as this *Land Report* is assembled. Planted and tended by the interns, aided this year by rain and relatively cool weather, the garden is thriving. It literally keeps us going. I don't think many editors receive the daily gift that I do, the smells and sounds of food being prepared in the kitchen directly below my office. (We have a rotating cooking schedule, and each of us takes turns feeding the rest.) It is just one of the many small and important parts that makes The Land a unique place.

Unique, too, is our research into an agriculture that uses the natural ecosystem of the place, the prairie, as its model. For over a decade our research staff of ecologists, plant breeders, and plant pathologists has led almost 150 interns, eight or ten at a time, through a ten-month research and education program that is centered around the questions that an approach of using nature as a standard asks: Are high seed yield, typical of annual grain crops, and perenniality, typical of plants of the prairie, mutually exclusive? Can a mixture of perennial plants, such as is found on the prairie, yield more than the same species grown in monocultures? Can such a domestic prairie fertilize itself, as the wild prairie does, through biological nitrogen fixation and rainfall? Can a perennial polyculture keep down weeds and outbreaks of pests and diseases like the prairie does?

The results of our agroecological experiments may be found in our *Research Report* (call or write us for more information). But a large part of The Land Institute revolves around the belief that a truly sustainable agriculture must be a part of a sustainable culture. Our discussions of sustainable culture may be found in the pages of 44 *Land Reports* (most of which are still available) and in the frequent meetings and classes held here. If you are in the area, call and arrange to stop by for a tour and some lively conversation.



Chad Hellwinckel threshes Indian ricegrass

The Land Institute's spring Prairie Festival is another forum for exploring the underpinnings of sustainable culture and agriculture. This year's Prairie Festival drew record crowds to The Land on the last weekend of May to hear David Orr, Arnold Schultz, Jon Piper & Judy Soule, Wes Jackson, John McCutcheon, and many others talk and sing their way through the theme of "Learning from the Land." Tonya Haigh writes more about our 14th Prairie Fest on page 6.

Prairie Festival marks the time when our daily schedule changes and the interns move from classwork to fieldwork. Visitors, seminars on scientific papers, field trips to prairies and farms, and frequent watermelon breaks punctuate the long days in the sun and wind.

As the previous *Land Report* hit your mailboxes, former Land Institute board member Conn Nugent came for a visit and gave a public presentation on "Inalienable Rights and Widespread Wrongs." Conn, head of the environmental program at the Nathan Cummings Foundation, is a historian by training, and in his talk (delivered off the cuff, but that's another story) explored whether we can use the Jeffersonian language of rights to help us move to a more just and environmentally responsible society. Conn returned to The Land a month later with Charles Halperin, the director of the Nathan Cummings Foundation, and we spent a morning talking about the work of his organization and the role of philanthropy in modern culture.

In June we were paid a visit by the ever-enthusiastic coordinator of the Konza Prairie Research Natural Area and head of Kansas State University's Herbarium, Ted Barkley. Ted has been on the faculty of K-State since 1961 (he arrived in Kansas the same time as musk thistle, he informed us), and spent a morning with staff and interns describing the hows and whys of herbaria. It wasn't until his visit that all of us understood what makes The Land Institute possible: plant ontological development.

Ted's spirit had the classroom abuzz, but we were hardly prepared for the flurry of excitement that came the next afternoon, when Wes received a call informing him that he had won a MacArthur award. More about that honor on page 5.

Wendell Berry came to Salina a few days later, and that evening in our barn gave a public presentation on "Sex, Economy, and Community" (reprinted on page 34). Wendell, a farmer, teacher, and writer, is the author of many books of fiction, poetry, and essays, including *The Unsettling of America, What are People For?,* and *Harlan Hubbard.* "Sex, Economy, and Community" is part of a longer essay that will be included in a new book due to come out in 1993. Wendell visited with interns and staff the morning following his talk to 150 or so Friends of The Land, and explored the question: "How can we dignify all the work?" We also discussed seeing that the needful things are remembered, and talked more on the theme of private versus public life.

Kansas State University graduate student Denise Olson is making trips to The Land for the second summer in a row, to continue work on an experiment in bio-control of squash bugs. She has planted several small plots of pumpkins here, and has introduced squash bug parasitoids in some of the plots. Parasitoid populations can flourish in our organically-maintained fields, which is useful to Denise's research, and exchanging more ideas with the folks at K-State is good for both of us.

Summer brings many visitors to The Land Institute, and this summer Sam Brownback, Kansas's Secretary of Agriculture, visited for an afternoon talk with staff and interns and a tour of the research plots. James Coffman, provost of Kansas State University, came with his wife a few days later.

Staff and interns held a brainstorming session on the imminent implementation of The Land Institute's new project, the Sunshine Farm (see page 18). Due to start this fall, the Sunshine Farm aims to develop on-farm renewable energy alternatives to fossil fuel using vegetable oil fuels, draft horses, photovoltaic panels and wind generators, crop rotations, and conservation tillage methods. Marty Bender is spearheading the project.

To better acquaint the interns with the prairie and the cultural and agricultural history of Kansas, we took a field trip to the Flint Hills of Kansas in mid-July. In a packed three-day weekend, we danced a barn dance, visited with Kelly Kindscher, walked through the prairies at the University of Kansas's Rockefeller Experimental Tract, saw a presentation of "Kansas Farm Women" in Lawrence (moderated by Tom Averill and Dana Jackson), visited with intern

Emily Pullins's grandparents in historic Council Grove (he was mayor, she a history teacher), visited with Jane Koger at her ranch in Chase County, and spent several hours on the prairie with rancher Pete Ferrell, discussing, among other things, his rotational grazing system and his future plans for farming in nature's image in the Flint Hills.

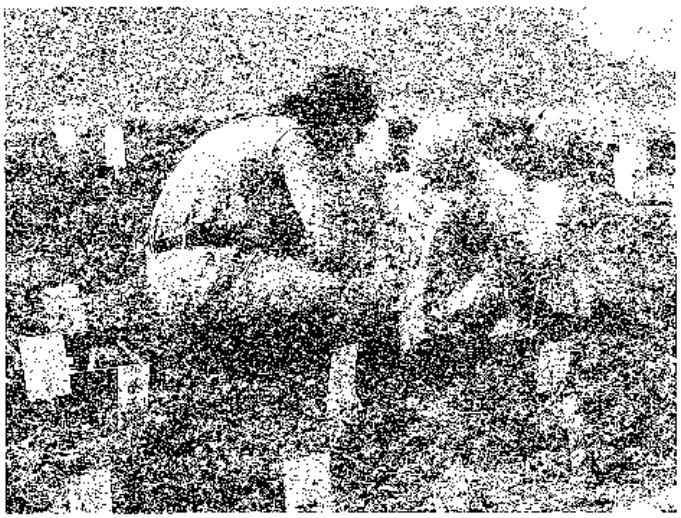
A Prairie in the Park

Corey Samuels

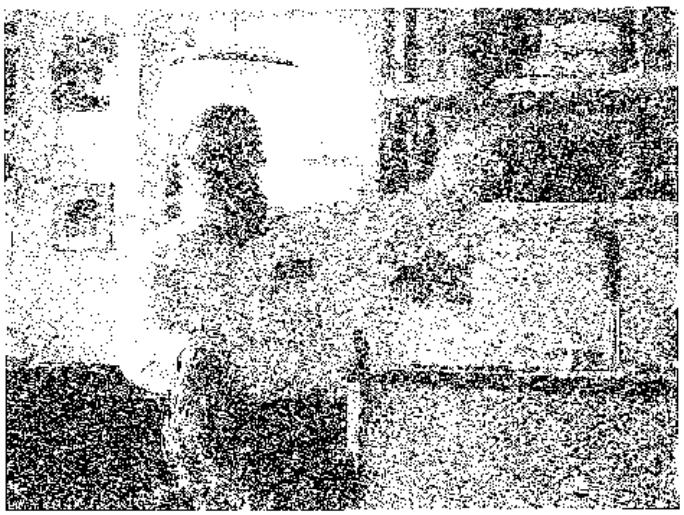
"What do you think was here before the park?" we asked the dozens of children who came over to see what all the dirt was about. "A parking lot?" "Houses?" The answer, of course, is a prairie. On Friday, June 12th, children visiting Salina's annual Smoky Hill River Festival had the opportunity to learn about the tallgrass prairie that preceded their town, and plant a small piece of one in Salina's Oakdale Park.

Land Institute interns and research fellow Michelle Mack staffed the booth, where kids were invited to look at old photographs of Salina as a prairie, then choose a plant to add to the area. Each child was encouraged to create a unique common name for his or her plant, and draw a picture of it on a plant stake. Children also drew a prairie mural.

This year's Prairie in the Park program added to the prairie area started by Land Institute interns and Salina kids at last year's festival. The Salina Parks Department Superintendent Bob Ash and his crew volunteered the space and maintain the area. Many children were excited to see how the little seedlings they remembered planting last year had grown to create a lush prairie.



Corey and a friend expanding the prairie and the awareness of it at the Smoky Hill River Festival.



Wes Jackson

Wes Jackson Wins MacArthur Award

Tom Mulhern

Wes Jackson, president and co-founder of The Land Institute, learned in June that he is among the 33 recipients of the prestigious MacArthur fellowship for 1992. Wes is the first Kansan to win one of the fellowships, awarded to 383 Americans since the program began in 1981.

The John D. and Catherine T. MacArthur Foundation created the fellowships, saying it wanted to free "exceptionally gifted individuals" from economic constraints so they could develop their potential. Wes will receive $335,000 over the next five years. This is his personal money to spend as he chooses, and not a grant to The Land Institute.

The MacArthur Foundation has 100 anonymous nominators who propose candidates for fellowships, and final recipients are picked by a selection committee and the MacArthur board. The foundation does not accept applications or recommendations from other sources.

Predictably, the award has brought the spotlight of public attention to Wes and The Land Institute. It was announced in front-page articles in the major Kansas newspapers and reported in numerous articles in the national media. The MacArthur fellowship is a great honor to Wes and a significant tribute to the long-term work of The Land Institute and those who support it.

Changes in The Land

Dana Jackson, The Land Institute's co-founder, director of education, and for 15 years the editor of *The Land Report*, has returned from a year's leave of absence spent studying at Harvard's Kennedy School of Government. Master's degree in hand, Dana will bring what she learned in public policy and economics, plus all of the intangibles of Ivy League life, to class discussions with the interns this fall. The Land's garden, once hers, will surely benefit from her return, too. Welcome back, Dana.

Marty Bender is back as well. Although employed by The Land Institute for the past year as the leader of the Sunshine Farm feasibility study (see page 18), Marty had been living and working in Lawrence, Kansas. Prior to that he earned a Ph.D. in ecology from the University of Kentucky, and more than a decade ago Marty was a research assistant at The Land Institute. He and his family are living in Salina now, and Marty is busy getting the Sunshine Farm up and running and integrated with our research and education programs.

John Craft assisted Marty with the Sunshine Farm feasibility study this past year. John was our farm and operations manager from '89 to '91, and some years prior to that was a student at The Land and our local wind energy expert. John has moved with his family to Goessel, Kansas, where he is teaching and working on wind machines. Before he left, though, he left us a new WindCraft wind generator to power the classroom (dubbed "Voltaire") and a photovoltaic array for the office building and greenhouse (also known as "Sparky").

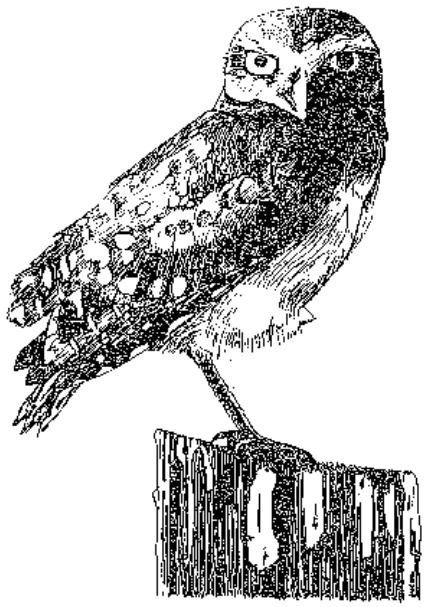
Michelle Mack and Laura Sayre, both 1991 interns and 1992 research fellows, have left The Land for graduate school. Michelle is studying at the University of California-Berkeley's Department of Integrative Biology, and Laura is studying literature in the Department of English at Princeton.

Jake Vail, acting director of education and editor of *The Land Report* for the past 12 months, left at the end of August to farm in Maryland—and would rather write in the first person. I came to The Land Institute as an intern in 1988, and have since been involved in many aspects of The Land's research, education, and management--not to mention organizing the 1992 Prairie Festival. Few could be so fortunate. Thanks for everything.

Learning from the Land: Prairie Festival 1992

Tonya Haigh

Part of the magic of Prairie Festival lies in the mix of new people and information with the many familiar faces and familiar traditions that have developed throughout the festival's fourteen years. While this year's Prairie Festival was attended by more people than ever before, many have been coming year after year since The Land Institute's early days. They come back to a Friday night bonfire and music jam, a 6 a.m. bird walk, a huge potluck dinner in which every brings what they can and eats until they're stuffed, music with Ann Zimmerman, and a barn dance in the big barn.



One of the traditions from an intern's perspective is the frantic two weeks preceding Prairie Festival. Getting a place that is home to around 25 people throughout most of the year ready for a weekend of 500 or so people is a daunting task indeed, and as early as March we heard horror stories about mowing and building outhouses and cleaning obscure places. A week of constant rain right before the big weekend added to our potential distress. However, by Friday we realized we had accomplished all of our tasks relatively unscathed and without the expected stress levels. Why? Partly, we would all agree, thanks to our fearless leader, Jake Vail. Also, of course, due to the incredibly hard-working interns and staff at The Land. But there was also an element of excitement which made the busy weeks speed by. We were delighted to see intern alumni return throughout the week and gladly lend a hand. Brooks Anderson, Doug Romig, Berni Jilka, and others were among the

At one stop on the Prairie Festival research tour, Emily Pullins describes her experiment.

corps of experienced port-a-potty builders that gave the week a real air of long-lasting community.

This feeling of continuity and tradition was celebrated by a Land Institute intern gathering on Friday evening. The party brought together almost thirty interns of past and present, some returning to The Land after over ten years. Everyone had a chance to introduce themselves and talk about what their post-Land Institute lives have held, and to talk with one another about their experiences here. Fresh strawberries and homemade ice cream were an excellent way to forge the bonds of common experience. The gathering was the largest ever, and was coordinated by research fellow Michelle Mack and current intern Corey Samuels.

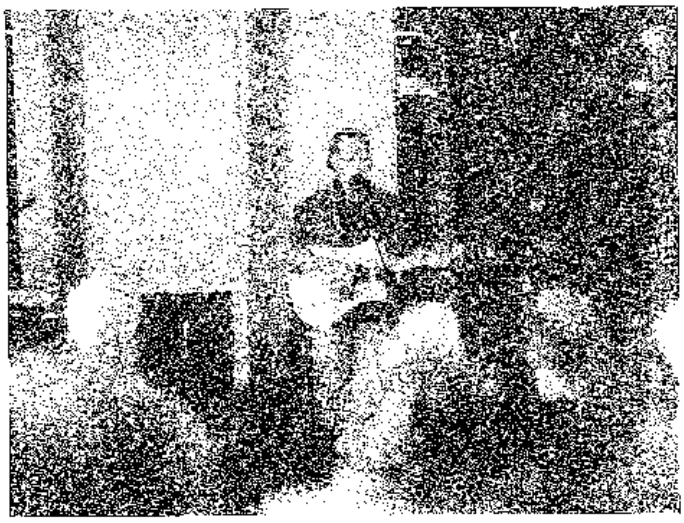
The speakers at Prairie Festival '92 had this theme to mull over and examine as they prepared their presentations: "Learning from the Land." The theme reflected what many of this year's speakers have been thinking and writing and teaching about for many years. David Orr of Oberlin College, for example, takes these issues very seriously. He spoke on Saturday to a large crowd about "Education and the Ecological Design Arts." His focus was on how what we learn and the way that we learn are variables in how we ultimately deal with the natural world. In setting up a dichotomy between intelligence and cleverness, he saw environmental problems as requiring answers that come from long range, systems thinking—intelligence, as opposed to the fragmented cleverness that schools now instill in us. David listed many challenges of an educational model that will teach us intelligent living, among them the need to face widespread fear of the natural world and to treat it as we would any other phobia, and the necessity of expanding our imagination when trying to imagine a system of living that can last. Ecological design is the theme that should integrate these skills and visions into the educational system, according to David. "Education has been about domination, I think now it needs to be about design.... What do we need to know to live well, to live sustainably on planet Earth?"

Arnold Schultz is another person who has been teaching the public to learn from what is around them. He founded and developed a concept and class at UC Berkeley he calls "Ecosystemology," and has been teaching this class since 1974. The word reflects Schultz's belief that the social, economic, political, biogeochemical and other systems that we learn about in school are not separate, but one concept called an ecosystem. His talk Sunday morning reflected some of the same main points that his textbook, *Ecosystemology* addresses:

> I am convinced that teaching ecological principles, fortified by countless facts and figures, won't cut it. We have to develop empathy, love and loyalty to all life and to the land. We have to relearn those things we learned in kindergarten, and appreciate them more than we do calculus, balance of trade, stock markets, and things that the University knows how to teach very well. Explicitly we have to teach the importance of hope — if hope is important in our lives, then the university just like kindergarten should endorse it. We have to learn and learn how to teach the importance of perceptual and conceptual blocks to learning because these blocks hamper the way we manage our resources and work with our fellow human beings. We must try to find ways to study and manage whole ecosystems without taking them apart.

Prairie Festival also brought artists to The Land, whose presentations represented direct learning from and symbolization of our interactions with nature. Stan Herd's talk about the work he has done with crop art, and more recently, prairie art, was followed by a tour of the prairie portrait he is now working on, located east of Salina. Terry Evans, a local landscape photographer, brought soil scientist Hans Jenny's slide presentation on the representation of soil in art throughout history. Author and farmer Michael Melius read from his works about personal experience in using senses and knowledge of a place as tools of language. "Kansas Farm Women: Growing out of the Tilth," a multimedia presentation including a slideshow and taped interviews, premiered at Prairie Festival. The show's creator, Cynthia Vagnetti, uses this artform to illustrate the lives of individuals who interpret and cultivate the earth.

Rita Napier, a University of Kansas historian, brought her perceptions on "Native Perceptions of the Land," and talked about what we can learn from the people who have lived as a part of this land. This message was also a major part of Kelly Kindscher's



John McCutcheon, singin' in the rain.

talk, which was based on his new book, *Medicinal Plants of the Prairie*.

