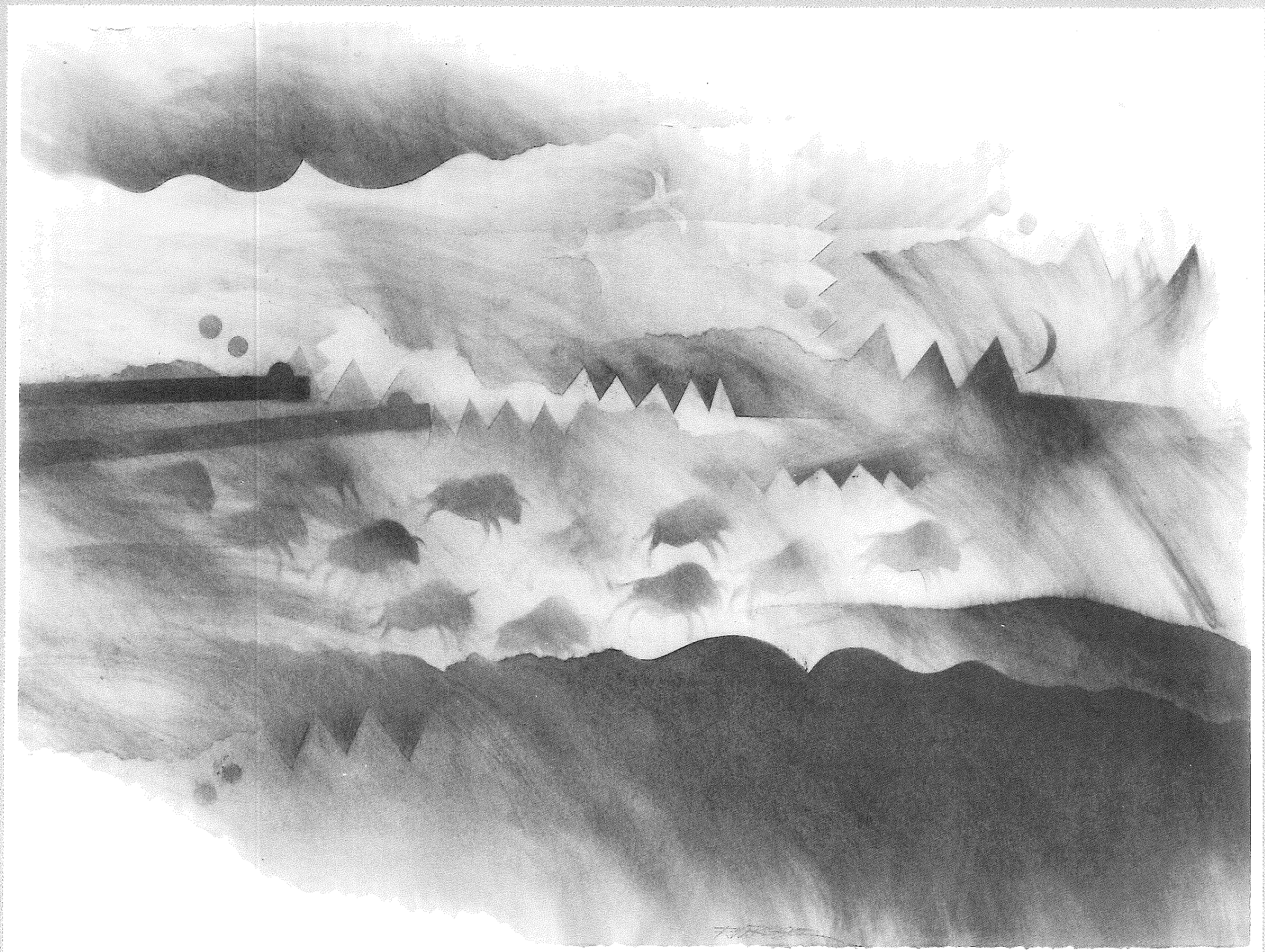

Fall 1989

THE LAND REPORT

Number 36

Contents

Number 36

PHOTOGRAPHS

Symposium photos on pages 3,4,5 by Terry Evans. Other photos by Raymond Epp, Dana Jackson and Bernie Jilka with darkroom work by Bernie Jilka. Photo of Alice Waters, courtesy of Chez Panisse.

On the Cover

This charcoal and graphite work by Robert Regier, Professor of Art at Bethel College in Newton, Kansas, is titled "Clearing the Land." It is part of a series called "The Vanishing Prairie," which was exhibited in The Land's gallery in October along with watercolors by Judy Love of Manhattan, Kansas. Robert Regier says that landscape needs to be thought of not only in terms of place, but also of time. Layers of time in this work are represented by visual shapes serving as metaphors for the natural history (wildlife), native cultures, and immigrants who settled on the plains and for those who were bent on eradicating what had been here before them.

--About This Issue--

This issue is on recycled paper. Until now, our printer has not been able to find a recycled paper with high enough quality to do our 40 page report with 20-25 photographs. We hope it is satisfactory. We hope to continue using recycled paper, even though it costs more than the bond we have been using. Recycling is pointless unless there is a market for recycled paper products. So, we've "put our money where our mouth is" in this issue. Let us know what you think of it.

Another unusual feature of this issue is the inclusion of The Land Institute's Annual Report for the fiscal year July 1, 1988 to June 30, 1989.

Much of the news about The Land this fall centers around our landmark October symposium on the marriage between ecology and agriculture. Regretfully, space limitations allow us to report only the flavor of the event, not much of the substance.

The main feature articles in our 36th REPORT relate to the idea of choosing health, rather than growth or production, as the measure of success in human endeavors. We welcome letters to the editor with reactions and reflections on this topic for our next publication.

THE LAND REPORT

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THE LAND INSTITUTE IS A NON-PROFIT EDUCATIONAL-RESEARCH ORGANIZATION DEVOTED TO SUSTAINABLE AGRICULTURE AND GOOD STEWARDSHIP OF THE EARTH.

Symposium is Main Event of the Fall

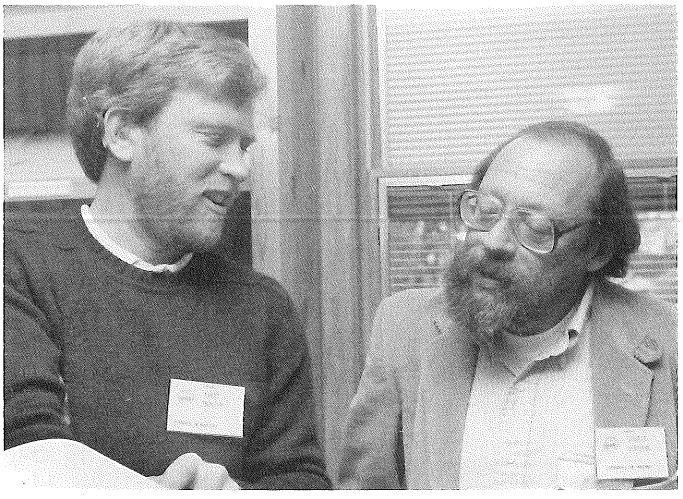
The Land Institute sponsored a symposium, "The Marriage of Ecology and Agriculture," which began with a public program on Friday evening, October 20, in the Salina Community Theater and continued for invited speakers and participants in The Land Institute classroom on Saturday and Sunday, October 21-22. The symposium was dedicated to Professor Paul B. Sears, renowned ecologist who retired from Yale University in 1960 and now lives in Taos, New Mexico.

The purpose of the symposium was to talk about Nature as the measure or standard and to think about agricultural sustainability from a point of view that goes beyond an emphasis on low inputs and optimum crop rotations. In his invitation to the participants, Wes Jackson explained that with nature as measure, farmers or researchers, when surveying a particular field, would ask: What was here before agriculture came? What will nature require of us here? What will nature help us to do here?

If these questions were asked, the research agenda for the scientist and the plans the farmer makes for each growing season would be different. Both scientist and farmer would better meet the most demanding criteria for what constitutes a sustainable agriculture than if the goals were to simply increase yield, control pests, and maximize profit.

With this in mind then, ecologists of several varieties — plant population biologists, evolutionary biologists, community ecologists, life history theorists

(contd., pg. 4)



Marty Bender, former staff member, now in graduate school at the Univ. of Kentucky, talks to Donald Worster during a break in the symposium.

THE MARRIAGE OF ECOLOGY AND AGRICULTURE
A Symposium
October 20-22, 1989
The Land Institute

Friday Evening
SESSION I: LAYING THE GROUNDWORK
—Dedication of symposium to Paul B. Sears
—*The Importance of New Concepts to Agriculture*
Congressman Pat Roberts, 1st District, Kansas
—Opening Lectures **(See text on pages 10-13.)**
Nature as Measure - Wendell Berry, Univ. of Kentucky
Ways of Seeing - Donald Worster, Univ. of Kansas
The Ecologist's Perspective - Herb Bormann, Yale Univ.

Saturday Morning
—*Waste in Agriculture and the Cost to Future Generations* - David Pimentel, Cornell Univ.

SESSION II: AGRICULTURAL RESEARCH WHEN NATURE IS THE STANDARD
—*The Prairie as an Analogy* - Jon Piper and Peter Kulakow, The Land Institute
—*Mimicking Nature in the Tropics* - Jack Ewel, Univ. of Florida

SESSION III: TAKING ADVANTAGE OF SOME NATURAL INTEGRITIES
—*"Thought"-Intensive Weed Control* - Rhonda Janke, Rodale Research Institute
—*Using Species Interactions to Manage Pests* - Alison Power, Cornell Univ.
—*Designing and Testing Sustainable Farms* - Chuck Francis, Univ. of Nebraska

SESSION IV: WHAT COMMUNITY OR POPULATION BIOLOGY TEACHES US
—*What Community or Population Biology Teaches Us*
--Subodh Jain, Univ. of Calif., Davis (unable to attend at last minute)
—*The Use of Ecological Tools to Understand Genotype by Environmental Interactions* -Paula Bramel- Cox, Kansas State Univ.
—*Employment of Germplasm Resources in Relation to Environmental Circumstances* - Major Goodman, North Carolina State Univ.

Saturday Afternoon
SESSION V: THE UPSHOT
—*The Corporate Response* - Don Duvick, Pioneer Hi-Bred International
—*Implications for Saving Natural Areas: Increased or Decreased Threat?* - Hugh Iltis, Univ. of Wisconsin

DINNER PROGRAM
—*Nature and Agriculture: Some Observations* - David Ehrenfeld, Rutgers Univ. (contd., pg. 4)

and so forth — have a major role to play for agriculture. In fact, scientists who have studied natural ecosystems, be they lakes or alpine meadows, forests or coral reefs, marshes or prairies, more or less for their own sakes, have as much to offer sustainable agriculture as those whose have devoted their attention exclusively to yield trials in randomized plots at the experiment station.

Though it may be an over-simplification, The Land Institute sees a "human cleverness" approach to agriculture situated at one end of a spectrum where biotechnology is the reigning emphasis at the moment. The "nature's wisdom" approach is at the other end. The October symposium assembled agricultural scientists, ecologists, members of the press and public policy advocates to give high visibility to what the "nature's wisdom" end (ecology with all its subdisciplines) has to offer, and to give the concept of nature as measure the necessary boost to help us toward a more sustainable agriculture.

After each talk, the press, policy makers and foundation representatives were given priority in asking questions. Conn Nugent, Director of the Five Colleges Program at Amherst, Massachusetts, and member of The Land Institute board of directors moderated the Saturday and Sunday sessions.