Land Institute staff and interns were also featured speakers throughout the weekend. Judy Soule and Jon Piper, Land ecologists of past and present, hosted a conversation about their book, *Farming in Nature's Image*. Their work verbalizes the philosophy and background of the research undertaken at The Land Institute, and is truly reflected in the theme "Learning from the Land." John Craft also talked about research at The Land, specifically about a new project in energy accounting called the Sunshine Farm. He discussed the preliminary plans for this energetically self-sustaining farm, the feasibility study of which has just been completed. The Sunshine Farm project will start this fall. Plant pathologist Mary Handley, two interns, Sara Wilson and Darryl Short, and intern alumni Tom Clemetson sponsored a morning program for children and their parents. Activities focused on a discussion of "sense of place," and included games in the prairie and drawing pictures of parents' favorite childhood places. Laura Sayre, who is this year's intern coordinator, led a prairie walk, and Tom Mulhern, development director, helped participants become more familiar with The Land Institute through a slide show and discussion. Wes Jackson brought home the "Learning from the Land" idea in his speech on Sunday. In addition, the interns had a chance to demonstrate how they've been learning from nature through the research tours. A large, enthusiastic crowd trekked through the Wauhob Prairie and the research plots, hearing from each intern how her or his project is related to the larger research agenda, and having a chance to raise questions and challenges. For the interns the research tour was an exciting place to polish their knowledge of the research they were just beginning to delve into, and to consider some of the promising or troublesome issues that the public could bring to them.

Certainly one would never mistake Prairie Festival as an overly serious affair, in spite of all of the serious learning that occurs all weekend. One easy clue to the festive nature was the music and other cultural entertainment enjoyed by everyone. The music and singing began around the bonfire Friday night and carried the mood through Sunday afternoon, when even downpouring rain couldn't stop hundreds of people from gathering to hear folk musician John McCutcheon. John performed twice on Sunday, first leading a sing-a-long of "Songs for Kids" enjoyed equally by the grown ups, and later playing his banjo, guitar, fiddle, hammered dulcimer, piano, and autoharp for an even larger crowd. His songs included traditional folk songs, songs from his own childhood and adulthood, and political parodies which were both entertaining and beautiful.

Between the beginning and the finale there were singers and guitarists and cellists and fiddlers and flutists and story-tellers and poets to stir our souls. Prairie Festival regular Ann Zimmerman brought many familiar and well-loved songs to a crowd that knew her well (some from 1984 when Ann was an intern). She fulfilled audience requests and our wildest dreams with songs like "Homegrown Tomatoes" and "Bad Attitude Blues." Another favorite local musician, Ruby Tilton, brought her guitar and entertained children and adults with songs about play and love and nature. During the break from all of the serious speeches, crowds gathered to hear Frank Martin and Pedro Calderón play their flutes. Cynthia Mack and Jim French led the celebration of a new day Sunday morning with harp music and stories, and Jim also teamed up with Mike Rundle to provide a story hour Saturday afternoon. Harley Elliott told stories of his own sort that evening, reading from his books of poetry. Mike Rundle was back Saturday evening to call the barn dance. The Kansas City band Calliope provided music to swing to, and hundreds of enthusiastic and sweaty dancers formed the lines of action.

All of this year's speakers and musicians were immensely popular with the Prairie Festival crowd, as can be attested to by the lack of empty chairs in almost every session. We would like to thank the people mentioned above and the following speakers for their time and enthusiasm: Ron Kroese of the Land Stewardship Project, Brian Athey of the University of Michigan, Cynthia Vagnetti, Nick Fent, Rob Myers of the University of Missouri at Columbia, Robert Sayre of the University of Iowa, Stacy All from the Salina Art Center, Chuck Francis of the University of Nebraska, Laura Jackson of the Desert Botanical Garden, Pete Ferrell, and Margaret Krome of the Wisconsin Rural Development Center.

Letters

Ibague Uncovered

Thank you for the spring issue of The Land Report. *There are some well-written pieces and a lot of food for thought. It was the cover, however, that rang bells and jogged my memory. I thought you might be interested in the reasons. In the lower right corner of the block print are the words "Ibague, 1946." That meant something to me.*

Many years ago, now, I was reading the diary of Celestino Mutis and came across an entry of December 1777 in which he mentioned "maiz silvestre" or "maiz cimarron"—wild corn. At the time he was living at Las Minas del Sapo (Frog Mine), a few miles from Ibague, Colombia. He was the most famous (maybe the only) botanist in South America at the time. On December 17, 1777, he wrote a Latin description of his specimen. Those of us interested in the origin of corn have long looked for any shred of evidence for an independent South American evolution. This entry needed a follow-up.

I went to Ibague twice, in 1974 and 1977, to look for the plant. At the University of Tolima, Ibague, I enlisted the help of Prof. Raul Echeverry of the Botany Department, and a Mutis fan. He had a portrait of Celestino hanging on the wall behind his desk. We never found any wild Zea. *Echeverry even took his class out to Las Minas del Sapo to search—Nada.*

At the other end of the trail, I found that all Mutis materials had been moved to the Jardin Botanico in Madrid. So, I went there and found that there was no specimen, but the Latin description in Mutis's own handwriting, the original, was on file. One does not often handle a piece of paper from 1777. It was of good quality and the water marks of a royal seal were clear and Mutis must have had a very fine quill. I took photographs of it, which came out very well, and spent many, many hours trying to decipher his handwriting and then trying to work out the Latin. They were both difficult, but in the end I had to conclude that Celestino Mutis was describing not a Zea, *but an old friend of yours and mine—*Tripsacum.

All good wishes,

Jack Harlan
New Orleans, Louisiana

(Jack Harlan is the author of *Crops and Man*)

On the Jenny Farm

First of all let me thank you for the very fine articles regarding Hans [Jenny; in Land Report *43].*

I was dubious of Hans's family having had a farm or owning a farm. I therefore wrote to his oldest friend, and to his cousin, and asked them about this. Here is the reply from Dr. Streckeisen. The owning of a farm is mentioned in Dr. Bidwell's article, and the picture on page 13 indicates that this farm belonged to his family. I think Dr. Streckeisen's letter explains this.

"You are right that the picture on p. 13 is wrongly captioned. Hans's father had never a farm; he was occupied with business. The picture you discuss is also included in the Blue book... the explanation is found on p. 149: 'Here is the house in Fex Valley we stayed at for several days with friends who had rented it for summertime.' It is a modest farm house of Engadine inhabitants, constructed by stones, as usual. The picture does not represent the alpine scenery, which may be hidden by the forest in the background..."

The references to pages in Albert Streckeisen's letter are from the Oral History of Hans, produced by the University of California.

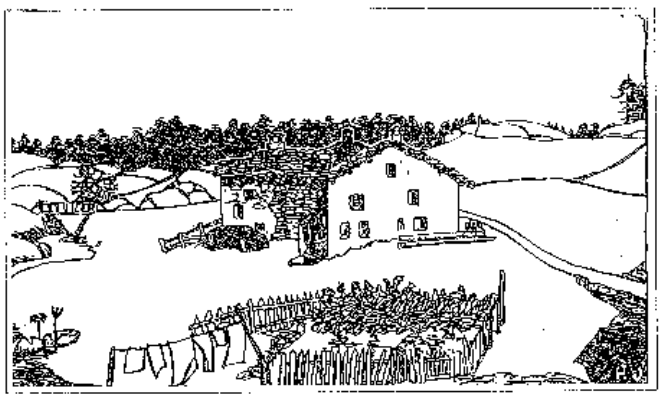
However, Hans did own a farm with me for about 35 years. This was because in my family you didn't amount to a hill of beans if you didn't own a farm! It is in Mendocino County, near the Pygmy Forest, and was used by Hans and his colleagues as a taking-off place for their work in the Pygmy Forest.

Considerable money was donated for a memorial to Hans. This is being carried out by The Nature Conservancy, University of California, and the Department of Parks of California, who own adjacent land in the Pygmy Forest. The dedication ceremony will take place on October 10th—we must wait until the Regents approve the naming before the announcements go out.

Perhaps it is silly of me to go to such lengths about accuracy, but it is one thing I can do for Hans.

Thanks again,

Jean Jenny
Berkeley, California



New Roots for Agriculture

Research at the Micro Edge

Mary Handley

Monoculture is not possible, you know. "Monoculture" is just a shorthand way to say "in this area I intend for only one plant species to grow and I choose to ignore everything else." As The Land Institute's plant pathologist, I can't ignore the "everything else," because that's where my realm begins. Below the level of crop and weed are all the microorganisma and even smaller things that are the domain of pathologists.

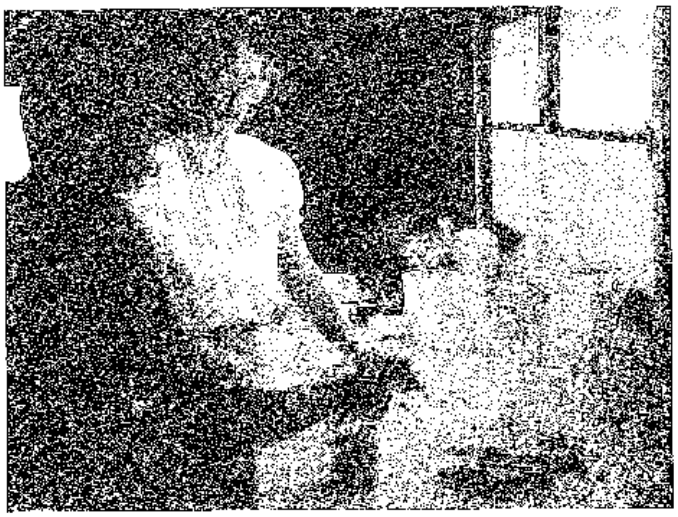
When I was in school, I found that many things became "everything else" and were ignored deliberately. In plant pathology, though, "everything else" is important. I didn't discover that right away. First I learned about diseases, any of which can totally destroy a crop, and I began to think that plant pathologists and pesticide chemists were all that stood between humanity and starvation. Then a couple of things happened to open my eyes to "everything else" and how it interacts.

The first eye-opening AHA! was during a lecture on Dutch elm disease. This fungus disease has nearly wiped out the American elms, yet does not kill Asian elms. The reason is that the fungus was introduced to North America, and our elms have not coevolved resistance to the fungus. The life cycle of the fungus is marvelous. The fungus produces spores in cavities created by elm bark beetle larvae under the bark of dead elms. The beetle larvae pupate in these cavities and emerge, covered with spores, and fly to healthy elm trees to feed. They inoculate the trees with spores, and the disease kills the tree. This creates more dead elms for beetles to lay eggs in, and the cycle repeats. What amazed me was how the whole thing hinges on dead elm trees. If the fungus doesn't kill the trees (as it doesn't in Asia) then the beetles are limited in places to lay their eggs, and the fungus is also limited in places to sporulate. The system works perfectly for the beetle and the fungus: it's only when we put it together with the "wrong" elms that there is a disaster.

The next AHA! which has shaped my work at The Land Institute came six years later, when I was working toward a Ph.D. in plant pathology. In a genetics course I wrote a term paper titled "The Role of Disease in Plant Evolution." AHA!: disease plays a role in evolution. Disease is a normal part of the life of a plant. We don't have to eliminate disease with chemicals or resistance; in fact we may be making things worse by interfering.

From these two insights, I learned that the complex interrelatedness that characterizes ecosystems also characterizes what I will call "microsystems"—the parts of the ecosystem that are microscopic. This includes a broad array of fungi, bacteria, nematodes, actinomycetes, and viruses that live on, in, or around plants (and animals). Each of these micro-components has a life cycle that is intimately connected with the life cycle of its host. Each is affected by wind, rain, sun, heat, soil nutrients, soil pH, plant variety, and all the other environmental components that characterize a place. And each influences the others.

That brings me, then, to The Land and our perennial polyculture research. Looking at wild plants in their native places is to look at the elms in Asia. To deduce how it is interconnected so that we do not create a disaster is my optimistic goal. I am continually amazed at the complexity of even our simplest "monoculture" research plots. We are working with plants derived directly from nature, complete with all the co-evolved diseases and pests. Germplasm plantings of Illinois bundleflower and eastern gamagrass have been established from seed collected directly from hundreds of sites. Each of our plants is unique. Each individual plant in our field is a distinct genetic individual--no genetically-engineered, tissue-cultured, advanced inbred breeding lines or uniform varieties here. That



Mary and Supi Seshan culture diseases in our lab.

means that they have a distinct set of genes that makes them as different as two people. Add to that healthy soil, with an intact community of microorganisms, and no insecticide or fungicide use to reduce aboveground insects and pathogens. Our plots thus contain an almost incomprehensible amount of diversity.

Keeping my perspective on the value of diversity and of disease, yet working to find ways to minimize (not eliminate) disease is difficult. Diseases do reduce yield. They reduce competitiveness, overwintering ability, growth, fertility, and longevity. Plant breeder Peter Kulakow, the interns, and I are trying to find eastern gamagrass individuals that are resistant to maize dwarf mosaic virus (MDMV). Yet the diversity keeps reminding me of its presence. Within the group of plants that gets infected with MDMV there is diversity. There are plants that have virus and severe symptoms, plants that have virus and only mild symptoms, and even some that have virus and no symptoms. Within the virus there is also diversity. Most plants have the "B" strain, but a few have the "A" strain. We have been collaborating with Bob Bowden at Kansas State University and Dallas Siefers at the Fort Hays Experiment Station in our initial work with MDMV. Something new this season is a laboratory that the interns, Laura Sayre, and John Jilka renovated from an old kitchen. We now have the capability to test eastern gamagrass here at The Land to determine which virus strain it contains. In the long term I'd like to know more about the diversity of reactions to the virus. Why is there such diversity in reaction to the virus in plants collected from wild populations of eastern gamagrass? Is there value to the ecosystem by being somewhat susceptible to this virus? I don't have any answers, but these are the kind of questions that keep popping into my mind.

I'd like to find an insect ecologist to collaborate with us to study the aphids on gamagrass as well. Aphids are the link that connects the plant to the virus. They spread the virus just as the elm bark beetle spreads Dutch elm disease. So that's an additional layer of complexity influencing the community: plants—aphids—viruses. Superimpose aphid predators such as ladybugs and lacewings, which our non-sprayed fields have in abundance. Add changes in temperature and moisture which influence all of the above. Stir liberally with a Kansas wind and hoe out weeds. Where to begin?

The other plant that I am studying is Illinois bundleflower. This plant is a legume, capable of gathering nitrogen from the air and converting it to a form usable by plants. The mechanism that allows this is complex, mediated by a bacterium (*Rhizobium*) which is a symbiont inside small nodules that form on the plant's roots. The process of forming these nodules is very similar to the parasitic process—in fact *Rhizobium* can act as a parasite if there is ample nitrogen present. Only when the plant needs nitrogen is the association beneficial to both. The effectiveness of nodulation and nitrogen fixation depends on the individual plant and bacteria involved, and on environmental factors.

Superimpose on this at least one, perhaps two major additional interactions and you begin to sense the complexity present underground. Illinois bundleflower has at least one root pathogen that kills small and large roots and can kill whole plants. Amy Howell, a recent Ph.D. graduate from the University of California at Riverside who has moved to Lawrence, Kansas, will be working with me this summer and fall to try to determine which fungus is causing this root rot and setting up ways to monitor its effect in our breeding and polyculture plots. Illinois bundleflower has also been reported to be mycorrhizal. That means that it develops an association with a fungus which aids the plant in nutrient and perhaps water acquisition in exchange for supplying the fungus with some nutrients. There are thus three microorganisms competing for space and nutrients on Illinois bundleflower roots in our plots. And those are just the major associations. Every plant has a community of epiphytes on its roots, leaves, stems, flowers, and fruit—fungi and bacteria and others that use the plant surface as their base but do not appear to interact directly with the plant. They are a lot of the "everything else" that is so easy to ignore.

Not easy, perhaps essential. The complexity becomes impossible to comprehend. For me, it is important to know it is there. The invisible "everything else" may be the key to a puzzle that appears unsolvable. I like to teach students about the layers on layers on layers that exist in "simple monocultures," and to help them understand that ecosystems teem

with things invisible. That each of these things is interesting, perhaps useful, possibly crucial. That one must keep an open mind and seek out the minutiae that hide beneath the surface. Too few of us, even when we know a lot about ecology, can imagine these "microsystems."

What is different about research at The Land Institute may be this imagining. Because we want to find new ways to design agriculture, and because we are looking to the native ecosystem for ideas to incorporate into these designs, we are alert for the invisible or subtle interactions. Because we are trying to change business as usual we are willing to consider that "everything else" has a voice to be heard. I can only hope that we are listening well.

Monsoon as Metaphor

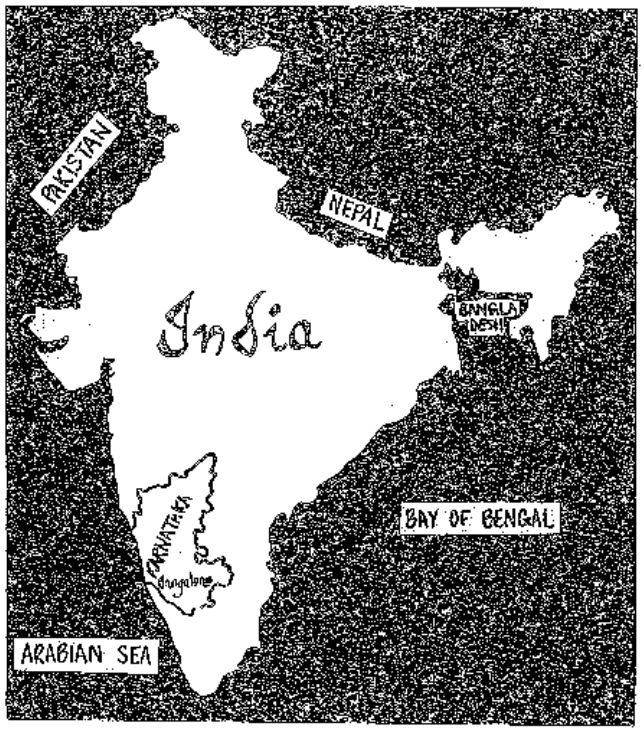
Suprabha Seshan

"...Because our standard is Nature, The Land's research must apply beyond Kansas or even the prairies; the ecological principles we discover for agriculture should be relevant worldwide..." Little did the authors of The Land Institute brochure realize what impact this statement would have on the life of a 1992 intern. Alone, it clinched my decision to travel half way around the world, from Karnataka, India, to Kansas, USA, to spend a year in another country and another culture to think about issues of sustainable agriculture and society. Alone, it justifies engaging for days and weeks and sometimes months in tasks that seem, at first glance, inconsequential to life in South India. Why, indeed, travel such distance to count reproductive tillers on thousands of eastern gamagrass plants, or to hoe interminable forests of tenacious weeds? Why so much energy and time and painstaking effort to understand the prairie when what one needs is an understanding of monsoon lands? What connection does the lifecycle of maize dwarf mosaic virus have to my future activities in another corner of the earth? These questions, and many more, mill around in my head whenever I wonder about applying all that I learn here at The Land, in India.