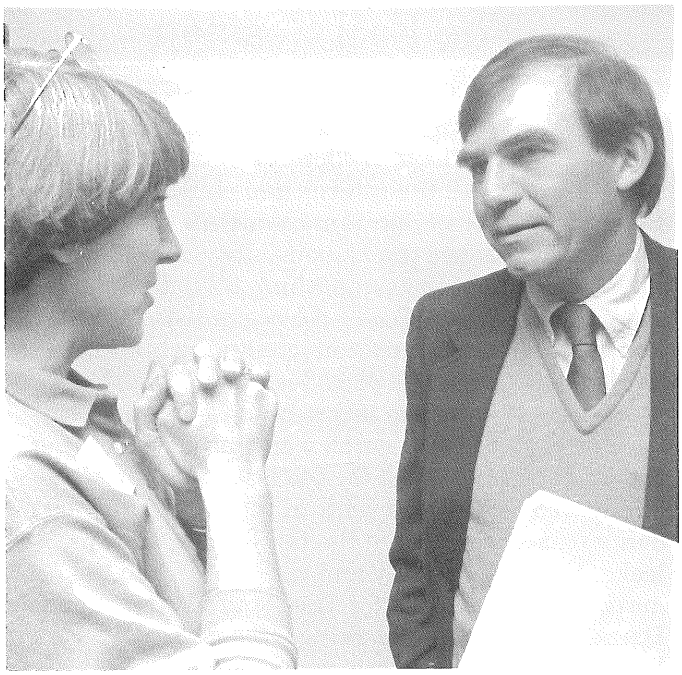
A grant from the Rockefeller Brothers Fund made the symposium possible. Wes Jackson designed the program and invited the participants. Beth Gibans coordinated all the arrangements.

PROGRAM - CONTD.

--*Soviet- U.S. Cooperation in Sustainable Agriculture* - Eugene Ryabov, Stavropol Scientific Research Institute, U.S.S.R.
--Poems by Wendell Berry

Sunday Morning
SESSION VI: CHANGING THE RESEARCH AGENDA
—*Policy Implications:* Maureen Hinkle (National Audubon), Rob Myers, (Univ. of Missouri), Alan Ott, (aid to Senator Nancy Kassebaum), Ron Kroese (Land Stewardship Project)
—*Ten Years Ago* - Garth Youngberg, Institute for Alternative Agriculture
—*Contributions from the Periphery* - David Orr, Meadowcreek Project

Alison Power, Donald Worster, Hugh Iltis, Donella Meadows, David Pimentel between sessions.



Donella Meadows and Jack Ewel

David Orr, Steve Viederman and Michael Orr enjoy Conn Nugent's story.

Symposium Dedicated to Paul B. Sears

In speeches at the Friday evening program, Hugh Iltis and Wes Jackson dedicated the symposium to Professor Paul Sears, "dean of all ecologists everywhere."

Paul Bigelow Sears was born on December 17, 1891 in Bucyrus, Ohio. He earned a B.S. degree in 1913 from Ohio Wesleyan, an M.S. from the University of Nebraska in 1915, and a Ph.D. degree in botany from the University of Chicago in 1922. He served in the army in 1917-1918.

Dr. Sears' long teaching career began as an instructor in botany at Ohio State University in 1915. He taught at the universities of Nebraska and Oklahoma, at Columbia Teachers College, and Oberlin College. In 1950 he became chairman of the new graduate program of research and instruction in the conservation of natural resources at Yale University. Having reached the mandatory retirement age of 68, Dr. Sears left Yale in 1960.

The chairman of Yale's division of sciences wrote in 1955: "Paul Sears is a biological statesman, one of the group of men—all too few—who know the life sciences well, but see them against the wider background of human affairs."

In addition to many professional scientific papers, Paul Sears wrote about science for the general public in such books as *This is our World* and *Deserts on the March*. Perhaps his most famous book, *Deserts on the March* dealt with the problems of soil erosion and land reclamation and was written while Dr. Sears was at the University of Oklahoma, drawing on his observations of the havoc wrecked by drought and the improper use of land leading to the Dust Bowl of the 1930's.

Professor Sears believes that scientists have obligations to society. In 1955, he said that a principle responsibility of the scientist is to provide politicians with facts, thus "reducing the area of uncertainty and dispute to a minimum." This gives scientists "a very definite relation to politics."

Paul Sears, who will be ninety-eight years old in January, was not able to attend the symposium in Salina. To show his support and to contribute to the ideas for discussion, he made a videotape which we showed on a large screen at the public program.

In the video, Professor Sears sits in a chair in his living room in Taos, New Mexico and answers questions posed by an interviewer. His body has naturally shrunken with age, but his head, and his mind, still seem large. He sports his characteristic mustache and wears a silver-clasped Western string tie and a checkered sports coat.

Dr. Sears had obviously given prior thought to the questions and, still exercising his civic responsibility as a scientist, he had some points to make.

"In my judgment, agriculture from the beginning has been an art, growing food by making use of practical experience—the rules of experience. And it's not only one of the oldest

arts—dating now back to 14,000 B.C. (according to reports from Europe), but it's enabled man to multiply in numbers that have become almost ominous and dangerous to himself. And one of our tasks is to arouse his awareness of the fact that he can't increase his numbers infinitely in a limited space. Great as our planet is, its capacity to support human life has its limits."

"Science in some ways is very complicated, in other ways it's a very simple matter. It's a matter of learning to use your five senses—all of them—and any other source of information you can lay your hands on—to make observations of what's going on around you. It's amazing how people neglect that simple thing. That's the reason Barnum was able to say, "There's a sucker born every minute," you know. People disregard this possibility. And yet it's the first obligation of an intelligent human being to use his senses with which he's equipped to learn the rules of the game."

Paul Sears chuckled as he responded to the question: Was it inevitable that agriculture would have to recognize ecology as a partner in the conservation of our land?

"Yes, I think it is true—and you might almost characterize it as a shotgun wedding—because we've got to the point— ...where the knowledge we could get from just trial and error, practical experience, isn't sufficient. For instance, the soil is a most amazing phenomenon. Most people haven't any realization of the fact that the soil really breathes. The roots are such active places that, like our lungs, they release carbon dioxide in doing work, and that work can only be effective if the soil is organized into crumbs, large particles of mineral matter, which permit water to soak in, drive out the carbon dioxide, and as it goes down, draw in oxygen so the roots can do their work. All of those processes are absolutely essential in nature and, of course, in serving man."

Professor Paul Sears has long known that humans need to apply the wisdom of nature to agricultural systems. We walk in his footsteps as we try to develop an ecological agriculture.

Paul Sears at The Land, Fall 1977.

The Fall Session

The fall schedule for staff and interns fell into two parts this year: *before* the symposium sponsored by The Land Institute on October 20-22 and *after* the symposium. All the interns and staff, directed by Beth Gibans the symposium coordinator, helped with the details that are the responsibility of good hosts.

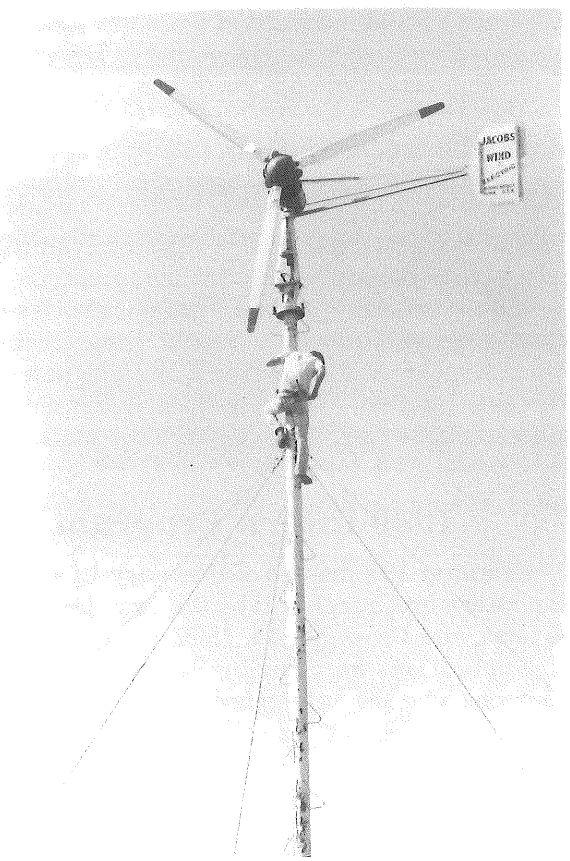
Because of the symposium, we did not have our annual fall Visitors' Day. We began listing clean-up and symposium preparation jobs on the blackboard in September. "Make the place look like it ain't" has always been our motto before public events.

Regular fall research work continued during the preparation, except for the last week. Frosts eliminated most of the work in the community garden, except for watering the fall lettuce, turnips, leeks, parsnips, parsley and cilantro. When the market garden season for The Land's Harvest ended, Danielle Carre began making wreaths and wall hangings of dried flowers, peppers and garlic.

Our operation manager John Craft took major responsibility for directing clean up and repair. Interns painted a fence and a wind generator pole, trimmed shrubs, washed windows, and hauled away trash. They set up bins in the barn to store office paper, plastic, glass and aluminum saved for recycling.

Some of the big fall projects for John Craft had nothing to do with the symposium, but they were significant additions and changes to buildings and grounds. Moving the shop from the Jackson's red barn to the closed shed by the greenhouse was a major effort. In the process, he had to construct shelves and storage and a place to mix soil in the open shed, as well as build benches and storage boxes for the new shop. John installed a 3500 watt induction generator machine just the week before the symposium. The tower had been empty since the 90 miles/hour winds of a July 1987 storm. It was good to hear the hum again and check wind direction by observing the tail of the machine. John also arranged for the construction of a new Morton metal building to store farm machinery on the Ohio Street property. It is barn red, trimmed with white, and sits unobtrusively amidst the other farm outbuildings.

Fall classes resumed four mornings a week beginning on September 11. We started with the discussion of Marty Strange's book, *Family Farming*, then covered *Habits of the Heart: Individualism and Commitment in American Life*, and a week of various readings in the area of conservation and environmental ethics. The research staff toured research plots with interns and conducted several sessions on analysis of data to prepare for the writing and presentation of the results of experiments. In the week before the symposium, we talked about the work of



Colin Laird paints the Jacobs wind generator pole.

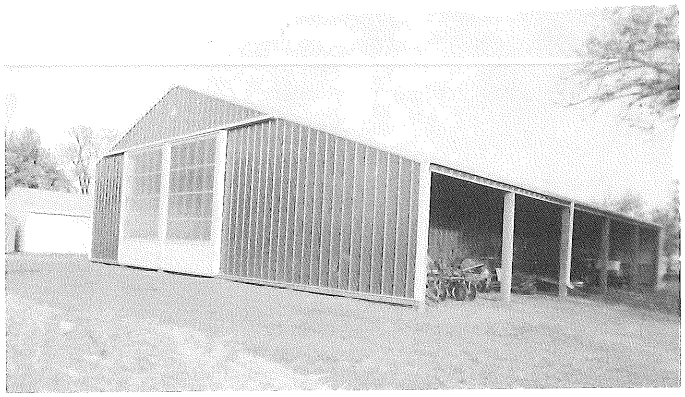
some of the scientists invited to present papers at the symposium. After the symposium we read and discussed *The Chalice and the Blade* by Riane Eisler, but designated most of the class time for research/ writing so interns and staff could complete papers for *The Land Institute Research Report* and prepare oral presentations to be given at Kansas State on December 4. In the last week of the fall session, Jim French taught two classes on agriculture and literature, a change-of-pace that was a treat for everyone.