The connection between The Land's work in the Great Plains and its application in another bioregion is in some ways clear—it lies not in the nitty gritty everyday details of research but in the underlying principle on which the research is based. The Land proposes that for any form of agriculture to be truly sustainable, it must mimic the local natural ecosystem. In the Great Plains the prairie is the standard and it informs Land scientists in their work towards a perennial polyculture that they hope will not only feed people, but also heal the soils and restore ecosystem functions through agricultural design. Nature becomes the source of wisdom (not "human cleverness") and the premise is, if it could work here, then it could work elsewhere. My concern while I'm at The Land is to think, if only imaginatively for the moment, of agroecosystem design for my part of the world. To borrow the title of Jon Piper and Judy Soule's recent book, what would "Farming in Nature's Image" in the tropics entail? If I were to exchange the prairie for the savanna grassland/dry deciduous forest complex that is typical around my hometown of Bangalore, what form would the agricultural mimic take?

There are some questions that complicate the issue. What is the "standard" in an ecosystem that has experienced considerable human impact, especially cultivation, for a very long time? When human and natural ecosystems have gone through a process of coevolution, what is it that we would want to mimic? In addition, the flora of the Indian subcontinent has been altered dramatically by a series of cultural transmigrations, starting with the Aryans around 1500 B.C., followed by the Greeks, then the Huns from Central Asia, the Mughals from Persia, and more recently, the British and the post-independence era. The importation of plants, useful, ornamental, and weedy, has been extensive, many of which have been successfully naturalized and adopted by indigenous populations, and have also resulted in ecotypes of their own. Would the standard that we mimic include the communities of non-native flora? I raise these points because "wilderness," or nature untouched by human action, does not exist in India, nor does the concept of it. The latter, I believe, has several implications, both philosophical and practical, but that's perhaps a subject for another discussion. The purpose of this article is only to share some aspects of a monsoon ecosystem, the exploration of which could guide the search for an agricultural mimic. Let us for now take a trip, in our mind's eye, to the region south of Bangalore, the capital of Karnataka state, which, with a population of 5 million, has the dubious honour of being Asia's fastest growing city.

Imagine for a moment that you are in the arid landscape of the Deccan plateau, cultivated and settled for well over two millenia. Stand on a pink granite "betta" (hill) and look at the undulating contours of ancient lava flows stretching to the horizon. The bedrock is solid granite, interspersed by bands of metamorphic schist and gneiss, and dates back in parts three billion years to a time when the Indian landmass was attached to the supercontinent Gondwanaland. Plate tectonic theory suggests that India broke away, drifted through the Tethys sea and crashed into Pangaea (now Eurasia) some 60 million



years ago, resulting in the upheaval of the Himalayas that are still rising today. With the knowledge that the Deccan is one of the oldest rock formations in the world, now scan the soils whose redness is of a startling intensity. These are laterite soils—acidic, friable, and well-drained, but poor in organic matter. They and the rock below sustain human communities in more than one way—with building stone, earth houses, and terracotta ware; cotton, silk and sisal; fruit, grain, and livestock. Explore the dusty trail that winds between the rocky outcrops to the quintessential Indian village—stone and mud huts that are windowless and small, with thatched roofs and clean dung-smeared floors. The streets are narrow and crooked, they act as thoroughfares and playgrounds, public areas and private, resting places and meeting spots. Often, the heart of a village is a big old tree in whose shade people and cattle can rest from the noontime tropical sun. Walk past the houses into the ragi (millet) fields, newly planted after the onset of the first monsoonal showers. At other times corn, pigeonpea, peanuts, or lentils may fill these fields, depending on the seasonal availability of moisture. Farmers with wells have more possibilities—they could grow sugarcane, rice, or mulberry (for silkworms); papaya, banana, or coconut. In patches you will see mango groves still laden with golden fruit, and perhaps also plantings of jackfruit, guava, and tamarind trees. The all-purpose neem tree, whose medicinal properties have been praised since ancient times, is common, too. The fields are lined on all sides by thorny lantana and acacia shrubs, so that neighbours' encroaching cattle may be kept out. Continue on your walk to the village temple, which sits under the enormous canopy of a giant banyan tree, whose impressive trunk and aerial roots surround the shrine. Everywhere you go the fragrance of frangipani flowers fills the air, and if you pause to listen, the calls of drongoes, coppersmiths, and mynah birds can be heard. Despite poverty, the landscape is diverse, in places stark and barren from overgrazing and deforestation, in places lush and green and vibrant.

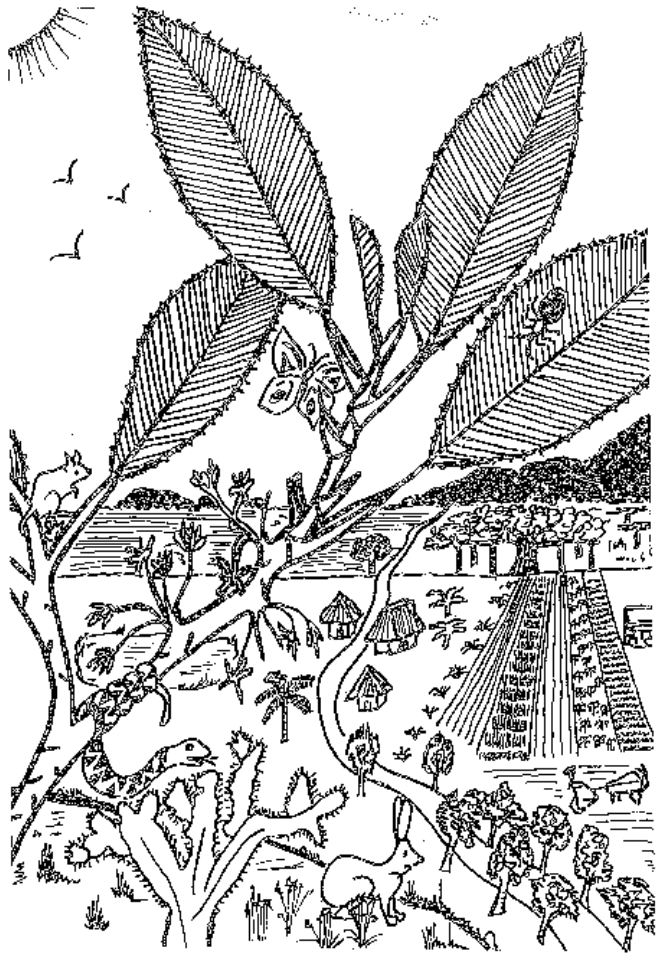
You arrived in India at the tail end of the summer drought and witnessed the arrival of the year's most crucial event. You watched the parched earth open to the first monsoonal showers and rejoiced with millions of others that the terrible drought was finally over. The significance of these annual tropical winds cannot be overstated. The monsoon (from *mausam,* meaning season in Hindi) blows from the Arabian Sea in the southwest from June to September and from the northeast during November and December. It is like a gigantic sea breeze followed by a land breeze, caused by the differential heating rates of the oceans and the Asiatic land mass. The south of India experiences not the four seasons of the temperate regions, but alternate wet and dry periods determined by the onset and duration of the monsoons. Summers can get very hot (averaging 100 F), and in the cool season it never falls below 60F. As the annual extremes of northern climates are unknown, seasonality thus depends on the monsoons. Bangalore receives 30 inches of rain in a year—very little compared to the 250 inches that places on the west coast of the peninsula can get. The monsoon has its own extremes and can mean everything from prosperity to death—it can be sparse in some years and excessive in others but either way people and nature have learned to live by it.

If you are someone who is interested in wild things and wild places, you may wonder if they exist in this rural region so close to a big city. What is the natural ecosystem and how does one recognize it? What is the local ecology? The best places to start looking are in uncultivated or undisturbed sites. Open scrub and grassland can be found between fields and villages or on hillsides. Succulents, woody shrubs, and perennial grasses predominate in these patches, along with scattered specimens of stunted drought-resistant trees. Annual forbs and grasses flourish during the rains and subsequently die. The savanna and scrub vegetation are largely the result of forest clearing and grazing in this region, much of which probably began several centuries ago. If grazing is prevented, secondary succession takes place and deciduous trees begin to grow. The climax vegetation is dry deciduous forest, and to find it one has to travel perhaps a hundred kilometres from the

city. These forests consist largely of teak (*Tectona grandis*), sal (*Shorea* spp.), laurel (*Terminalia* spp.), and bamboo. They have a rich herbaceous underflora during the monsoon, unlike evergreen rainforests further west. Fifty-three percent of the Indian forests are of the dry deciduous kind and have long sustained agriculture and forest plantations. They are characterized by rapid rates of nutrient cycling and also by a large storage of minerals in the soil as compared to the vegetation. The savanna, in contrast, stores few nutrients in the soils due to considerable leaching from the heavy rains. Other forest features include rapid breakdown of litter, high annual increase in vegetation, and speedy growth of ephemeral herbs. The latter play an important role in nutrient conservation during the rainy seasons, as they prevent water run-off with their network of fine roots. Many vital ecosystem processes, such as nutrient release from litter decomposition and soil mineralization, are synchronized to peak during the monsoons. Trees and shrubs flower, fruit and lose leaves at different times of the year, with each process lasting from a few days to several months for different species. Plants thus combine resources at different times to increase chances of survival. This temporal partitioning of events, strategies, and resources is a key element of the seasonally dry tropics.

A walk through the "jungle" and some of the protected grassland areas is, in my opinion, one of the most rewarding experiences of a sojourn in India--particularly if you wish to see large mammalian fauna. In relatively unpopulated areas, one can still encounter herds of elephant and Indian bison; ungulates such as chevrotain, muntjac, sambhar, and chital; sloth bears, wild dogs, macaques, pangolins, mongooses, and on rare occasions the leopard and the tiger. Such a diversity of large grazers and predators must have a considerable impact on the vegetation. Reptiles and birds are also many and diverse. Of the latter, over 250 species have been sighted around Bangalore and many more still in the forests. Snakes are frequently found around human settlements and include poisonous species like banded kraits, Russell's vipers, and cobras. The presence of wildlife is still powerful despite the tremendous pressure of population on the environment. Human and animal communities continue to live side by side, each affecting the other, each depending on the other, each giving character to the forests of the Indian subcontinent.

I've tried to give some idea of what exists, both human and natural, in the dry deciduous regions around Bangalore. I've omitted many important issues, such as the severe rates of deforestation, the many traditional systems of land use, the incredible variety of foods and crops in the area, and the terrible droughts that have persisted for many years. These



and more would be essential to the enquiry into agroecosystem design, which, as I said earlier, is an important link between The Land Institute's work and other regions of the world. The questions are varied and complex. For instance: what are the formal elements of the grassland forest ecosystem? What are the various constraints? Minerals? Moisture? Nitrogen? What is the disturbance regime and how does the grassland succeed into a forest climax? What is the role of large mammals, especially grazers, and what does the trophic pyramid look like? How have indigenous societies traditionally farmed? Does a mimic already exist, as for example, in the spice gardens of the Havik communities with their multistoried analog to the forest? If you plant a ground layer of cardamom, middle layer of plantain or cocoa, and an upper betelnut canopy, in appropriate succession, and then surround them by mango, jackfruit, and coconut trees, would that satisfy our mimic requirements? Do we need to do little more than put together these traditional analogs, rather than search for new species or crops that will represent functional groups in the natural plant communities?

(continued on page 33)

Great Ideas in Ecology

Eugene Odum

In a commentary entitled "Science Literacy,"[1] there is a table of "Science's Top 20 Greatest Hits" as chosen by biologist Robert Hazen and physicist James Trefil. They suggested that these "great ideas" might be the basis for a course in general science, and comments from readers were invited.

In addition to the two laws of thermodynamics, Hazen and Trefil's list includes three other concepts that could be construed as ecological. These concepts are "everything on earth operates in cycles," "all forms of life evolved by natural selection," and "all life is connected."

For many years, I have contended that ecology is no longer a subdivision of biology but has emerged from its roots in biology to become a separate discipline that integrates organisms, the physical environment, and humans—in line with *oikos*, root of the word ecology.[2] From this view, the ecosystem level becomes the major focus. Populations are considered as ecosystem components and landscapes as associations of interacting ecosystems. This viewpoint is now generally accepted, as was indicated by a recent British Ecological Society survey in which members were asked to list what they considered the most important ecological concepts. The ecosystem was the concept most frequently listed.[3]

At the time that the science literacy article appeared, I was drawing up a list of basic concepts in ecology that might be included in courses designed to improve environmental literacy among undergraduates here at the University of Georgia. Here are 20 of my "great ideas" in ecology, as distinguished from "great ideas" in biology (e.g., DNA, genetic code, and general theory of natural selection). The last five items in my list relate to human ecology and the ecology-economics interface, which must be major foci in environmental literacy education in view of the increasingly serious global impacts resulting from human activities. The references I have selected for each concept may not be the best ones, and certainly they are not the only ones.

1. An ecosystem is a thermodynamically open, far from equilibrium system. Input and output environments are an essential part of this concept. For example, in considering a forest tract, what is coming in and going out is as important as what is inside the tract. The same holds for a city. It is not a self-contained unit ecologically or economically; its future depends as much on the external life-support environment as on activities within city limits.[4]

2. The source-sink concept: one area or population (the source) exports to another area or population (the sink). The statement is a corollary to concept 1. It is applicable at ecosystem as well as population levels. At the ecosystem level, an area of high productivity (a salt marsh, for example) may feed an area of low productivity (adjacent coastal waters). At the population level, a species in one area may have a higher reproduction rate than needed to sustain the population, and surplus individuals may provide recruitment for an adjacent area of low reproduction. Food chains may also involve sources and sinks (see concept 12).[5]

3. In hierarchical organization of ecosystems, species interactions that tend to be unstable, nonequilibrium, or even chaotic are constrained by the slower interactions that characterize large ecosystems. Short-term interactions such as interspecific competition—the evolutionary arms race between parasite and host, herbivore-plant interactions, and predator-prey activities—tend to be oscillatory or cyclic. Large, complex systems—such as oceans, the atmosphere, soils, and large forests—tend to go from randomness to order and will tend to have more steady-state characteristics, for example, the atmosphere's gaseous balances.

Accordingly, large ecosystems tend to be more homeostatic than their components. This principle may be the most important of all, because it warns that what is true at one level may or may not be true at another level of organization. Also, if we are serious about sustainability, we must raise our focus in management and planning to large landscapes and beyond.[6]

4. The first signs of environmental stress usually occur at the population level, affecting especially sensitive species. If there is sufficient redundancy, other species may fill the functional niche occupied by the sensitive species. Even so, this early warning should not be ignored, because the back-up components may not be as efficient. When the stress produces detectable ecosystem-level effects, the health and survival of the whole system is in jeopardy. This idea is a corollary of item 3; parts are less stable than wholes.[7]

5. Feedback in an ecosystem is internal and has no fixed goal. There are no thermostats, chemostats, or other set-point controls in the biosphere. Cybernetics at the ecosystem level thus differs from that at the organism level (body temperature control, for example), where the control is external and with a set point. Ecosystem control, where manifested, is the result of a network of internal feedback processes as yet little understood—another corollary of concept 3.[8]

6. Natural selection may occur at more than one level. This idea is another corollary of concept 3. Accordingly, coevolution, group selection, and traditional Darwinism are all part of the hierarchical theory of evolution. Not only is the evolution of a species affected by the evolution of interacting species, but a species that benefits its community has survival value greater than a species that does not.[9]

7. There are two kinds of natural selection, or two aspects of the struggle for existence: organism versus organism, which leads to competition, and organism versus environment, which leads to mutualism. To survive, an organism does not compete with its environment as it might with another organism, but it must adapt to or modify its environment and its community in a cooperative

manner. This concept was first suggested by Peter Kropotkin soon after Darwin.[10]

8. Competition may lead to diversity rather than to extinction. Although competition plays a major role in shaping the species composition of biotic communities, competition exclusion (in which one species eliminates another, as in a flour beetle microcosm) is probably the exception rather than the rule in the open systems of nature. There, species are often able to shift their functional niches to avoid the deleterious effects of competition.[11]

9. Evolution of mutualism increases when resources become scarce. Cooperation between species for mutual benefit has special survival value when resources become tied up in the biomass, as in mature forests, or when the soil or water is nutrient poor, as in some coral reefs or rain forests.[12] The recent shift from confrontation to cooperation among the world's superpower nations may be a parallel in societal evolution.[13]

10. Indirect effects may be as important as direct interactions in a food web and may contribute to network mutualism. When food chains function in food web networks, organisms at each end of a trophic series (for example, plankton and bass in a pond) do not interact directly but indirectly benefit each other. Bass benefit by eating planktiverous fish supported by the plankton, whereas plankton benefit when bass reduce the population of its predators. Accordingly, there are both negative (predator-prey) and positive (mutualistic) interactions in a food web network.[14]

11. Since the beginning of life on Earth, organisms have not only adapted to physical conditions but have modified the environment in ways that have proven to be beneficial to life in general (e.g., increase O_2 and reduce CO_2). This modified Gaia hypothesis is now accepted by many scientists. Especially important is the theory that microorganisms play major roles in vital nutrient cycles (especially the nitrogen cycle) and in atmospheric and oceanic homeostasis.[15]

12. Heterotrophs may control energy flow in food webs. For example, in warm waters, bacteria may function as a sink in that they short-circuit energy flow so that less energy reaches the ocean bottom to support demersal fisheries. In cooler waters, bacteria are less active, allowing more of the fruits of primary production to reach the bottom.[16] Small heterotrophs may play similar controlling roles in terrestrial ecosystems such as grasslands.[17] This concept is a corollary of concept 11.

13. An expanded approach to biodiversity should include genetic and landscape diversity, not just species diversity. The focus on preserving biodiversity must be at the landscape level, because the variety of species in any region depends on the size, variety, and dynamics of patches (ecosystems) and corridors.[18]

14. Ecosystem development or autogenic ecological succession is a two-phase process. Early or pioneer stages tend to be stochastic as opportunistic species colonize, but later stages tend to be more self-organized (perhaps another corollary of concept 3).[19]

15. Carrying capacity is a two-dimensional concept involving number of users and intensity per capita use. These characteristics track in a reciprocal manner—as the intensity per capita impact goes up, the number of individuals that can be supported by a given resource base goes down.[20] Recognition of this principle is important in estimating human carrying capacity at different quality-of-life levels and in determining how much buffer natural environment to set aside in land-use planning.