Three mornings a week we held our traditional "warm-ups" at 9:00 A.M. This fall we designated one of these as "Warm-up with Wes," a special time for Wes Jackson to discuss essays or speeches he is writing or significant papers and books he has read. He chose the topic and often provided handouts ahead of time. The other two warm-ups during the week gave everyone an opportunity to introduce topics for discussion.

Interesting guests also came to warm-up this fall, such as Donald McCaig, National Public Radio commentator and novelist who raises sheep and border collie dogs, and actor Robert Wagner, who came to The Land with a film crew to do a segment for a television program called "The Reporter." Steve Viederman of the Jessie Smith Noyes Foundation arrived a day early for the symposium and talked in warm-up about the idea of the "affordability" of human actions that have an impact on the earth. In November, Penny Geis, chair of the Saline County Commission and a professional mediator discussed the use of mediation in resolving environmental issues. Terry Evans talked about artists who photograph images that express environmental concerns.

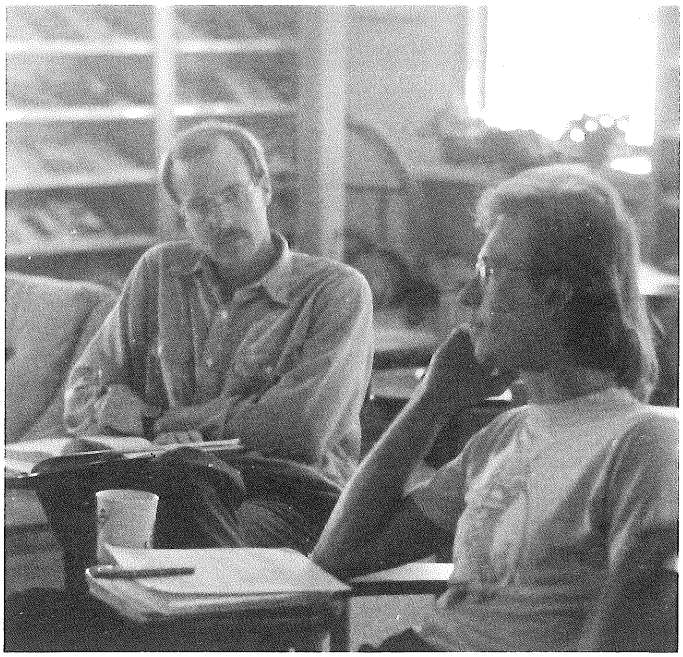
Dr. Sylvan Wittwer, former head of the agricultural experiment station at Michigan State University and author of an important book about Chinese agriculture, *Feeding a Billion*, was our guest on November 28-29. We asked him to give an evening presentation on Chinese agriculture in our classroom and invited the public to attend.

The business office seemed to get busier and busier this fall. Linda Okeson, business manager,



Morton building purchased with the help of four donors.

Ed Orris removes tomato cages from garden.



Raymond Epp and Jake Vail in a class discussion. During the spring and fall sessions, classes are held four mornings a week over assigned readings in agroecology and "Considerations for a Sustainable Society."

finally gave up and did some of the audit preparation in her home because of all the activity. Development director Tom Mulhern and receptionist-secretary Sharon Thelander, with the help of Karen Smith, Yolanda Mulhern, and interns, filled the kitchen tables with fundraising mailings. The symposium coordinator, Beth Gibans, made travel, food and lodging arrangements from the office and communicated with all those invited to the symposium.

Public attention caused by major articles in the September issue of *American Health*, the November *Atlantic Monthly* and *Audubon*, as well as newspaper stories generated by the symposium, increased the number of phone calls and weight of the mail.

1990 Intern Program

February 19 (instead of February 12 as listed on the intern brochure) will be the first day of the 1990 term, and December 14, 1990 will be the last day. Applications were due by December 1, 1989, but persons who are interested should inquire. If all the positions have not been filled, late applications might still be considered. Call (913) 823-5376.

Hollywood came to The Land Institute in the form of actor/TV star, Robert Wagner. Here the crew films him sitting on the railing of the bridge over the Smoky Hill River. The program with a segment about The Land was aired on November 19.

Pamela Cubbage and Yolanda Mulhern work on mailing.

Staff News

The board of directors decided at the June meeting to restructure management of The Land Institute. Wes Jackson was elected President and charged with major fundraising responsibilities. The board approved a three member management team (MT), with Dana Jackson as one member, to manage day to day business.

The staff met once a week during June and July to discuss operating guidelines for the management team and to select two more team members. By early August, their choices—Tom Mulhern and Peter Kulakow—and an operating plan for the MT had been approved by the executive committee of the board of directors, and the MT began meeting every Tuesday afternoon. Tom currently serves as chairman.

Following each meeting, a list of the decisions is placed in a staff notebook kept in the business office and sent to the executive committee and Wes Jackson. General staff meetings are held every other Wednesday morning and notes from these meetings also are placed in the staff notebook.

* * * * *

Brad Burritt, Danielle Carre and their son Ian will be moving to Colorado in December to begin working with Brad's family on their farm. For the past two summers they have produced vegetables free of chemical fertilizers and pesticides for The Land's Harvest and marketed them at the Salina Farmers' Market and at a produce stand on The Land's Ohio Street property. Brad has also been in charge of field crops and equipment. The talents, the skills and the love of this family will be missed very much at The Land Institute.

* * * * * *

Jake Vail will fill a new position of Research-Education Assistant in 1990. 60% of his time will be spent on a LISA funded research project and 40% will be education related. Bernie Jilka will be the 1990 Research Fellow (a second year intern position).

Thom Leonard spent two months in Europe this fall giving presentations about The Grain Exchange.

* * * * *

Baptists Make Grant

In October, the American Baptist Churches of the Central Region presented a $25,000 grant to The Land Institute. The money was donated by members of the American Baptist Churches, USA, in Kansas, Oklahoma and Arkansas through the *One Great Hour of Sharing* offering. A portion of the offering is reserved for relief and prevention of agriculturally-related disasters.