16. Input management is the only way to deal with nonpoint pollution. Reducing waste in developed countries by source reduction of the pollutants will not only reduce global-scale pollution but will spare resources needed to improve quality of life in undeveloped countries.[21]

17. An expenditure of energy is always required to produce or maintain an energy flow or material cycle. According to this net-energy concept, communities and systems, whether natural or human-made, as they become larger and more complex, require more of the available energy for maintenance (the so-called complexity theory). For example, when a city doubles in size, more than double the energy (and taxes) is required to maintain order.[22]

18. There is an urgent need to bridge the gaps between human-made and natural life-support goods and services, and between non-sustainable short-term and sustainable long-term management. Agroecosystems, tropical forests, and cities are of special concern. H.T. Odum's "emergy" concept and Daly and Cobb's index of sustainable economic welfare are examples of recent attempts to bridge these gaps.[23]

19. Transition costs are always associated with major changes in nature and in human affairs. Society has to decide who pays, for example, the cost of new equipment, procedures, and education in changing from high-input to low-input farming or in converting from air polluting to clean power plants.[24]

20. A parasite-host model for man and the biosphere is a basis for turning from exploiting the earth to taking care of it (going from dominionship to stewardship, to use a biblical metaphor). Despite, or perhaps because of, technological achievements, humans remain parasitic on the biosphere for life support. Survival of a parasite depends on reducing virulence and establishing reward feedback that benefits the host.[25] Similar relationships hold for herbivory and predation.[26] In terms of human affairs, this concept involves reducing wastes and destruction of resources to reduce human virulence, promote the sustainability of renewable resources, and invest more in Earth care.

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The Sunshine Farm

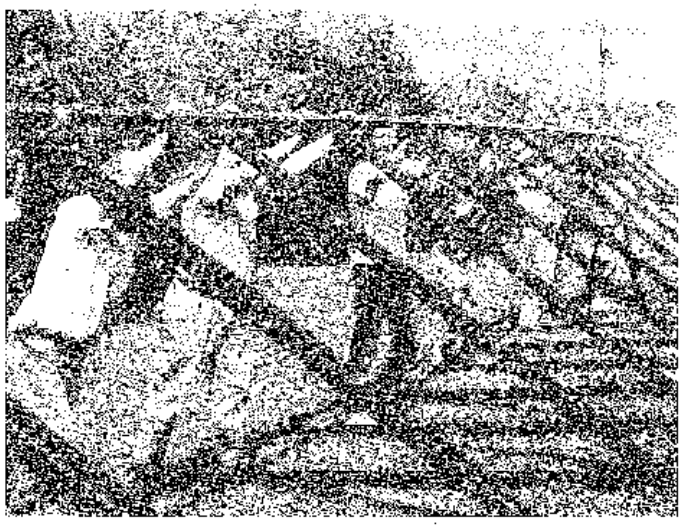
Marty Bender

The Land Institute has just completed a one-year feasibility study of the proposed Sunshine Farm, funded by the Austin Memorial Foundation. In the Sunshine Farm, we have combined traditional farming methods with recent scientific findings and technology to design a sunlight-powered farm that will be compelling to conventional farmers seeking alternatives. During this ten-year project, ongoing research and innovation will determine practices that will be incorporated into the Sunshine Farm. The Austin Memorial Foundation has recently renewed its commitment to the Sunshine Farm with a second one-year grant, and additional start-up grants have been provided by the Ira Hiti Foundation for Deep Ecology and the Wallace Genetic Foundation. Sunshine Farm staff will include a farm ecologist (myself) and a farm manager to design the experiments and to establish the farm.

In designing the Sunshine Farm we have made several assumptions. Our first is that with eventual government rationing fossil fuel supplies for agriculture will become unpredictable and will come at a cost of energy subsidies from taxpayers and other sectors of the economy. Thus, a central question in our study is how much agricultural productivity can be maintained while sunlight-powered farms sponsor their own inputs without fossil fuels. The Sunshine Farm will grow some of its inputs, such as fuel and nitrogen fertility, thus exchanging energy that is directly or indirectly renewable solar for the embodied energy in conventional fertilizers, fuel, and machinery. Although the energy used in off-farm processing, packaging, and distribution is a very important aspect of energy use in food systems of industrial societies, we will not include it as an input, because this consideration is more the responsibility of society than it is of farmers.

There will initially be no farm family on the Sunshine Farm, but we will record the hours of human labor in the field (not counting research efforts). We will then determine the energy cost of this labor by using a study that has disaggregated the GNP to estimate the portion of the farm family's consumption of goods and services required to enable the family to earn a living on the farm.

How much food sunlight-powered farms produce will depend on what crops and animals are raised. Since cereal grains and livestock are staples of the American diet and are the basis of agriculture on the Great Plains, the primary focus of the Sunshine Farm will be grain and livestock production. Vegetarian diets would allow cropland to support more people than meat-based diets because they avoid the energy and protein losses that occur as animals convert feed to products we consume. However, much meat could be produced on the rangeland that occupies 46% of the agricultural land in six of the Great Plains states (ND to TX) and is unsuitable for till agriculture.



PKM Steel donated the frame for our new photovoltaic array. Here, staff and interns unload it and set it in place.

Our emphasis on crop rotations and livestock production does not mean that more cropland will be devoted to animals. U.S. agriculture is already oriented towards livestock production: about one-fifth of U.S. cropland is now in hay and silage. Extensive use of crop rotations would require maybe another one-fifth of U.S. cropland, or twice as much forage as is currently produced. Moreover, roughly 80% of the grains produced in the U.S. are fed to animals, which provides some slack for reducing animal feed. With the extra forage resulting from crop rotations, the amount of grain fed to animals could easily be reduced so that more grains could be grown for human consumption.

With these assumptions, we have designed the Sunshine Farm as follows. Located on Land Institute property, the Sunshine Farm will occupy 150 acres, with 50 acres of tillable bottomland and 100 acres of upland native pasture. In 1920, when fossil fuel input was relatively small compared to now, the typical farm size ranged from 160 to 200 acres in central Kansas and Nebraska. Roughly a third of Kansas farms are still between 50 and 259 acres.

The primary five-year crop rotation will be the following sequence of conventional grains and forage: milo, soybeans, wheat & oats/alfalfa (wheat and oats are nurse crops for alfalfa in the third year), with alfalfa continuing the last two years of the rotation. So, each year on 50 acres there would be 10 acres each of milo and soybeans, 5 acres each of wheat and oats followed by alfalfa, and 10 acres each of second-

and third-year alfalfa.

We will grow each crop in narrow strips of 4 or more rows, as it has been shown that crop yields are higher in strip cropping than in separate fields. The adjacent strips of different crops are somewhat like a polyculture, and higher yields are probably due to border effects such as differences among crops in rooting zones and timing of resource use.

The tillage method for growing crops will be ridge-till, a recently-developed form of conservation tillage. Ridge-till reduces soil erosion by not tilling the residues from the previous crop until the planting of the next crop. In contrast, conventional tillage incorporates crop residues soon after harvest, exposing the soil to erosion. An advantage of ridge-till is that it allows experimentation in controlling weeds with less or no herbicide use.

The animals on the Sunshine Farm will be cattle, hogs, chickens, and draft horses. Twenty cattle and perhaps 100 free-ranging chickens (with a moveable chicken pen and a portable electric fence) will range the 100-acre pasture. Approximately 30 hogs will be raised each year from 4 to 6 gilts. We will sell the hogs after they glean the already-harvested sorghum acreage. We will have two draft horses that will have access to pasture at night and in winter. The 50 acres of cropland will provide more than enough winter feed for these animals.

Fertility will be provided in the primary crop rotation by symbiotic nitrogen fixation in the soybeans and alfalfa. However, so much nitrogen is removed in the harvest of soybean grain and alfalfa hay that, in spite of the fixed nitrogen, for average crop yields in central Kansas there is a net nitrogen deficit at the end of five years. We could add commercial fertilizer to eliminate this deficit, but the manufacture of nitrogen is energy-intensive. Instead, the last year of alfalfa in the rotation will not be harvested but will be plowed down as green manure to reduce the net nitrogen deficit to a small amount.

To determine the effects of treating alfalfa as a green manure in its third year, we will plant control plots in which the same crop rotation will have one, two, or three harvests of alfalfa in its third year. Subsequent grain yields will be compared with those in which the alfalfa is not harvested at all in its third year. We will test an innovative strip-cropping method of providing nitrogen on small plots on the Sunshine Farm. Every third strip will be in alfalfa, with grain strips on both sides. Instead of conventionally haying the alfalfa, we will use a forage blower to blow finely chopped alfalfa onto an adjacent grain strip. The alfalfa will be immediately incorporated into the strip by disking or cultivation, repectively, if the grain crop is absent or present. Repeated cutting of alfalfa stimulates nitrogen fixation, so that roughly twice as much nitrogen would be fixed as would be if the alfalfa was not cut. The nitrogen thus ends up in the grains instead of harvested alfalfa. Per pound of nitrogen transferred, the energy required to cut, rake, blow, and disk the alfalfa is less than a third of the embodied energy in anhydrous ammonia.

Since there is no biological way to provide the amounts of phosphorus and potassium needed for crops, as there is for nitrogen, we will import these nutrients onto the farm at the cost of the energy that is embodied in the manufacture, transportation, and application of these nutrients. Although organic farms often use unprocessed phosphate rock, we will use commercial phosphate fertilizer on the Sunshine Farm, since its embodied energy is roughly the same as that for an effective equivalent amount of phosphate rock. This is because two to three times as much phosphorus is required from phosphate rock as from commercial fertilizer, due to the low solubility of phosphate rock, even over 30-year studies. For potassium, we will use muriate of potash on the Sunshine Farm because it has less embodied energy than other potassium fertilizers.

In the long run, the use of mined phosphorus and potassium is a temporary solution. Phosphorus will become the most critical nutrient for agriculture because world phosphate reserves are projected to become economically unusable through depletion within several centuries. World potassium reserves may last several millenia at current consumption, but this could easily dwindle to several centuries if recent growth rates in consumption continue. The U.S. is not self-sufficient in potassium, and imports about 70% of what it uses. Eventually, maintenance of crop productivity will require extensive recycling of human excrement, as F.H. King observed in Chinese and Japanese agriculture in the early 1900s.

In addition to fertility, the Sunshine Farm will sponsor its own traction needs. On the Sunshine Farm, heavy-duty field operations such as plowing, disking, and combining will be done with a small diesel-engine tractor running on vegetable oil.

On the basis of literature review and calculations, we rejected the following technologies or fuels for traction use: anaerobic digestion (biogas), biomass gasification (producer gas), methanol, Stirling engines, electric tractor powered by batteries or hydrocarbon fuel cells, and ethanol from starch, cellulosic, or sugar crops (with the exception of sugar beets). They were rejected either because of immaturity of the technology or fuel process, or because of a negative energy balance (where the energy value of the fuel is less than the energy required to grow and process the fuel, including credit for any by-product). Since ethanol from sugar beet juice produced in beet sugar factories has a positive energy balance, we will further investigate the literature, and grow sugar

beets in trial plots on the Sunshine Farm.

We chose soybeans as the initial candidate for vegetable oil fuel because this crop is a nitrogen-fixing legume which could be used in the primary crop rotation to provide nitrogen. However, in the Great Plains, soybeans can be grown only about as far west as central Kansas. Since sunflowers, rapeseed, safflower, and peanuts were the vegetable oils with the most positive energy balances (including soybeans), they will be investigated in trial plots.

A review of the literature on long-term diesel engine tests of vegetable oil fuels processed to varying degrees suggests that processing of vegetable oil fuel would eventually be done in community- or village-level processing plants. Thus, the Sunshine Farm will initially purchase a quantity of processed oil equivalent to the amount of oil that could be obtained from each oilcrop grown on the farm. An equivalent amount of meal by-product will also be purchased as feed for the animals. Meanwhile, we will test various methods for on-farm production of vegetable oil fuel on the Sunshine Farm to determine if a satisfactory fuel could be produced with a minimum of processing.

A team of draft horses will be used to spread manure and perform light-duty field operations. We view the inclusion of draft animals in the Sunshine Farm as part of the necessary and desirable mix of energy sources that provides security through diversity. Since most farms have a small parcel of land that is usable only as pasture, we have assumed that the horses have access to pasture.

Extensive calculations suggest that the portion of the cropland on draft-horse farms devoted to horse feed would be roughly the same as the portion of cropland on tractor farms devoted to oil crops for vegetable oil fuel. Thus, draft animals will not divert more cropland from food production than oil-fueled tractors would.

There will also be electrical needs on the Sunshine Farm, such as the maintenance shop, grain drying, water pumping, possibly a vegetable oil press, and other stationary power needs. Power for these needs will be provided by a hybrid system consisting of a wind turbine generator, photovoltaic cells, and a small back-up diesel generator run on vegetable oil fuel. We will meet the wood requirements for space heating of already existing buildings by side-trimming windbreak hedgerows or small wooded areas.

In addition to demonstrating sunlight-powered farming, the Sunshine Farm will provide a farm background into which the research and results of The Land Institute's perennial polyculture program can gradually be introduced. The effects of grazing, soil fertility management, and other farming practices on perennial polycultures and plant breeding could be studied on the Sunshine Farm.

I will soon begin writing a book about the findings and conclusions that are the basis of the design of the Sunshine Farm. This book will explore the effects of four key factors on the productivity of sun-powered farming: soil fertility, nutrient and water use by crops and animals, photosynthetic efficiency of crops, and amounts of nutrient cycling and inputs selected by the farmer. Such information will guide farmers exploring paths to energy and nutrient sustainability in their own operations, and it will provide agronomists with questions that need to be studied.

The Land Institute is ready to begin implementation of the Sunshine Farm Project, which aims to develop renewable energy options for agriculture. This integrated farm study will incorporate a range of renewable energy technologies, including a diesel tractor fueled with vegetable oil from crops grown on the farm, draft horses, photovoltaic panels and wind turbines for generating electricity, crop rotations, and conservation tillage methods. We are looking for a farm manager to work on this project.

Job Description

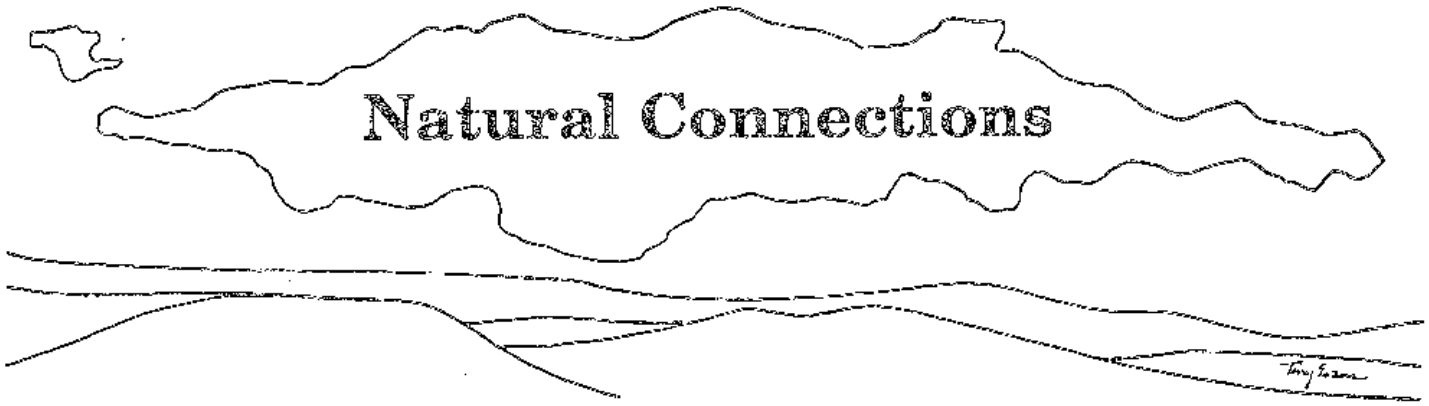
The farm manager will be responsible for many operations of the Sunshine Farm, working with the full-time project ecologist and reporting to the Management Team at The Land Institute. With the ecologist, he/she will establish and maintain the primary crop study. Close cooperation with the ecologist will be required to obtain data for experiments and to monitor the energy and material balances on the Sunshine Farm. The farm manager and ecologist together will coordinate with other staff members and students on various aspects of establishing and operating the Sunshine Farm. The farm manager will maintain facilities and machinery, determine the need for equipment and supplies, care for livestock, maintain crops through harvest and storage, and deliver crops and animals to market.

Desired Skills and Experience

a. Working experience with some or all of the following crops and livestock (organic experience preferable): wheat, milo, soybeans, alfalfa, cattle, pigs, chickens.
b. Experience with the use and care of draft horses.
c. Ability to keep machinery and equipment in working order and to stock supplies necessary for this maintenance.
d. Ability to repair machinery and equipment in a timely manner.
e. Ability to modify equipment (e.g., construct ridge-till implements to be pulled by draft horses).

The research emphasis of the Sunshine Farm will place additional responsibilities on the farm manager. These include:
a. Speaking to visitors not only about the crops and animals, but also the technology and research on the Sunshine Farm.
b. Close cooperation with the farm ecologist and other staff and students.
c. Keeping track of the complex layout of research plots.
d. Additional time in the field to measure data.

To apply: This is a full-time salaried position. Applicants should submit a letter stating their interest and describing their qualifications (enclose resume if available). We are accepting applications now and hope to fill the position by October 1, 1992. For additional information contact Marty Bender at 913-823-5376. Submit application to Farm Manager Search, The Land Institute, 2440 E. Water Well Road, Salina, KS 67401.

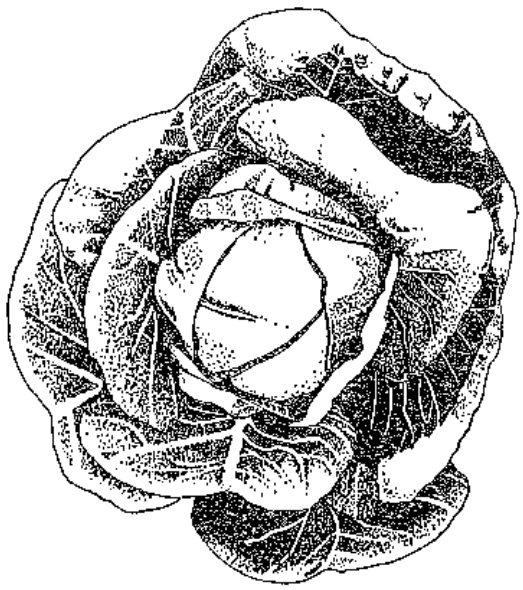


Spirited Cycles in the Garden

Emily Pullins

The story of our vegetable garden here at The Land is in many ways the story of the struggles and successes, if not downright luck, we have had this year. The weather has blessed us—not too hot, not too cold, and just enough rain. The bugs haven't bugged us (we have broccoli for the first time in years, and it's still coming!). Ted Schuur and I, two interns with limited gardening experience, little guidance, and complete responsibility for the garden, were able to get the appropriate seeds and seedlings started on time. And miraculously, interns have found enough time to keep the weeds under some semblance of control.

This year we interns are responsible for many tasks that were managed or run by staff members in the past. The garden is just one example of the success our group has had in meeting those responsibilities. But we have had quite a bit of help. For example, the garden is filled with spirits; when I turn the soil, so soft and fragrant, I think of Dana Jackson's years of loving care that helped bring it to such richness. Beth Gibans, who left The Land this past March, still meanders here; she helped us design the perennial flower and herb bed just outside the classroom. I sense a hundred-some interns just like us, thinking, talking, laughing while we work the raised beds. And children, all those children who taste colorful lettuces, pick sweet peas, and smell fresh-crushed herb leaves—learning where food comes from. The oohs and aahs of admiring visitors are heard again through rustling leaves. These reminders and spirits motivate our work, and deepen my appreciation of every scent and morsel. To look at the garden, which is now bursting with tomatoes, corn, peppers, and basil, to name a few, is to see five months of internship coming to fruition, lifetimes of dedication and care, the empowerment of witnessing the processes of life and death. I know of nothing so satisfying, so precious as experiencing the cycles of the land.



Walking Home

Jake Vail

The environmental movement is moving around the world, dynamic but thin like the skin of ions that occasionally arranges itself into the northern lights. Like the lights, some shining parts of environmentalism sporadically provide fascination, and even humility. More often, though, we watch reports of the environmental movement on the evening news, we may even plant a tree, but then we come away essentially unchanged. Why? How do we learn to enlarge our compassion for the earth? How do we then make our compassion last?

Compassion requires an awareness of and attention to something. Once something has gained our attention, compassion requires the desire to continue to be attentive. The awareness often feeds the desire, the intensity by which it does often catching us by surprise. But lasting compassion, by definition, takes time. Wise words have come forth over the past twenty years about the importance of finding and fostering a sense of place, of movement over an area. But comparatively little has been said of movement over time. As movement around the world has increased, many have lost a sense of place. As the speed of movement has increased, more have lost a sense of pace. As Paul Valéry noted, we have lost the leisure to ripen.

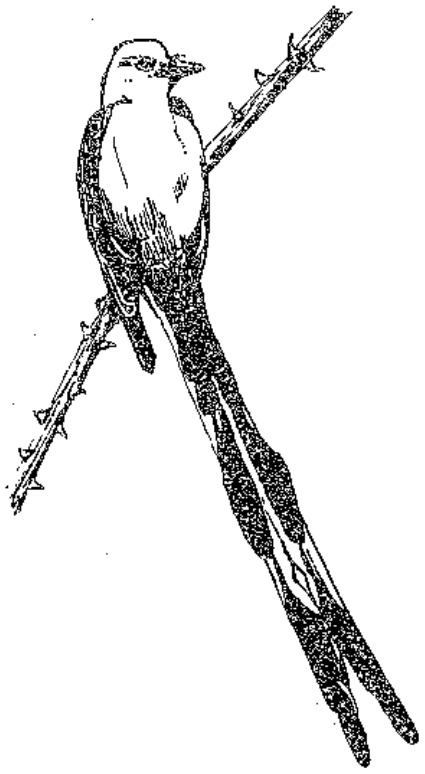
Consider the term itself: "environmental movement." The environment—that part of it we want to learn from, preserve, and emulate—moves slowly. We used to be a part of it. Why are we now in such a hurry? Cockroaches and kudzu, starlings and cheat grass hurry. Too many well-intentioned people who want to save the world are acting with the same impatient and imperialistic mentality as its colonizers, rushing in, convinced of the good they are doing, where angels fear to tread. What, however, is the real basis of doing good, of compassion, of love? I have to agree with Kurt Vonnegut: Respect. Respect, like wind on the prairie, is both of and above these virtues, constantly flowing. When something as sublime and powerful as love has been reduced to a little red heart on a bumpersticker stuck between one's self and one's favorite form of recreation, or residence, or dog head, we had best rethink respect. We will never save the earth if we don't respect it.

"In a race against time, if you pass time you can get there ahead of time," observes Michael Melius. Learning the sense of place that seems to be an integral part of respecting the world *requires* a sense of pace, that we slow down and patiently search for ways to fit more harmoniously into a natural order. As we do so, each in different ways in different places, learning particular rhythms and practices, we may find ourselves thinking in new ways and becoming quite specialized. Thinkers from Wendell Berry to Buckminster Fuller have long railed against specialization, and flown the flag of the generalist. Holistic thinkers must be generalists of the highest order, they say, so as to be holistic doers and not cause unanticipated and irreparable harm. But the flag of the generalist is the same one that cockroaches and kudzu fly as they march over the world: progress. The generalist *moves*.

It's the same old story: In thinking about the parts, what we nouns ought to *be*, the verbs, the relationships, are ignored. What ought we *do*? Look at the tropical rainforests, the coral reefs, the Arctic tundra, the prairie. Modern-day Edens. Practicing specialists abound in these mature ecosystems, where interconnections are old and tight. Eden, it turns out, is an assemblage of specialists, including humans, that is extremely elaborate, aged, complex, and mysterious, a community of beings and dwellings so specialized they make your jaw drop. Because of what they *do*. Though different, they move together. The landscape moves the child, the child sings the landscape. The moth in repose looks like bird shit because of the bird. Which came first? In such a community, or in endeavoring to build such a community, it is more important to slow down, work well, and work together, *to coevolve*, than to strive to become exceptional generalist individuals.

> The unit of what's called evolution out there, is really not this species or that species. It is an entire interlocking business of species. And curiously enough the whole progress, so-called, of evolution is stimulated by the need to stay put. The grass changes and the horse changes, and the grass changes and the horse changes, and they change in such a way that the relationship between them may stay constant.... One of the big changes made in mid-nineteenth-century biology was the notion that natural selection is a force for change. It's not. Natural selection is a force for staying put.... What you've got to do is change in such a way that the system changing has a certain steadiness, a certain balance. —Gregory Bateson

We have brought about the end of nature, and are now busy convincing each other of nature's worth and the need to regain it. The work of ecological restoration, merging egosystems with ecosystems, can be a hopeful and powerful tonic, if done with a "certain steadiness, a certain balance;" if we take the time to respect the place we are working to restore. Barry Lopez urges that we pay attention rather than



constantly pose questions. If the work is not done well, if, in our enthusiasm, we rush in or apply techniques learned in another place, the tonic may be bitter indeed. One of the oldest lessons in natural history, one that we still haven't learned, is that it is far more difficult to put things together than it is to take them apart.

A few years ago I took a long solo romp in the San Juan Mountains of Colorado. It was the first time I had been to such a place, and knew extremely little of where I was. Before I was ready for it, I found myself walking through cathedrals of trees where sunlight filtered through stained-leaf windows. Past plants festooned with flowers festooned with hummingbirds festooned with feathered rainbows. Huge earth-scented mushrooms. Crenelated horizons. Through icy water in July. Welcomed. Moving slowly, learning quickly.

"The exact balance of spirit and humility," says Gary Snyder of walking. Once out of the car, on the earth, you are immediately more humble. Down to earth [Humble-humus-human]. Carry what you need, grow a few blisters. The living world opens up.

I hiked the blue mountains for days, climbing and descending thousands of feet and millions of years, seeing few humans and talking with fewer, surprising elk and being surprised by a grey jay who perched on my foot as I rested. Smelling pine, tasting rain. Watching weasels run in silence. I tried singing the horizon. (The San Juans evoke a Bach-like fugue. The prairie, by contrast, more a meditative "Ommmm.") Eventually, reluctantly, I returned to the trail head. After days of walking at whatever pace seemed right, I was in seconds rolling at fifty miles per hour. I had to pull my truck over and stop. The sudden awareness of the wrongness of a human moving at such a speed hit me hard. This comes back to haunt me often.

Think of it: we moderns are conditioned from birth to sit and to roll. For almost all of human existence, when young we either were carried by Mom or we walked. We are so perversely removed from that time now that we call a roller a stroller. In it, the only touch is plastic; the nearest human is out of reach. No wonder we cry. Feet feel earth rarely; rubber and asphalt insinuate themselves into our every move. Out of the womb we are in minutes auto-mobile, separate from what supports us and from each other. How can the natural world welcome us? How can we pay attention? Bruce Chatwin:

> Day in and day out, a baby cannot have enough walking. And if babies instinctively demanded to be walked, the mother, on the African savannah, must have been walking too: from camp to camp on her daily foraging round, to the waterhole and on visits to the neighbors.... Richard Lee calculated that a Bushman child will be carried a distance of 49,000 miles before he begins to walk on his own. Since, during this rhythmic phase, he will be forever naming the contents of his territory, it is impossible he will not become a poet.

And what of the boy or girl of tomorrow? What poetry and pace will come of sitting strapped into a La-Z-Boy on wheels?

But even as we sit in traffic, wishing we could go faster, we may feel an odd dissonance. Many wish to reconnect, to be re-rooted. Not too surprisingly, there is a surge of interest in native cultures. Unfortunately, the surge has spawned rivers of sham shamans. New old-fashioned rituals are rife. With the push of a button, I can learn the language of the people whose land I drive over, or network, if that's a verb, with healers who exchange mantras for MasterCard. But up Madison Avenue in the green consumer parade is the wrong approach. From where, after all, did aboriginal people gather wisdom? The land and its inhabitants. Terry Tempest Williams reminds us: No one culture has dominion over birdsong. Speeding and spending through life, though, we miss it. To become rooted, to go down like big bluestem into the rich old ways, to learn the land's wisdom and tell stories of our own, we need to slow down.

Property is theft, speed is greed. And they are related. In 1892, Simon Patten pointed out that "The standard of life is determined, not so much by what a

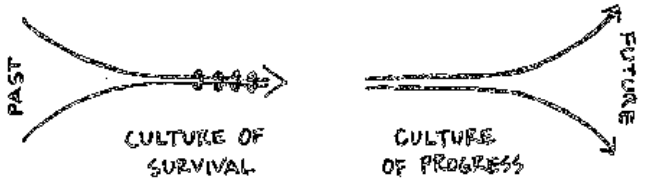
man has to enjoy, as by the rapidity with which he tires of the pleasure. To have a high standard means to enjoy a pleasure intensely and to tire of it quickly." To relearn how to enjoy intensely and *for a long time* is thus critically important. Otherwise, like Los Angeles residents given an excuse to plunder for the thrill of it, we will continue to ignore any moral or natural economies and, in search of new pleasures, steal as fast as we can. How do we relearn lasting affection when there are more malls in the U.S. than there are high schools, when the world itself, once the school from which we all graduated, has become nothing but a shopping mall?

Slowing down (note the felicitous phrase: slow down—toward the earth. Speed up, toward... what? Asphyxiation?) can be done many ways. Most, it seems, have to do with limiting our use of technology. From answering machines to credit cards, televisions to tractors, modern life is finally modern only because of our machines and what they have done to us. A call to slow down, the call of the wild, thus sounds much like a Luddite rallying cry. But Ned Ludd and his cohorts, like wolves in the north woods or panthers in the Everglades, were members of a mature community, specialists whose intimate old connections were severed by a new, external, fast-paced, unplaced, generalist economy.

The more deliberately we act, after all, the easier it will be to see the connections. The less obvious threads will demand but patience—and perhaps the removal of insidious distractions. A few suggestions for those in the environmental movement: Lobotomize your television, before it does the same to you. Not only what you see, but *how* you see will change. Cut up your credit cards and live by exchanging with people rather than borrowing from faceless, placeless megacorporations. Unplug the electrical cords in your home. "To see the Milky Way, you have to turn off the lights." Take off your watch. Listen. Plant, tend, harvest, and prepare your supper. Go for a walk. Practice the fine art of sauntering. (There is no need to become another in the legions of oxymoronic eco-tourists. More and more people are visiting national parks in their cars, but fewer and fewer go for hikes in the back-country. National Park, indeed.)

Nomadic cultures, of course, walked for a reason: to find food. Gathering came before hunting, and long before agriculture. Walk for a while and you will gather. Food. Thoughts. Stories. Walk in a place for a while and you will slowly gather myths and legends. The stuff of culture.

We are an agricultural society, and have been for some 11,000 years. This won't change any time soon, so the environmental movement would do well to consult some success stories of agricultural geniuses of place. There is much practical wisdom to be learned, for example, in F.H. King's *Farmers of Forty Centuries*. John Berger, in the afterword to his wonderful book of stories, *Pig Earth*, discusses the profound differences in agriculture and culture between peasants and us moderns. Peasant culture comes of a place and a natural pace, and contrasts markedly with modern life. The word "peasant" comes literally from the earth: pais, paisano, peasant. Peasant life is down-to-earth, for a peasant's very survival hinges on his or her ability to read the ways of a place, learn its limits, and act accordingly. Peasant ways are therefore conserving and cautious. Berger draws an instructive contrast between the views of past and future in a culture that directly knows and depends on the land, and the views of a culture of progress that takes the land for granted. The two views are opposites of one another:



As Berger explains, cultures of progress are forward-looking because the future offers ever-larger hopes. In contrast, "a culture of survival envisages the future as a sequence of repeated acts for survival. Each act pushes a thread through the eye of a needle and the thread is tradition. No overall increase is envisaged." The grounded practices of a "culture of survival" have much to teach us as we confront the limits of the earth. Our ways of seeing will change as we slow down and dig in. We will recognize that we have always lived within physical and moral limits, and that we always will. We will recognize that the time has come to again discuss and delineate those limits, and, as in poetry, we will see a graceful freedom come of such a delineation. We will realize that we must not let the lessons of the wild and of our forebears get trampled over by the quickening march of progress. Rather, as our compassion for the earth enlarges, we will gather the historical debris that remains, compost it, and incorporate it into our gardens.

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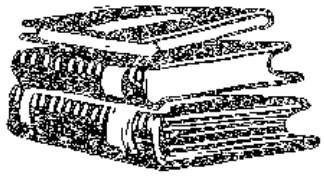

Books

Under Western Skies: Nature and History in the American West

By **Donald Worster,**
Oxford University Press, 1992. $27.50, cloth.

Reviewed by *Sara Wilson*

As a child growing up in the American West, it never occurred to me that I lived in a desert. I was raised in Utah in a city called Bountiful, a place true to its name—a more than steady population growth, a healthy standard of living, overflowing suburbs, and generous green lawns. Neither camels, nomadic tribes, nor even water rationing or conservation measures gave visible tribute to the scant 15 inch annual rainfall. By the 1970s it had become commonplace for cities in the American West to thrive regardless of the lack of water; a triumph of man, technology, and the modern age of reason over local environmental constraints. Downtown Bountiful gave tribute to this modern feat, as Main Street fountains flowed continuously through the summer months. In my experience, a lack of money, and not a lack of resources or water, was behind local deprivation.

The earliest views I held of my local environment were distorted, but this was to be expected given that my first perceptions were formed in suburban Bountiful. There was nothing more natural than Kentucky blue grass, tulips, peach trees, and sprinklers on hot summer afternoons. I reveled in nature, spending much of my childhood exploring and and watching its cycles on our overgrown irrigated acre. Yet more than anything in my backyard, I loved the dramatic and desolate wilderness areas in Utah. It was there that everything was rich in contrast and color, wild and pure, giving an overwhelming sense of freedom and well-being. I loved nature in all its abundance in Bountiful, and in the escape that the wilderness provided. I had the best of both worlds, but never saw the incongruities between the two. One was home where fruit and vegetables were grown. The other was camping, hiking, and a scenic backdrop, but not a place to live.

The first time I realized that the environment of the West was not as I had assumed was when I was eight years old. I had spent a whole day immersed in the deep, almost warm waters of Lake Powell, named after John Wesley Powell, early American frontiersman and explorer. A place where water stretches blue for miles in all directions only to meet immense red sandstone cliffs, stark and impressive under the clear desert sky. I was sitting along the edge in the evening glow, when my older sister returned from far down the shoreline. She brought back news of a giant cement structure just beyond the bluffs: the Glen Canyon Dam. One of nature's masterpieces was wrenched away from nature and changed into an electricity generating machine and water storage facility. I was heart-struck.

I can now appreciate how my deeply-held notions of nature in my native region have little to do with what existed two hundred years ago. Each time I return to Utah, I wonder, What is the environment of the American West? What do we know of the desert? How sustainable is current urban, suburban, and industrial life in the American West? Given that empires in the desert have a pattern of passing away after flourishing, are we on the same track? Can I expect to live in the region I call home with even a moderate urban lifestyle for the remainder of my life? And what about the generations beyond mine?

It is a rare gift to come across a book that gives insight and voice to issues and questions that are critical to your past, present, and future. *Under Western Skies* by Donald Worster is just that; a work bringing everything familiar about the American West into new perspective, filling in blind spots of history, giving a context for understanding the status quo, and providing a clear, thoughtful vision for the future. *Under Western Skies* provides an analysis of humans and the environment in the West, mapping carefully how each has shaped and influenced the other. In my view it is a landmark book about my native place, and about a region that has a strong impact on the rest of the modern world (California produce graces many a table more than one might suspect). Worster provides a survey of segments from our past, looks deeply into our values and myths, and makes sense of our rapid transition to a highly complex and mechanized social and economic structure. He then gives a detailed vision to help us move more sanely into the next century and beyond.

Consistent with his earlier work, *Dust Bowl*, Worster brings the romantic ideals and modern day struggles of the West back to the drawing table and re-writes them into a work unlike any history textbook to be found. *Under Western Skies* is readable and witty, yet rigorous and far-reaching, for Worster

takes on the task of bringing nature back into the history of a people who have no visible reason to live within their local ecological constraints.

Under Western Skies is true environmental history, focused on the American West but valuable to people of all regions. Worster provides insights to the ties between humans, the environment, and technology, all of which profoundly shaped the West—which in turn shaped the newly emerging American nation and the ecological choices we would make in this century. Subtitled "Nature and History in the American West," *Under Western Skies* is, refreshingly, not a linear or predictable account of humans exploiting and exploring the West, nor is it a dramatic summary of environmental ills and disasters. It is a series of essays, each of which is original and self-contained. For example, Chapter 3, "Cowboy Ecology," looks at the American myth of freedom and rugged individualism as shaped by pastoralism and ranching in the American West, and also delves into the ecological impacts of ranching. Chapter 7, "Grassland Follies: Agricultural Capitalism on the Plains," is particularly relevant to our work at The Land Institute. The two longest pieces, about the struggle in the Black Hills between industrial and tribal land use, and oil and natural resource development on the Alaskan frontier, were written especially for this book.