Dave Stewart, Campus and Resource Minister, and Wayne Shireman, Director of World Mission Support, participated in a brief public ceremony at The Land Institute on October 19. The following is an excerpt from their statement on that occasion.

In funding the grant, American Baptists are recognizing a need to respond to a current disaster that is not readily apparent to many and is not a high enough priority to others. This is the disaster of the relentless mining of earth's resources without making provision for the restoration and regeneration of those resources through natural and sustainable means. . . This is the disaster of relating to the land as ours to possess and exploit as opposed to relating to the land as sustainer of life; as a trust for which we are called to be stewards. If this disaster is allowed to continue, the agricultural problem will continue and the present reality of limited and inequitable food resources will worsen many times over.

American Baptist Churches have not only recognized this disaster, its scope and its prospects. They have also recognized the creative, vital and timely contribution that The Land Institute is making to the future of agriculture and to the land's ability to to sustain and improve the quality of life. A decade ago, the importance of The Land Institute's work was recognized by a very small minority..Today, the minority has grown considerably and commands much more respect. Tomorrow, the wisdom and necessity of this work will be fully recognized and valued. Both the earth and all its creatures will be blessed.

Dave Stewart, Dana and Wes Jackson, Wayne Shireman

On the Marriage between Ecology and Agriculture

Nature as Measure

Wendell Berry
(an excerpt)

Industrial agriculture, built according to the single standard of productivity, has dealt with nature, including human nature, in the manner of a monologist or an orator. It has not asked for anything, or waited to hear any response. It has told nature what it wanted, and in various clever ways has taken what it wanted. And since it proposed no limit on its wants, exhaustion has been its inevitable and foreseeable result. This, clearly, is a dictatorial or totalitarian form of behavior, and it is as totalitarian in its use of people as it is in its use of nature. Its connections to the world and to humans and the other creatures become more and more abstract, as its economy, its authority, and its power become more and more centralized.

On the other hand, an agriculture using nature, including human nature, as its measure would approach the world in the manner of a conversationalist. It would not undertake to impose its vision and its demands upon a world that it conceives of as a stockpile of raw material, inert and indifferent to any use that may be made of it. It would not proceed directly or soon to some supposedly ideal state of things. It would proceed directly and soon to serious thought about our condition and our predicament. On all farms, farmers would undertake to know responsibly where they are and to "consult the genius of the place." They would ask what nature would be doing there if no one were farming there. They would ask what nature would permit them to do there, and what they could do there with the least harm to the place and to their natural and human neighbors. And they would ask what nature would help them to do there. And after each asking, knowing that nature will respond, they would attend carefully to her response. The use of the place would necessarily change the user. The conversation itself would thus assume a kind of creaturely life, binding the place and its inhabitants together, changing and growing to no end, no final accomplishment, that can be conceived or foreseen.

Farming in this way, though it certainly would proceed by desire, is not visionary in the political or utopian sense. In a conversation, you always expect a reply. And if you honor the other party to the conversation, if you honor the otherness of the other party, you understand that you must not expect always to receive a reply that you foresee or one that you will like. A conversation is immitigably two-sided and always to some degree mysterious; it requires faith.

Cautionary Thoughts on a Marriage Proposal

Donald Worster

We have been called together to witness a proposal of marriage—not the marriage itself, which is still only a distant possibility, but an offer of marriage and that made by only one of the parties, the science of ecology. The other party, agriculture, is only barely represented here. We don't really know what he thinks about the idea, or if he thinks at all about it, or even whether he is the marrying kind. The rest of us, including this historian, have come in support of the proposal but must confess to being a little nervous and uncertain as to whether the marriage could work.

Who is this potential groom, agriculture, and what is his past? A very complicated fellow, he is the farmer in the field, of course, but also the rural banker, farm implement manufacturer, pesticide salesman, international grain merchant, and food processor. He is modern agribusiness in all its manifestations. He works hard, is full of self-confidence, and yet he is a ward of the government, unable to function alone these days. He is full of contradictions, not only between his insistence on free enterprise and his demand for public support, but also between ancient memories of stability and harmony and modern drives for wealth and power. The first and most difficult task is to convince this fellow that he needs a mate. Before he will come to the altar, he must be brought to understand that his life is incomplete as it is, that in fact it is a mess, that he needs to reform himself if he has any hopes of surviving, and that the proposed marriage with ecology can be the first step toward that reform.

The history of agriculture in North America provides the best argument I know for reform. Over the past three hundred and fifty years since the Europeans began taking control of the continent away from the first native agriculturists, we have a record that shows as much failure as success. With a determined innocence the agricultural community has tried to ignore those failures.

The first commercial agricultural venture in the New World was the tobacco plantation system established in the sixteenth century around Chesapeake Bay, and scientists have marked that advent from the increased mud that shows up in sediment cores taken from the floor of the Bay. Soil erosion and depletion plagued that regime from the start. The other beachhead for European agriculture was New England, and it too did not show much stability. By 1850 most of southern New England had been

deforested and planted to corn, wheat, English hay, and other crops. The landscape was as open as Kansas. The region was virtually self-sufficient in food. Farmers would have scoffed at anyone warning it would all end soon. By 1900, however, extensive acreages had returned to brush and many farmhouses had been surrendered to the mice and porcupines. Today, two-thirds of the state of Massachusetts is covered with forest once more, and old stone walls that once marked the edges of fields are now lost in the trees. Eighty-four percent of the food is imported. The bears have returned, and so have the beaver and deer and even moose. Is New England a success or a failure agriculturally? If you think about the long term, about enduring rural communities, lasting traditions, stable human and ecological relationships, then the region is very nearly a failure. Our first efforts to farm this continent started off profitably, but within a couple of centuries began to self destruct.

So goes the history of agriculture westward across the continent. Americans boasted of winning a permanent empire, but lost as much as they won. Every decade since the late nineteenth century the cotton belt of the Deep South has had to take in a few more notches, until today it is a much diminished version of is former glory; today some of the largest producers of cotton are located out in west Texas, in Arizona, and in the Central Valley of California. Large expanses of the old cotton kingdom have gone back to grass or forest. Meanwhile, the new cotton fields in the West have an uncertain water supply and may in their turn go out of production.