Two themes unify the essays of *Under Western Skies*. The first is human inconsistency, our uncanny ability to create and live in paradox. Worster repeatedly brings up our ability to work against our long-term interests out of no premeditated calculation, but out of a narrow frame of reference. Second, Worster accents the age-old questions of how humans live and survive in nature, giving example after example particular to the modern American West.

In the West, the legacy of myth and the persistence of our ill-informed history give us the momentum to carry on even as we threaten the environment. We have grand expectations concurrent with our short term interests, but not a realistic survey of what the region can sustain. The initial struggles faced by white settlers have been resolved for us, removed onto that brief but all too big space between the air-conditioned living room, the air-conditioned car, and the air-conditioned office. Our lack of perspective leaves us blind to the daily failings and grand oversights that degrade our ecosystems, our communities, and our values. Our ecosystem is slowly degraded, and its pieces are extracted, bought, and destroyed. If it were not for heavy subsidies, Imperial Valley would dry up and most extensive irrigation and water storage systems in history would clog up. Yet our interest in the pieces that we do find important is whittling away future options for supporting humans, or at least very many, in the West. Nature is resilient, but it also has a history of undermining even the most entrenched elites once they overreach themselves. The strength of *Under Western Skies* is in asking the troublesome, but hopeful question: Given our blindness, and given the damage already done, can we begin to understand this region and find ways of living in the West that can be sustained for thousands and thousands of years?

Worster answers with a shaky affirmative—yes, but we have a long way to go. The first step is creating a more inclusive, demystified history of our ancestors, and looking to the ideologies and values that brought us to where we are now. We have to be able to see imperialism as imperialism, not as "progress" or "the march of freedom"—to see the violent process by which the West was wrested away from its original inhabitants as not merely an inevitable part of the history of this continent. In Worster's mind, we need to keep only that which is noble from the white American tradition, and balance it with the insight of those who are native or have learned to be native to this place.

Starting this process is problematic for a people whose history emerged "out of the clouds of myth and romance." The history of the American West is still shrouded in ideologies and dreams that will not be easily given up. Our memory, and thus our history, is built around romance and conquest—bison, wild mustangs, cowboys, and pioneers, wrapped into a drama of struggles to own this land regardless of the wild environment and even wilder Indians. From the first rumors of gold, rich soil, and available land, there came about a belief that we belonged here. It was difficult to see that this was in fact not virgin untamed land, but had been shaped over thousands of years by the patterns and livelihoods of its prior inhabitants. In our minds the availability of wealth was symbolic of our destiny, and the open land went on forever in riches. But this was only if settlers looked westward, and not back to the belts of settlements behind them. The availability of resources gave rise to an almost transcendental belief in growth and entrepreneurialism. The same perceptions went on to lay the foundations for the central myth to arise from the American frontier—the agrarian myth of sturdy yeoman farmers living rationally and quietly from the land. It seemed as the human depravity and social injustice could be left behind in the wide open spaces and precious isolation of the West. Individual freedom could be expanded and democracies insured in such a vast land. Environmental constraints and early privations would disappear once the West was contained and put to good use by our European agriculture, cattle, technology, and science.

Less than two hundred years after the frontier opened, the romance, freedom, riches, and some would even venture the democracy paramount to the West have all but disappeared. We now know that

our early attempts and ambitions in ranching and agriculture have directly caused some of the most extensive environmental disruptions in recorded history. In the "dirty thirties," while rich Kansas soil was carried by the winds into the Atlantic Ocean, we watched bewildered; cursing and praying, but not questioning or changing our ways. The cowboys, the Indians, and the buffalo have become tame, or are too few in number to appear otherwise. Modern times are as distinct from the wild West as bison are from nuclear testing, and the change could be seen in one person's lifetime. In the modern West, wide open spaces stretch between a few densely populated oases that are absolutely dependent on the intensive management of one scarce and vital resource: water. In the late 1800s, historian Frederick Turner predicted that it would be impossible to conquer this new territory by old pioneer methods. The region required "expensive irrigation works, cooperative activity and capital beyond what a small farmer would have. The farmer in the arid regions of the West must be both a capitalist and a protegee of the government." A society built on massive, elaborate water managing systems would require hierarchical concentrations of wealth and power, rule by expertise, and dependence on bureaucracy.

Turner's vision is true, as I discovered at Lake Powell and have further come to see in my study of agriculture at The Land Institute. In the West, particularly in California, international agribusiness empires and bureaucratic command economies have developed around major irrigation projects, making individual farmers and small communities less than ever masters of their own fate. As Worster outlines in Chapter 6, "Hoover Dam: The Hydraulic Society," the chief political lesson of Hoover Dam is that the outcome of the domination of nature is a concentration of economic, social, and political power. Worster asks, "How could it be otherwise? Is it conceivable that a loose gathering of simple farmers could carry out such an engineering triumph? Or that a hundred little villages could achieve as much as the single focused energies of a Los Angeles elite?"

There is, Worster writes, an ecological basis for social and economic power. Without the managed Colorado River, Bud Antle, Inc., would soon be covered with desert dust. But as it stands, Bud Antle and fewer than 700 other farmers essentially own Imperial Valley, with a mere 72 of them owning more than half the land. Farm owners have become international food marketeers, thanks to the ongoing subsidies that guarantee water. The thousands of people who work the land, mostly Mexicans or Americans of Mexican ancestry, are poorly paid, giving one of the four leading agricultural producing counties in the U.S. a low average standard of living.

Worster gets at the fundamental paradox of the West in his examination of the "Western hydraulic society:" nature intensely controlled is no longer capable of offering a sense of freedom. We have become trapped in the very technology that we devised to master the world around us, and have developed a society and economy that force us to give up the freedom that kept us moving westward in the first place. The irrigating farmer learns, rushing from head gate to head gate, turning so many acre-feet a day into beans or alfalfa, that to regiment the river one must regiment oneself. And the regimentation extends far beyond the fields. Irrigators are subject to irrigation districts, privileged local elites, and technical experts. We are finding that the more control and efficiency we achieve in intensively managed nature, the more we are defeated. Twenty thousand miles of river use, storage (and consequent evaporation), more use, and more storage, as in the case of the Colorado River, is a sure recipe for degradation of water quality. It does not become more useful to more people, but less useful to fewer.

The Colorado River has not reached the sea in over thirty years, and in that time our technological domination of it has increased the alkalinity and salt content to the point where the water is becoming unfit to use, in cities and on farms alike. Western towns and industries built on the subsidy of hydraulic engineering may collapse if salinization trends continue. As Worster states, "the Colorado River might still one day reach the sea." The major changes in Western hydraulic society, says Worster, will most likely come not from our government, our social infrastructure, or even individuals: they are more likely to come from the environment. This is especially worth considering when the costs of water degradation coincide with economic hard times for individuals and the government. The urban West was built on federal subsidies for water and energy projects. As the national debt increases, are we sure that the money required to maintain these elaborate systems will continue?

We have not necessarily created a better world for ourselves after all these years of technological wizardry, claims Worster, for we know more and more about how to do things and less and less about what is worth doing. Finally, he explains, humans share the fate of their environment: "What has been done to the Colorado River has been done to the tourist that looks into the flat water backing up behind a dam like Hoover: he too in a sense has been conquered and manipulated, made to run here and there, made to serve as an instrument of nature." *Under Western Skies* makes it plain that "We have arrived at a day and age of complexity in this region when it is clear that neither a simple-minded nature fantasy nor a simple-minded greed will give us a future worth living."

Considerations for a Sustainable Society

In the Grassroots of Academe

Tonya Haigh

On a Sunday morning, Gail Lennon of Lookout, California, said to a room full of community leaders and academic leaders, "We need to send out a press release that says we, the women of rural grassroots organizations and the women of the universities, have proclaimed our unity." Her sentiment followed three days of academic papers, discussions, and strategy meetings which constituted the Fourth Conference of Rural/Farm Women in Agriculture, held in Davis, California, in June. Many women, including myself, felt the emerging sentiment that was voiced by Ms. Lennon, and agreed that the conference had sparked a dialogue that holds much potential. The question in all of our minds is, How can work in universities and work in grassroots organizations support and revolutionize each other?

The symposium, the theme of which was "A Symposium on Rural/Farm Women in Historical Perspective," brought together researchers from many areas, including agricultural history, rural sociology, feminist theory, demographics, literature, and economics, and provided a forum for presentations of academic papers and discussions. Sustainable agriculture was a uniting theme throughout the conference, including discussions of women's roles in sustainable agriculture and back-to-the-land movements, and also dialogue as to how community development which includes sustainable agriculture is a viable alternative that is consistent with the style and values of many rural women. Through the help of a Kellogg Foundation grant, the organizers were able to bring to California twelve women who are leaders in community grassroots organizations across the United States. Among the organizations represented by the twelve women were PrairieFire Rural Action, Natural Organic Farmer's Association, Passages, a Program for Victims of Domestic Violence and Sexual Abuse, League of Rural Voters, McClure River Valley Community Development Center, Women Involved in Farm Economics, and Sonlight Resources Institute. The women led one three-hour session, and were selected respondents at sessions throughout the weekend. They brought fiery commentary, true stories of success and struggle, and a charge for action to the three day symposium. It was these women who made it clear to me and many others the potential cooperative good we could do, and especially the potential help those in academics could be to those doing the hard work.

One of the themes that emerged from the weekend was of recognizing the responsibility of academics to further the good work of the grassroots leaders. The twelve women who graciously came to this conference gave the research that was being presented some real grounding. Everyone benefited from the interaction. I believe the twelve grassroots organizers benefited by gaining contacts, hearing new and useful information, and being recognized as change makers. The researchers were able to reaffirm the currency of their research. They also received suggestions for further research needs, and new people to contact. Yet the question of what bigger thing we can do lurked in our minds all weekend. How can this beneficial interaction expand to reach beyond the minority of involved people who are able to attend gatherings like this one?

One of the most important services the academic world can do for community organizers is to increase access to the array of grants and other financial help that is available. This is an incredibly simple and yet profoundly important link between people who regularly apply for grant money, and people who may have no experience in this area. One of the women that I met, for instance, had been operating her resource institute on volunteer labor and fundraising drives since 1986, and was not aware until just last year that many organizations and foundations exist that would be very interested in funding her. This kind of information is not automatically available to those who can use it, and in most cases it is very difficult for them to stumble across it. In addition, academics can learn the language and symbols of the funding sources and relate them to the needs and potentials of grassroots organizations. Therefore, people with connections who feel affinity with these organizations should seek them out with the knowledge to provide financial and grant-writing expertise.

Another potentially powerful link between change-makers is in the process and results of social research. Universities are full of researchers who earn their credits or their grades or their salaries by assembling and organizing raw data into information which is analytical, critical, and potentially extremely powerful to those who make community decisions. This information is often not returned in summarized and useful form to the people who contributed to it, and who could get a world of use out of it. Leaders of communities, often interviewed and studied in economic, political, and sociological studies, can use the results of such projects in educating their communities, planning, and influencing policy.

For instance, it is easy to think of how commu-

nity leaders would benefit from knowledge about who owns the farmland in that community and who is making decisions about that land. Women as landowners was a topic of study for more than one researcher at the symposium. Anne Effland and Denise Rogers of the U.S. Department of Agriculture presented interesting trends in ownership and usership of farm lands. They found that women do own farmland independently, and acquire that land through inheritance more often than men do. They found women often own smaller parcels of land than do men or partnerships, and they found women were less likely to operate lands they owned, or to make decisions about the operation on their lands. It should be of highest priority that this kind of information is returned to the people interviewed and others who need it.

In addition, people who are often the subjects of academic studies may know very well what sort of information will be useful to their communities. They not only should have a voice in designing research projects, but could, if given the space and system, suggest new projects for undergraduate and graduate students. Students always benefit from the experience of interviewing, accounting, or library work, as well as benefiting from exposure to a real organization that is dealing with real people.

I heard many of the women at this conference express appreciation for the chance to find out what kinds of research people are doing. Conferences such as these are not the only means of communicating records of similar research in progress across the country or around the world—there are many academic journals published with the expressed interest of sharing research. But are they made available to centers of grassroots activity? Are they known among mainstream America? Are they accessible? Are they in language that is understandable, or full of jargon? These are serious questions that people who publish research and people who manage such publications need to consider and act upon if they are interested in their research affecting more than a small readership. Many magazines and even telecommunications projects exist to share research, but women at the conference could think of none that were widely accessible and tailored to their purpose. Thus, they talked about the possibilities of a setting up a network, either through computer modem or newsletter. One of the results of the conference is a mass mailing to everyone who attended, which would include a mailing list and a place for messages or ideas. In addition, selected conference papers will be published in a special volume of Agricultural History, published at the University of California at Davis.

The benefits of this idea-sharing were obvious at the conference, and make the potential of a medium for communication seem enormous. Between sessions, at meals, and later in the hotel, studies and personal stories were translated by informal groups into brainstorms of suggestions for further research, for plans of action, and for who to contact and what to ask next. One of the speakers, in fact one of the rural community organizers, ended up being the inspiration for a new line of action for Barbara Oliver of Sonlight Resources Institute. Julie Rawson's talk about community supported farms led Barbara to see this as "the piece to a puzzle we have been thinking about for a long time." Barbara has begun work organizing a community supported agriculture project which will involve local farmers and rural non-farmers. She hopes to begin the project in September to be ready for the beginning of the growing season in February.

One idea that may give this movement of cooperation momentum is the possibility of further interviews with the grassroots women and the publication of a book aimed both at researchers of rural women and grassroots organizations, and at organizers of grassroots efforts themselves. The book would have the intention of publicizing some of the amazing works that women in rural communities are currently doing as models for other efforts, and for pointing out what these leaders need and where they can get help. In addition, it would have the potential of raising awareness in the academic community as to what kinds of rural efforts exist and how they can help them. It might also be an excellent supplementary text for classes in women's studies, rural sociology, peace studies, environmental education, and other subjects.

There are millions of ways that community leaders and academic leaders can add to each other's efforts. One of the most productive ways we can discover our potentials is to continue coming together to think and talk and plan. Then we can act.

Tonya Haigh

Microscopic Excesses of the Information Age

Ted Schuur

Manifest Destiny: the sweeping effect of the North American landscape that molded the European mindset in its delicate infancy on the wooded shores of New England, as the tiny trickle of pilgrims swelled to a torrential flood of immigrants to inundate the land. Manifest Destiny: the self-proclaimed drive with the hubris to claim the inherent right to ownership of lands unseen by European eyes. Our Manifest Destiny represents the force which directs us in our quest not only to discover, but to exert control and ownership of these wild lands. It has brought us from coast to coast, to the face of the moon, and to the ends of the Earth; now in the year 1992 we stand again on the edge of unfamiliar and uncharted territory with the same vision before us. Not the sandy shores of some deserted island, not the craggy craters of a new planet; instead the boundary lies within—the fluid membrane that dynamically shapes the outline of the nucleus of the living cell.

Contained within the cell nucleus is deoxyribonucleic acid, DNA, the macromolecule that by the unique nature of its non-repetitive pattern of chemical building blocks inscribes the information that controls all of the products of living cells. Information coded in DNA informs the cell how to construct the protein enzymes required to sustain life. Conversely, DNA relies completely on signals from the cell to instruct it as to which set of information is of value at each point in time.

Our Manifest Destiny proclaiming the right to ownership of unclaimed territory has led to a groundbreaking petition by the National Institute of Health for the patent rights over information "read" from hundreds of segments of DNA from the human genome.[1] It is important to know that the act of "reading" the code in DNA does not explicitly instruct scientists of the function of that particular byte of information. At this point we have only a vague understanding of the subtle and complex methods that the cell uses to translate and understand that information, and the act of "reading" merely leaves us with a book of strange hieroglyphics and a blind search for its Rosetta stone.

Once again, the pattern of Western domination repeats as we survey the vast, unclaimed territory of the human genome with grand visions of demarcation and ownership. What does it mean that we are about to take the collective information of the human species and divide it among a few individuals? Who believes that they have the proper knowledge and right to own this vital information? To really understand the validity of this novel claim we must first understand the history and implications behind the ideas of property rights and ownership.

The idea of property rights and ownership had basis in the writings of John Locke. His thinking flourished in England during a period of enclosure, when village common lands were fenced off and claimed by individuals. Enclosure resulted in the increased efficiency in the exploitation of land in terms of production. Increased abundance was a direct result of human intervention and labor, so as a spokesperson for the trends of his time Locke sought to define the rights that people had over the products of their work in order to promote production. "As much Land as a Man Tills, Plants, Improves, Cultivates and can use the Product of, so much is his Property."[2] Locke envisioned the idea of ownership embodied in the land, as it was the source of all material wealth. But ownership does not come from wild land, only from land that has been improved by humans.

What is borne in this anthropocentric idea of improvement? Improvement of the land can come only after a level of understanding and knowledge is attained. How can one improve the land except to first understand the working of the natural cycles? From that knowledge, cues are taken which instruct actions that have potential for improvement. Knowledge is a dynamic process flowing in both directions from observer to observed in a cycle that can inform future action. Just as the DNA informs the cell, listening to the message of the cell to learn which part of the vast store of information is important at a given time, we must also listen to what is around us in order to know which actions may be appropriate.

How does this dialectical knowledge apply when it comes to the ownership of the biological information found within the molecules of our bodies? Can we know enough of this new territory to claim the right of ownership? "Everyone can make... good sense locally, if the affection, the scale, the knowledge, the tools and the skills are right"—according to Wendell Berry, the scale at which one chooses to act affects the ability to know and to act properly.[3] Berry goes on to say that the right scale of work excludes working at the global scale, since we cannot know effectively at a global scale. The need for generalization is too great at this level and will not work over time as the lack of knowledge becomes apparent. This thought also applies to knowing at the molecular level. Is it possible for us to know accurately enough at the sub-microscopic level so that we can claim ownership? Werner Heisenberg advanced the Uncertainty Principle, the idea that at the atomic level one can know either the position of a particle or its velocity, but that one cannot know both simultane-

Ted Schuur, acting locally

ously. His principle has direct impact on the importance of correct scale, as it can generally be ignored at the scale of our everyday lives, but is glaringly apparent at the atomic level and affects everything that we see and do on that level.

We do know enough to know that we cannot visualize this world in terms of our everyday lives. This is a world where all molecules are vibrating and oscillating in an atomic dance where the music never stops. Time ceases to appear continuous; electrons are either here or there, there is no in-between. Try to picture this reality in your everyday life as you call to your dog across the field and the next thing you see is that he is by your side! If we can hardly begin to imagine this world, how can we know it enough to try to claim that we own it?

Accuracy of knowing relates to the scale of thought, so which scale becomes most appropriate? Our knowledge is intimately linked to our physical nature; we subconsciously measure by the distance we walk in a day, the number of heartbeats in a minute, the volume of air in a lungful. These are the cues to which our thoughts are attached and have the finest tuning. Perhaps we will know to the finest possible degree of accuracy only when the scale we choose relates directly to our physical presence.

These considerations seriously question the idea of knowing and owning on the molecular level. From the time of Locke, ownership was gained by improvement of the land. Later, as it became evident that cultivating the products of the mind could be as laborious and as valuable as working the land, and needed equal protection, the same ideas diverged from their roots in the land and were applied in defining the right to ownership of ideas. Locke's ideas of ownership manifest themselves in the U.S. patent code, which states, "Whoever invents or discovers any new or useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent."[4] This definition tried to capture the value of intellectual labor, in contrast to the physical labor that Locke sought to protect. Just as wild lands were not protected by Locke, the court system of the United States has recognized that discovery or description does not necessarily imply or deserve ownership— as in the case of plant breeders, who have been denied full patent rights to novel varieties specifically because the methods used did not employ novel ideas, but relied on traditional methods instead. No improvement was made in the realm of ideas, just as wild lands have not been improved by humans. In this same vein the patent filed by the NIH does no more than describe; it is lacking of all knowing and is in no way the improvement or creation of anything new. Thus ownership should be denied.

In our society there is an incredible wealth of information available to those willing and able to pay. This patent is a symbol of the excesses of the information age, going as far as to take the ancient information held collectively by the human species and divide it up among the highest bidders. Just as the Homestead Act of 1862 sectioned vast parcels of land without regard to the underlying landscape, here we are with the potential to snip up the information contained in the human genome and give it away without truly knowing what is there. Can we afford the same ruin to ourselves that we inflicted on the lands of the West, where the owners of the land lacked the knowledge of its requirements?

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Learning from Each Other

Dana Jackson

On June 4, 1992, Edith Stokey, Associate Academic Dean, told the commencement audience at Harvard's Kennedy School of Government the secret of the school's success. She said that it recruits the brightest, most capable and accomplished people and keeps faculty and administrators out of their way as much as possible to allow them to learn from each other. Then, when the students leave the university and become successful, Harvard takes credit for their achievement.

The Land Institute's intern program can be described in a similar way. We recruit idealistic student interns with good academic records, put them together in class and field to learn from each other, and then send them out to become leaders in sustainable agriculture. When we later hear about their good work, we proudly point out that they are former Land Institute interns, implying our influence on their success.

Having returned to The Land Institute after a year's leave of absence to attend the mid-career program at Harvard's Kennedy School of Government, I am excited about working with the 1992 interns: Tonya, Chad, Emily, Corey, Ted, Supi, Darryl and Sara. Some of the aspects of the Kennedy School that I most enjoyed are present at The Land, and I look with new appreciation at the intern program that has evolved here.

The KSG mid-career program recruits people who have been working in the public interest, either as elected representatives in some level of government, civil service employees in government agencies and departments, or as staff in non-profit organizations and institutions dedicated to influencing public policy. They come from posts in the Coast Guard, the Central Intelligence Agency, the Environmental Protection Agency, Departments of State, Commerce, and Defense; ministries of finance, communications, and human services in Kenya, Israel, Bolivia, Germany, and many other nations. They have worked in state budget offices, water offices, and agencies for housing and human services. Several of my classmates had been elected to city councils, state legislatures and provincial governments. Many others directed non-profit advocacy organizations working to change public policy in housing, health care, and the environment. Some worked for international relief agencies and the United Nations.

"Put all together and stir" was the recipe for learning at the Kennedy School. In most classes the professor expected the students to teach each other. Even well-known professors such as Robert Reich, political economist, commentator on National Public Radio's "Market Place," and now a key advisor to Presidential candidate Bill Clinton, conducted a very participatory class. He used the case study method for his course called Governing in a Democracy:

Corey, Jake, Darryl, Emily, Ted, Supi, and Tonya in the Flint Hills, on a tour of Pete Ferrell's ranch.

Organizational Management and Political Strategy, and the experience of class members illustrated and substantiated his main points.

The Kennedy School encourages cooperative problem solving (except during exams) rather than individual competition, and professors urge students to form small study groups. I worked all the problems in my "Microeconomics for Public Policy" and "Policy Analysis for Managers" classes in study groups. My study group for Reich's course analyzed case studies before class, and in "Institutional Design" we met to critique one another's final papers.

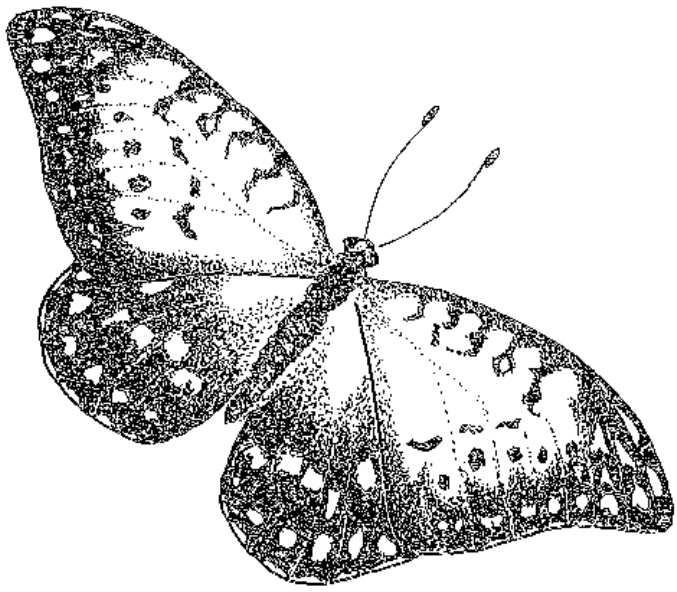
Outside of class, speakers at public forums and brown-bag lunches provided additional intellectual stimulation. Public discourse on politics, international development, race relations, gender issues, the dissolution of Communist states, etc., occurred every week.

So, how is The Land's intern program analogous to the mid-career program?

Each year we appreciate the academic and geographical diversity among the interns. They are recent college graduates with majors in biology, religion, history, economics, and other fields, from small liberal arts colleges and large state universities across the U.S. (and in Germany and India the last two years). They want to work for the public interest by promoting natural resource conservation, ecological agriculture, and healthy communities. They are concerned about racial and gender equality and democratic processes. We "put them all together and stir" in warm-ups and class discussions. As in a small study group, all the eight to ten members need to participate, and each group works out processes to respect different points of view while honestly responding to them. In work meetings they practice group problem solving, finding ways to accomplish enormous amounts of work with a few people. The educational program is enhanced by visits from scholars and activists. In one week this summer, Robert Proctor from Penn State came to a warm-up and discussed books he has written in the field of science, technology, and human values, Valli Seshan talked about social work in India and other nations, and Richard Austin discussed the sabbath and how creativity comes of rest from hard work.

The one-year mid-career program at the Kennedy School is unlike regular graduate programs. It is well designed for individuals who need time off from their jobs to rekindle their idealism, stimulate their intellect and imagination, explore new ways to get work done, and interact with new associates. The Land's intern program gives recent college graduates a year off from the conventional career track, providing the opportunity to study topics outside their majors and learn without the pressure of tests and grades, to write papers that get published instead of being read by one professor, a chance to share idealism, to get "hands on" physical work experience, and develop important friendships. No collegiate academic program or alternative educational program offers the same combination to this age group.

What a privilege it is to participate in both programs!



(Monsoon as Metaphor, cont'd from p. 14)

This is just the beginning of a difficult but fascinating area of enquiry, and at this stage I have more questions than answers. The challenge of agriculture to both sustain human communities and restore ecosystems requires persistence, imagination, and intimacy of place: a challenge that pertains not only to the grasslands of North America but to the monsoon forests of Asia, and indeed, all regions of the world.

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Sex, Economy, and Community

Wendell Berry

> Under cosmopolitanism, if it comes, we shall receive no help from the earth. Trees and meadows and mountains will only be a spectacle, and the binding force that they once exercised on character must be entrusted to Love alone. May Love be equal to the task!
>
> But the imperialist is not what he thinks or seems. He is a destroyer. He prepares the way for cosmopolitanism, and though his ambitions may be fulfilled, the earth that he inherits will be grey.
>
> "It all turns on affection now," said Margaret. "Affection. Don't you see?"
>
> E.M. Forster, *Howard's End* (1910)

In the government-sponsored quarrel between Clarence Thomas and Anita Hill, public life collided with private life in a way that could not have been resolved and could only have been damaging. The event was depressing and fearful both because of its violations of due process and justice, and because it was an attempt to deal publicly with a problem for which there is no public solution. It embroiled the United States Senate in the impossible task of adjudicating alleged offences which occurred in private, of which there were no witnesses, and of which there was no evidence. If the hearing was a "lynching," as Clarence Thomas said it was, that was because it dealt a public punishment to an unconvicted and unindicted victim. But it was a peculiar lynching, all the same, for it dealt the punishment equally to the accusor. It was not a hearing, much less a trial; it was a story-telling contest that was not winnable by either participant.

Its only meaning and its only result was damage to all participants, and to the nation. Public life obviously cannot be conducted in that way, and neither can private life. It was a public procedure that degenerated into a private quarrel. It was a private quarrel that became a public catastrophe.

Sexual harrassment, like most sexual conduct, is extremely dangerous as a public issue. A public issue, properly speaking, can only be an issue about which the public can confidently know. Because most sexual conduct is private, occurring only between two people, there are typically no witnesses. Apart from the possibility of a confession, the public can know about it only as a probably unjudgeable contest of stories. (In those rare instances when a sexual offence occurs before reliable witnesses, then, of course, it is a legitimate public issue.)

Does this mean that sexual conduct is only private in its interest and meaning? It certainly does not. For if there is no satisfactory way to deal publicly with sexual issues, there is also no satisfactory way to deal with them in mere privacy. To make sense of sexual issues, or of sex itself, a third term, a third entity, has to intervene between public and private. For sex is not, and cannot be, any individual's "own business;" nor is it merely the private concern of any couple. Sex, like any other necessary, precious, and volatile power, commonly held, is everybody's business. For sexual problems and potentialities that have a more than private interest, what is needed is common or shared forms and solutions that are not, in the usual sense, public.

The indispensable interest, and the indispensable form, intervening between public and private interests, is that of community. The concerns of public and private, republic and citizen, necessary as they are, are not adequate for the shaping of human life. Community alone, as principle and as fact, can raise the standards of local health (ecological, economic, social, and spiritual) without which the other two interests will destroy one another.

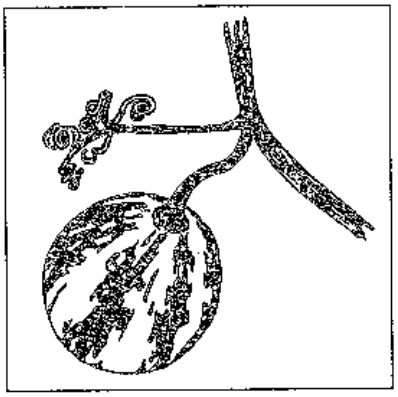
By community, I mean the commonwealth and common interests, commonly understood, of people living together in a place, and wishing to continue to do so. To put it another way, it is a locally understood interdependence of local people, local culture, local economy, and local nature. Lacking the interest of or in such a community, private life becomes a sort of reserve in which individuals defend their "right" to act as they please and attempt to limit or destroy the "rights" of other individuals to act as they please.

A community identifies itself by an understood mutuality of interests. But it lives and acts by the common virtues of trust, goodwill, forbearance, self-restraint, compassion, and forgiveness. If it hopes to continue long as a community, it will wish to—and will have to—encourage respect for all its members, human and natural. It will encourage respect for all stations and occupations. Such a community has the power—

Wendell Berry and Darryl Short

not invariably, but as a rule—to enforce decency without litigation. It has the power, that is, to influence behavior. And it exercises this power, not by coercion or violence, but by teaching the young, and by preserving stories and songs that tell (among other things) what works and what does not work in a given place.

Such a community is (among other things) a set of arrangements between men and women. These arrangements include forms of courtship, marriage, family structure, divisions of work and authority, responsibility for the instruction of children and young people. These arrangements exist, in part, to reduce the volatility and the danger of sex—to preserve its energy, its beauty, and its pleasure; to preserve and clarify its power to join, not just husband and wife to one another, but parents to children, families to the community, the community to nature; and to assure, so far as possible, that the inheritors of sexuality, as they come of age, will be worthy of it.



But the life of a community is more vulnerable than public life. A community cannot be made or preserved apart from the loyalty and affection of its members and the respect and good will of the people outside it. And for a long time these conditions have not been met. As the technological, economic, and political means of exploitation have expanded, communities have been more and more victimized by opportunists outside themselves. And as the salesmen, saleswomen, advertisers, and propagandists of the industrial economy have become more ubiquitous and more adept at seduction, communities have lost the loyalty and affection of their members. The community, wherever you look, is being destroyed by the desires and ambitions of both private life and public life, which, for want of the intervention of community interests, are also destroying one another. Community life is by definition a life of cooperation and responsibility. Private life and public life, without the disciplines of community interest, necessarily gravitate toward competition and exploitation. As private life casts off all community restraints in the interest of economic exploitation or ambition or self-realization or whatever, the communal supports of public life are undercut, and public life becomes simply the arena of unrestrained private ambition and greed.

As our communities have disintegrated from external predation and internal disaffection, we have changed from a society whose ideal of justice was trust and fairness among people who knew each other into a society whose ideal of justice is public litigation, breeding distrust even among people who know each other.

Once it has shrugged off the interests and claims of the community, the public language of sexuality comes directly under the influence of private lust, ambition, and greed, and so becomes inadequate to deal with the real issues and problems of sexuality. The public dialogue degenerates into a stupefying and useless contest between so-called "liberation" and so-called "morality." The real issues and problems, as they are experienced and suffered in people's lives, cannot be talked about. The public language can deal, howbeit awkwardly and perhaps uselessly, with pornography, sexual hygiene, contraception, harrassment, rape, etc. It cannot talk about respect, responsibility, sexual discipline, fidelity, or the practice of love. "Sexual education," as a public function, carried on in this public language, is and can only be a dispirited description of the working of a sort of anatomical machinery—a sexuality that is neither erotic nor social nor sacramental, but a cold-blooded, abstract procedure that is finally not even imaginable.

The public discussion of sexual issues has thus degenerated into a poor attempt to equivocate between private lusts and public emergencies. Nowhere in public life (that is, in the public life that counts: the discussions of political and corporate leaders) is there an attempt to respond to community need in the language of community interest.

In fact, there is no one to speak for the community interest except those people who wish to adhere to community principles. The community, in other words, must speak in its own interest. It must learn to defend itself. And in its self-defense it may use the many powerful arguments provided for it by the failures of the private and public aims that have so nearly destroyed it.

The defenders of community should point out, for example, that for the joining of men and women there need to be many forms that only a community can provide. If you destroy the ideal of the gentle man, and remove from men all expectations of courtesy and consideration toward women and children, you have prepared the way for an epidemic of rape and abuse. If you depreciate the sanctity and solemnity of marriage, not just as a bond between two people, but as a bond between those two people and their forebears, their children and their neighbors, then you have prepared the way for an epidemic of divorce, child neglect, community ruin, and loneliness. If you destroy the economies of household and community, then you destroy the bonds of mutual usefulness and practical dependence without which the other bonds will not hold.

If these and all other community-made arrangements between men and women are removed; if the only arrangements left between them are those of sex and sexual politics, instinct and polity without culture, then sex and politics are headed, not only toward many kinds of private and public suffering, but toward destruction of justice, as in the confrontation of Clarence Thomas and Anita Hill.

* * *

It is certain, as I have said, that communities are destroyed both from within and from without: by internal disaffection and external exploitation. It is certain too that there have always been people who have become estranged from their communities for reasons of honest difference or disagreement. But it can be argued that community disintegration typically is begun by an aggression of some sort from the outside, and that in modern times the typical aggression has been economic. The destruction of the community begins when its economy is made, not dependent (for no community has ever been entirely independent), but subject to a larger external economy. As an example, we could probably do no better than the following account of the destruction of the local wool economy of the parish of Hawkshead in

the Lake District of England:

> The... reason for the decline of the customary tenant must be sought in the introduction of machinery towards the end of the eighteenth century, which extinguished not only the local spinning and weaving, but was also the death-blow of the local market. Before this time, idleness at a fellside farm was unknown, for clothes and even linen were home-made, and all spare time was occupied by the youths in carding wool, while the girls spun the "garn" with distaff and wheel.... The sale of the yarn to the local weavers, and at the local market, brought important profits to the dalesman, so that it not only kept all hands busy, but put money in his pocket. But the introduction of machinery for looms and for spinning, and consequent outside demand for fleeces instead of yarn and woven material, threw idle not only half of the family, but the local hand-weavers, who were no doubt younger sons of the same stock. Thus idleness took the place of thrift and industry among a naturally industrious class, for the sons and daughters of the 'statesmen, often too proud to go out to service, became useless encumbrances on the estates. Then came the improvement in agricultural methods [that is, technological innovations], which the 'statesman could not afford to keep abreast of.... What else could take place but that which did. The estates became mortgaged and were sold, and the rich manufacturers, whose villas are on the margin of Windermere, have often enough among their servants the actual descendants of the old 'statesmen, whose manufactures they first usurped and whose estates they afterwards absorbed.[1]

This paragraph sets forth the pattern of industrial exploitation of a locality and a local economy, a pattern that has prevailed for two hundred years. The industrialization of the eastern Kentucky coal fields early in the present century, though more violent, followed this pattern exactly.[2] A decentralized, fairly independent local economy was absorbed and destroyed by an aggressive, monetarily powerful outside economy. And like the displaced farmers, spinners, and weavers of Hawkshead, the once-independent mountaineers of eastern Kentucky became the wage-earning servants of those who had dispossessed their parents, sometimes digging the very coal that their families had once owned and had sold for as little per acre as the pittance the companies paid per day. By now, there is hardly a rural neighborhood or town in the United States that has not suffered some version of this process. The same process is destroying local economies and cultures all over the world.