The Great Plains, which we once prophesied would be the garden of the world, is currently our most failure-prone agricultural region, as it has been throughout the twentieth century. Take away the underground water reserve of the Ogallala aquifer, and the plains will lose a considerable portion of their farm economy. Take away federal relief and price supports, and they will lose even more. The depletion of the aquifer within another half century is now certain, and the drying up of federal monies is more and more a distinct possibility. Consequently, over much of the region we may soon be back to a condition of dry-land farming in a free market economy—a condition that in the 1930s gave us the Dust Bowl and, in some counties, a population loss of over 50%.

Recalling those facts from the near and distant past ought to be enough to sober up the potential groom and send his thoughts toward reform of character, marriage, and settling down. He has been living a hard life, if he only knew it, and it is getting harder.

Agriculture does not have to live this way. In other parts of the world, at least until very recently, there have been plenty of examples of farm communities that have existed in the same place, with little change in population or techniques, for a thousand or more years. Why have we Americans had so much difficulty in achieving something similar? It is not because we have lacked scientific know-how or capital or time. No, the reason is that the American agricultural sector has been unwilling to accept the social and ecological restraints inherent in such communities. A stable enduring rural society, in equilibrium with the processes of nature, does not allow much freedom or self-assertiveness for the individual. Typically, such societies hedge the individual about with a complex array of rules, regulations, and traditions: for instance, he or she cannot buy or sell land without community approval, cannot marry or start a family before reaching a prescribed age and achieving an adequate holding, cannot plant or harvest before others, must follow the group in the herding of livestock, marketing of cheese, or selecting of seed. The whole community, and all of the ancestors too, are involved in the individual's decisions. The individual farmer acts within a severely constraining network of duties and obligations that allow little personal initiative. That is the best way, people all over the world have understood, to avoid too much risk and preserve the present. Such a network, of course, puts a ceiling on the amount of private wealth that any one person in the community can accumulate. It limits creativity. It is conservative and hidebound. But it avoids most of the failures caused by misjudgment, egotism, ignorance, ambition, experimentation, excitement, fantasy. Why have we in North America rejected that way of thinking? Why is our potential groom, the American agriculturist, so very different in temperament?

The historian replies that our agriculture has, from the beginning point of 1607 or 1620 (depending on whether you start with the settlement of Jamestown or Plymouth), been shaped by the market economy and its culture of economic individualism. Or to put it another way, our modern agriculture began with a capitalistic ethos and has continued thus ever since. It is radical in its rejection of traditional rural community patterns. It is revolutionary in its elevation of the individual over the group. American agriculture has taken as its first principle the idea that the pursuit of unlimited private property and private gain ought to decide all questions of plowing, herding, planting, reaping, all rearrangements and manipulations of nature. Whatever the individual conceives, he should be free to do with the land. Every one of the successes we proudly celebrate in our agriculture—high production, great wealth, diminishing labor—are the clear result of that determination to establish a free, individualistic, market-directed approach to decision making. But then we must admit, when we have stopped being celebratory

or disingenuous, that we have a long list of failures too, and they have resulted from the same market mentality.

So is this American agriculturist, long devoted to his freedom to play around in the grain and wool markets of the world, now chastened and mature, ready to enter into the bonds of matrimony? That is the first question that a historian brings to this scene of proposal.

The bride to be, or that wants to be, is the science of ecology, or more accurately, is a few ecologists who have a feeling for agriculture and want to see it saved from itself. They are like a young earnest schoolmarm, full of piety and learning, eager to land this husband and make him a pupil, teaching him all the virtues of reverence, responsibility, and scientific reason. A historian must admire the intention but wonder about the bride's preparation for marriage. Can this good soul succeed in her desires?

Ecology promises to bring to the marriage an informed, expert understanding of how nature works, a knowledge that agriculture does not have on its own but needs from others. I accept the claim, as almost everyone does. There has been in recent decades an impressive accumulation of knowledge about the processes and structures of the natural world—about, for example, the natural methods plants have developed to combat their insect enemies or survive drought. Most of this knowledge did not exist for farmers of the last ten thousand years, and the fact that it is now available is one of the blessings of modernity. Any one in the agribusiness network who does not appreciate that knowledge and seek to take advantage of it is trying to deny progress.

But the knowledge offered by ecologists is deceptive in one vital respect: it does not afford a general or comprehensive measure of what it means to be successful or unsuccessful in agriculture. Science is excellent in addressing particulars, but vague and indecisive in recommending general policies for a society to follow. Its authority is limited and piecemeal. It is too much a product of its culture to be the broad, independent, all-wise oracle that agriculture needs. All of ecology's models of nature derive at last from culture. The ecologist finds it very difficult to step outside of her moment in history, her place in society, to reveal some general authoritative truth about the order of nature and to insist that agriculture adapt itself to that order.

Take the concept of the ecosystem. Some years ago one might have supposed that it was a firmly established truth, sanctioned by science and completely reliable as a guide. All the farmer had to do was to learn the principles of ecosystems and redesign his farm accordingly. Recently, however, ecologists have begun to find fault with the whole concept and even to abandon it altogether. An ecosystem, some have said, is merely a fiction. It may describe the structure of nature in some places for brief periods of time, but in other places it is seriously misleading.

The historian sees immediately in these changing fashions in science the fickle but powerful hand of a changing culture. One generation of scientists invents the idea of the ecosystem and, worried about the environmental transformations going on, holds it up as a measure for all to follow. Another generation, looking for verification of the model and perhaps less worried about those transformations, throws the ecosystem out of the textbooks. Neither generation is truly free of its times and culture to talk about nature in some transcendental way. Each is influenced by the world of events. As Raymond Williams has written, in our ideas of nature there is a great deal of history.