The industrial revolution has thus made universal the colonialist principle that has proved to be ruinous beyond measure: the assumption that it is permissible to ruin one place or culture for the sake of another. Thus justified or excused, the industrial economy grows in power, and thrives on its damages to local economies, communities, and places. And the politicians and bureaucrats who measure the economic prosperity of their nations have judged according to the burgeoning wealth of the industrial interests, not according to the failure of small local economies or the reduction and often hopeless servitude of small local people. The self-congratulation of the industrialists and their political minions has continued unabated to this day. And yet it is a fact that the industrialists of Hawkshead, and all those elsewhere since, have lived off the public, just as surely as do the despised clients of "welfare." It is a public of industrially destroyed communities that the industrialists live off of—a destruction that the industrialists have not compensated for by their ostentatious contributions to the art, culture, and education of the professional class, or by their "charities" to the poor. Nor is this state of things ameliorated by efforts to enable a local population to "participate" in the global economy, by "education" or any other means. It is true that local individuals, depending on their capital, intelligence, cunning, or influence, may be able to "participate" to their apparent advantage, but local communities and places can "participate" only as victims. The global economy does not exist to help the communities and localities of the globe. It exists to siphon the wealth of those communities and places into a few bank accounts. To this economy, democracy and the values of the religious traditions mean absolutely nothing. And those who wish to help communities to survive had better understand that a merely political freedom means little within a totalitarian economy.

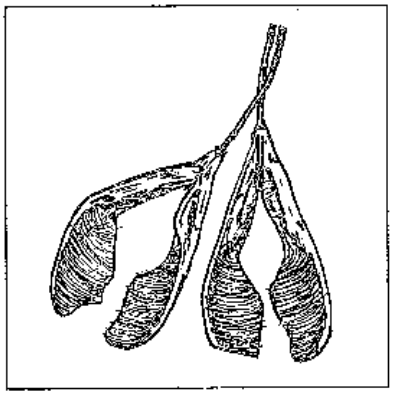
The situation in the wool economy of Hawkshead at the end of the eighteenth century was the same as that which, a little later, caused the brief uprising of those workers in England who were called Luddites. These were people who dared to assert that there were needs and values that justly took precedence over industrialization; they were people who rejected the determinism of technological innovation and economic exploitation. In them, the community attempted to speak for itself and defend itself.

The Luddites revolted not only against their own economic oppression but also against the poor quality of the machine-work that had replaced them. And though they destroyed machinery, they "abstained from bloodshed or violence against living beings, until in 1812 a band of them was shot down by soldiers..." Their movement was suppressed by "severe repressive legislation" and by "many hangings and transportations."[3]

The victory of industrialism over Luddism was overwhelming and unconditional; it was undoubtedly the most complete, significant, and lasting victory of modern times. And so one must wonder at the intensity with which any suggestion of Luddism still is feared and hated. To this day, if you say you would be willing to forbid, restrict, or reduce the use of technological devices in order to protect the community, or the good health of nature on which the community depends, you will be called a Luddite, and it will not be a compliment.

Thus technological determinism has triumphed. By now the rhetoric of technological determinism has got thoroughly mixed with the rhetoric of national mysticism, so that a political leader may confidently say that it is "our destiny" to go to the Moon or Mars or wherever we may go to the profit of those who will provide the transportation. Because this "destiny" has become the all-shaping superstition of our time, and is therefore never debated in public, we have difficulty in seeing that the triumph in technological determinism is the defeat of community. But it is a fact that in both private conversation and public dialogue the community has neither status nor standing from which to plead in its own defense.

The triumph of the industrial economy is the fall of community. But the fall of community reveals how precious and how necessary community is. For when community falls, so must fall all the things that only community life can engender and protect: the care of the old, the care and education of children, family life, neighborly work, the handing down of memory, the care of the earth, respect for nature and the lives of wild creatures. All of these things have been damaged by the rule of industrialism, but of all the damaged things probably the most precious and the most damaged is sexual love. For sexual love is the heart, the nucleus, of community life. Sexual love is the force that, in our bodily life, connects us most intimately to the Creation, to the fertility of the world, to farming and the care of animals. It brings us into the dance that holds the community together and joins it to its place.



In dealing with community, as in dealing with everything else, the industrial economy goes for the nucleus. It does this because it wants the power to cause fundamental change. To make sex the preferred bait of commerce may seem merely the obvious thing to do, once greed is granted its now conventional priority as a motive. But this could happen only after a probably instinctive sense of the sanctity and dignity of the body—the sense, as the Bible puts it, of having been "fearfully and wonderfully made" or of having been made "a living soul"[4]—had been destroyed. Once this ancient reticence had been broken down, then the come-on of the pimp could be instituted as the universal spiel of the marketplace; everything could be sold on the promise of instant, innocent sexual gratification, "no strings attached." Sexual energy cannot be made publicly available for commercial use—that is, prostituted—without destroying all of its communal or cultural forms: forms of courtship, marriage, family life, household economy, and so on. And, like the industrialization of work, the commercialization of sex leads straight to the exclusion of children from the lives of adults. The devaluation of sexuality, like the devaluation of a monetary currency, destroys its correspondence to or with other values.

In the wake of the Thomas-Hill catastrophe in Washington, *The New York Times Sunday Magazine* contained a skin lotion advertisement which displayed a photograph of the naked torso of a woman. From a feminist point of view, this headless and footless body represents the sexual ideal of the worst sort of man: a woman who cannot think and cannot escape. From a point of view somewhat more comprehensive, the point of view of community, it represents also the commercial ideal of the industrial economy: the completely seducible consumer, unable either to judge or to resist.

The headlessness of this lotionable lady suggests also another telling indication of the devaluation of sexual love in modern times, and that is the gravitation of attention from the countenance, especially the eyes, to the specifically sexual anatomy. The difference, of course, is that the countenance is both physical and spiritual. There is much testimony to this in the poetic tradition and elsewhere. Looking into one another's eyes, lovers recognize their encounter as a meeting, not merely of two bodies, but of two living souls. In one another's eyes, moreover, they see themselves reflected, not narcissistically, but as separate and small, far inferior to the creature that they, together, make.

In the poetry that I know, the most graceful and the richest testimony to the power of the eyes is in Act III, Scene ii, of *The Merchant of Venice*, where Portia says to Bassanio:

> Beshrew your eyes,
> They have o'erlook'd me and divided me,
> One half of me is yours, the other half yours,—
> Mine own I would say: but if mine then yours,
> And so all yours...

Portia is no headless woman. She is the brightest, most articulate character in the play. Witty and charming as these lines are, they are not frivolous. They attest to the sexual and the spiritual power of a look, which has just begun an endless conversation between two living souls. This speech of hers is as powerful as it is because she knows exactly what she is doing. What she is doing is giving herself away. She has entered into a situation in which she must find her self by losing it. She is glad, and she is frightened. She is speaking joyfully and fearfully of the self's suddenly irresistible wish to be given away. And this is an unconditional giving, upon which, she knows, time and mortality will impose their inescapable conditions; she will have remembered the marriage ceremony with its warnings of difficulty, poverty, sickness, and death. There is nothing "safe" about this. This love has no place to happen except this world, where it cannot be made safe. And this scene finally becomes a sort of wedding, in which Portia says to Bassanio: "Myself, and what is mine, to you and yours / is now converted.... I give them with this ring..."

There is no "sexism" or "double standard" in this exchange of looks and what it leads to. The look of which Portia speaks can have had such power only because it answered a look of hers; she has, in the same moment, "o'erlook'd" Bassanio. She is not speaking as a woman submitting to the power of a man, much less to seduction. She is speaking as one of a pair who are submitting to the power of a redemptive love. Responding to Portia's pledge of herself to him, Bassanio cannot say much; he is not so eloquent as she, and his mind has become "a wild of nothing, save joy." He says only:

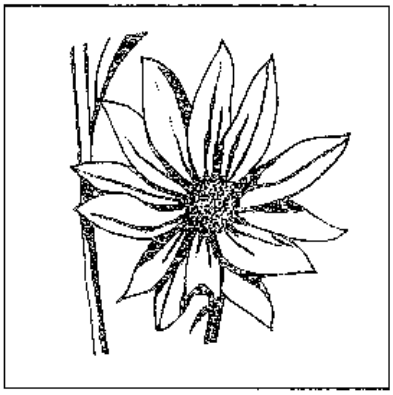
> when this ring
> Parts from this finger, then parts life from hence,—
> O then be bold enough to say Bassanio's dead!

But that is enough. He is saying—as his actual wedding will require him to say—that he will be true to Portia until death. But he is also saying, as she has said, that he is dead to his old life and can now live only in the new life of their love. He might have said, with Dante, "Of a surety I have now set my feet on that point of life, beyond the which he must not pass who would return."[5]

This is a play about the precedence of affection and fidelity over profit, and so it is a play about the order of community. Lovers must not, like usurers, live for themselves alone. Finally, as this play suggests, they must turn from their gaze at one another back toward the community. If they had only themselves to consider,

lovers would not need to marry, but they must think of others and of other things. They say their vows to the community as much as to one another, and the community gathers around them to hear and to wish them well, on their behalf and on its own. It gathers around them because it understands how necessary, how joyful, and how fearful this joining is. These lovers, pledging themselves to one another "until death," are giving themselves away, and they are joined by this as no law or contract could ever join them. Lovers, then, "die" into their union with one another as a soul "dies" into its union with God. And so here, at the very heart of community life, we find, not something to sell as in the public market, but this momentous giving. If the community cannot protect this giving it can protect nothing—and our time is proving that this is so.

We thus can see that there are two kinds of human economy. There is the kind of economy that exists to protect the "right" of profit, as does our present public economy; and this sort of economy will inevitably gravitate toward protection of the "rights" of those who profit most. Our present public economy is really a political system that safeguards the private exploitation of the public wealth and health. The other kind of economy exists for the protection of gifts, beginning with the "giving in marriage," and this is the economy of community, which now has been nearly destroyed by the public economy.



And there are, unsurprisingly, two kinds of sexuality that correspond to the two kinds of economy. The sexuality of community life, whatever its inevitable vagaries, is centered on marriage, which joins two living souls as closely as, in this world, they can be joined. This joining of two who know, love, and trust one another brings them in the same breath into the freedom of sexual consent and into the fullest earthly realization of the image of God. From their joining other living souls come into being, and with them great responsibilities that are unending, fearful, and joyful. The marriage of two lovers joins them to one another, to forebears, to descendants, to the community, to Heaven and Earth. It is the fundamental connection, without which nothing holds, and trust is its necessity. Once this trust is broken, all the suspicion in the world cannot compensate.

Our present sexual conduct, having "liberated" itself of the several trusts of community life, is public, like our present economy. It has forsaken trust, for it rests upon the easy giving and breaking of promises. And having forsaken trust, it has predictably become political. In private life, as in public, we are attempting to correct bad character and low motives by law and by litigation. "Losing kindness," Lao Tzu said, "they turn to justness."[6] The superstition of sexual anger, as of other kinds of anger, is that somewhere along the trajectory of any quarrel a tribunal will be reached which will hear all complaints and find for the plaintiff; the verdict will be that the defendant is entirely wrong, the plaintiff entirely right and entirely righteous. This of course is not going to happen. And because such "justice" cannot happen, litigation is only a way of prolonging itself. The difficulty is that marriage, family life, friendship, neighborhood, and other personal connections do not depend exclusively or even primarily on justice—though, of course, they all must try for it. They depend on trust, patience, respect, mutual help, forgiveness—in other words, the practice of love, as opposed to the mere feeling of love.

Because of our determination to separate sex from the practice of love in marriage and in family and community life, our public sexual morality is confused, sentimental, bitter, complexly destructive, and hypocritical. It begins with the idea of "sexual liberation:" whatever people desire is "natural" and all right, men and women are not different but merely equal, and all desires are equal. If a man wants to sit down while a pregnant woman is standing, or walk through a heavy door and let it slam in a woman's face, that is all right. Divorce on an epidemic scale is all right; child abandonment by one parent or another is all right; it is regrettable but still pretty much all right if a divorced parent neglects or refuses to pay child support; promiscuity is all right; adultery is all right. Promiscuity among teen-agers is pretty much all right, for "that's the way it is;" abortion as birth control is all right; the prostitution of sex in advertisements and public entertainment is all right. But then, far down this road of freedom, we decide that a few lines ought to be drawn. The sexual abuse of children, we wish to say, is not all right, nor is sexual violence, nor is sexual harrassment, nor is pregnancy among unmarried teen-agers. We are also against venereal diseases, the diseases of promiscuity, though we tend to think that they are the government's responsibility, not ours.

In this cult of liberated sexuality, "free" of courtesy, ceremony, responsibility, and restraint, dependent on litigation and expert advice, there is much that is human, sad to say, but there is no sense or sanity. Trying to draw the line where we are trying to draw it, between carelessness and brutality, is like insisting that falling is flying ("free" and "natural") until you hit the ground, and then trying to outlaw the ground. The pretentious, fantastical, and solemn idiocy of the public sexual code could not be better exemplified than by the now ubiquitous phrase, "sexual partner," which denies all that is implied by the names of "husband" or "wife" or "lover." It denies, with a sort of obsequious egalitarianism, anyone's responsibility for the consequences of sex. With one's "sexual partner," it is now understood, one must practice "safe sex"—that is, one must protect oneself, not one's partner, or the children that may come of the "partnership."

According to its claims, sexual liberation ought logically to have brought in a time of ease and candor between men and women. It has, on the contrary, filled the country with sexual self-consciousness, uncertainty, and fear. Women, though they may dress as if the sexual millenium had arrived, hurry along our city streets and public corridors with their eyes averted, like hunted animals. "Eye contact," once the very signature of our humanity, has become a danger. The meeting ground between men and women, which ought to be safeguarded, has become a place of suspicion, competition, and violence. One no longer goes there, asking how instinct may be enlarged in affection and loyalty, ramifying in many ways; now one asks how instinct may be indulged with the least risk to personal safety.

Seeking to "free" sexual love from its old commu-

nal restraints, we have "freed" it also from its meaning, its responsibility, and its exaltation. And we have made it dangerous. "Sexual liberation" is as much a fraud, and as great a failure, as the "peaceful atom." We are now living in a sexual atmosphere so polluted and embittered that a woman must look upon virtually any man as a potential assailant, and a man must look upon virtually any woman as a potential accuser. The idea that this situation can be corrected by the courts and the police only compounds the disorder and the danger. And in the midst of this acid rainfall of predation and recrimination we presume to teach our young people that sex can be made "safe"—by the use, inevitably, of purchased drugs and devices. What a lie! Sex was never safe, and it is less safe now than it has ever been.

What we are actually teaching the young is an illusion of thoughtless freedom and purchasable safety, which encourages them to tamper prematurely, disrespectfully, and dangerously with a great power. Just as the public economy encourages people to spend money and waste the world, so the public sexual code encourages people to be spendthrifts and squanderers of sex. By their common principles of extravagance and undisciplined freedom, our public economy and our public sexuality are exploiting and spending moral capital built up by centuries of community life—exactly as industrial agriculture has been exploiting and spending the natural capital built up over thousands of years in the soil.

In sex, as in other things, we have liberated fantasy, but killed imagination. And in this we have sealed ourselves in selfishness and in loneliness. Fantasy is of the solitary self, and it cannot lead us away from ourselves. It is by imagination that we cross over the differences between ourselves and other beings, and thus learn compassion, forebearance, mercy, forgiveness, sympathy, and love—the virtues without which neither we nor the world can live.

Thus, starting with economic brutality, we have arrived at sexual brutality. Those who affirm the one and deplore the other will have to explain how we might logically have arrived anywhere else. But sexual lovemaking between humans is not, and cannot be, the thoughtless, instinctual coupling of animals; it is not "recreation;" it is not "safe." Because it is so powerful, it is risky, not just because of the famous dangers of venereal disease and "unwanted pregnancy," but because it involves and requires a giving away of self, which, if not honored and reciprocated, inevitably reduces dignity and self-respect. The invitation to give oneself away is not, except for the extremely ignorant or the extremely foolish, an easy one to accept.

Perhaps the current revulsion against sexual harrassment may be the beginning of a renewal of sexual responsibility and self-respect. It must, at any rate, be the beginning of a repudiation of the idea that sex among us is merely natural. If men and women are merely animals, it is hard to see how sexual harrassment could have become an issue, for such harrassment is no more than the instinctive procedure of male animals, who openly harrass females, and usually by unabashed physical display and contact; it is their way of asking who is and who is not in estrus. Women would not think such behavior offensive, if we had not, for thousands of years, understood ourselves as specifically human beings—creatures who, if in some ways animal-like, are in other ways God-like. In asking men to feel shame and to restrain themselves-- what one would not ask an animal—women are implicitly asking to be treated as human beings in that full sense, as living souls made in the image of God. But any humans who wish to be treated, and to treat others, according to that definition must understand that this is not a kindness that can be conferred by a public economy or by a public government or by a public people. It only can be conferred, upon its members, by a community.

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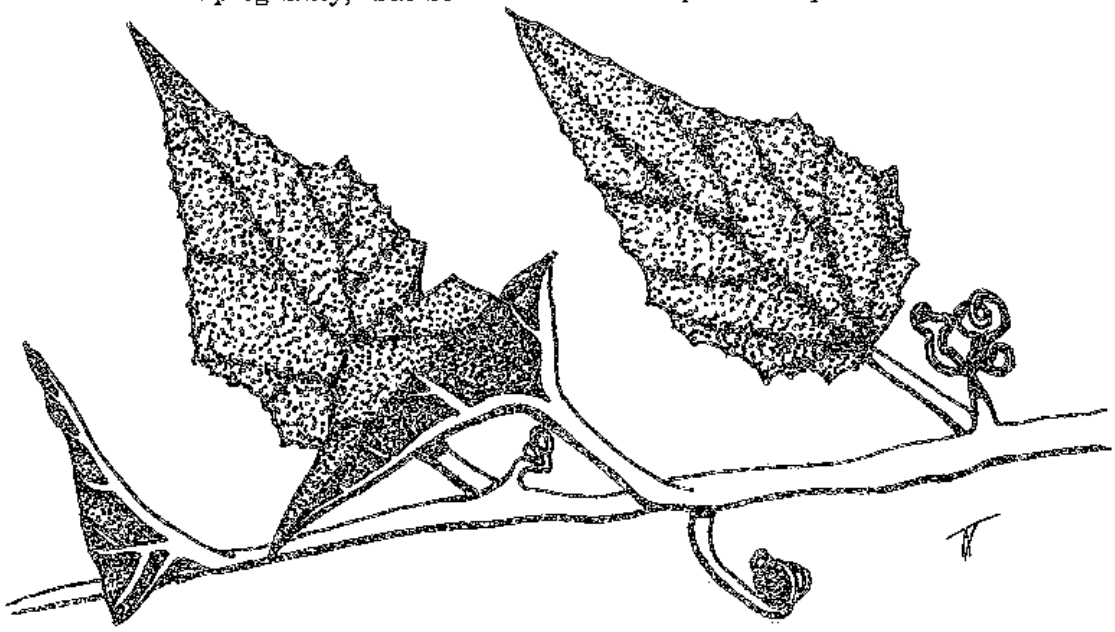

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Left: Sara Wilson, Corey Samuels, Darryl Short, Tonya Haigh, Ted Schuur, Chad Hellwinckel, and Emily Pullins harvest eastern gamagrass.

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