We do indeed require some standard against which we can measure our agriculture in its general tendencies and practices. Unfortunately, the science of ecology has not proved able to furnish that standard in clear, unequivocal, enduring terms.

Even what the ecologist knows for certain often proves difficult to apply in practical situations. She may understand in minute detail the folly of our pesticide practices and recommend other methods or ends. But the farmer may feel trapped by his own past and have to ignore her advice. He is not, in truth, an altogether free agent, able to adjust instantly to scientific knowledge. He may have debts to the bank that have to be paid promptly and in full; his crop decisions may therefore be made according to the prospects of high market return, not on moral or ecological grounds. He may see the dangers in letting the marketplace determine land use but feel that circumstances give him no choice but to risk these dangers.

In short, the farmer and all his associates in the agricultural sector are people who cannot live outside of history either. They commonly think in the ways their age sanctions and cannot realistically be expected to do otherwise without a great deal of pressure and persuasion. They often feel they must live with the economic institutions they have inherited, for all their faults, until in some distant future other institutions may have evolved. They may talk a great deal about asserting their individuality, but they also tend to accept the notion that no freedom, even in a marketplace economy, is ever really complete. The weight of economic history and tradition can be lifted but it will not be easy.

Thus the plea from a prospective bride to "come and let me teach you how to be ecological" must appear a little utopian at times to such a groom. Science is not in any position to find for any part of

society, the agricultural or other, a perfectly rational, coherent, comprehensive, objective, permanent design. It has not done that for itself. How could it do it for farmers?

Agriculture in the United States has been deeply embedded in the history of the market economy over the past several centuries. It cannot be expected to go abruptly in new directions without confronting and dealing with that history and that economy. The science of ecology, on the other hand, despite its impressive knowledge, represents neither omniscient authority nor deep historical understanding.

Does the ecologist fully realize what she is up against in the case of the groom, and does she have a realistic sense of her potential as tutoring wife? This is the second question that the historian brings to this scene of proposal.

Speaking as a third-party observer, I hope the marriage takes place and soon, even if it has to be arranged by others instead of coming from a spontaneous romance. What is needed in that marriage, I must add, is a shared dedication to a larger ideal than each other. Both bride and groom, before they take another step, ought to agree on a common moral principle: that nature is a pattern and a set of processes that we humans did not invent and must respect. Nature is more than a field to be exploited by the human mind and its technology. It is more than a pile of commodities to be bought and sold for gain. It is more than an intellectual puzzle to be taken apart by curious scientists. It is more than whatever it is we want it to be. Nature is a whole greater than we can understand or manipulate.

A marriage that does not begin with that common understanding by both parties is likely to flounder soon.

Furthermore, both science and agriculture must acknowledge that they cannot teach that awareness to each other. It must come from outside the relationship, from ethics and philosophy, from politics and social discourse, from the community at large trying to discover a new relationship to nature.

In short, this marriage requires another way of seeing from the one that has dominated both science and agriculture over the past few centuries. I mean our tendency to see nature only in pieces, not as a whole—our habit of being so analytical, so focused on particulars, that we lose sight of the very order of nature—or we lose confidence that such an order even exists. That has happened, I believe, to an agriculture ruled by the market mentality, which cultivates the ability to see opportunities for personal profit but not that sense of interdependencies. The same loss of vision has also plagued science since the seventeenth and eighteenth centuries; science may have begun with a glorious vision of rational order in nature but now in very many places has reached the point of seeing only chaos in the larger picture.

A marriage that only united two narrow ways of seeing would produce more, not less, blindness. We would not find such a union very promising.

On the other hand, a marriage that brought these two talented parties together in a common search for that principle of order, a marriage that was informed by a broader moral discourse, is one that looks auspicious. Such a union might one day bring forth a child better than any we have known.

An Ecologist's Perspective

Herb Bormann
(an excerpt)

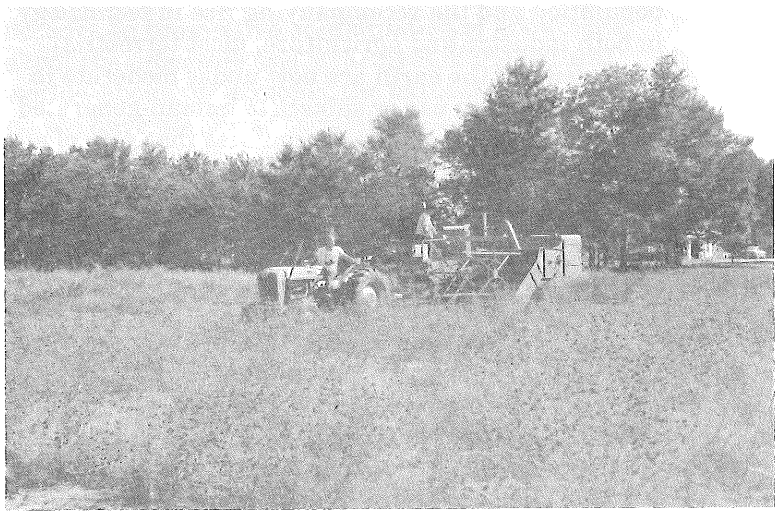
Two hundred years ago, at the time of the ratification of our Constitution, most of the terrestrial regions of the earth were probably dominated by naturally occurring ecosystems with minimum effect by man. Since then the human population has risen from one billion to about 5.5 billion. With this rise in population and the accompanying rise in technology in both industry and agriculture, most terrestrial ecosystems of the earth are now under moderate to intensive human use or subject to human-generated side effects. One estimate speculates that 40% of all global terrestrial plant productivity now finds its way into human uses.

When naturally occurring ecosystems are converted to agriculture, fundamental changes in the structure and function of the ecosystem take place. In modern western agriculture monocultures with a narrow genetic base replace diverse communities of plants and animals. Complex ecosystem structure is replaced by simple structure often with bare soil beneath the crop. Ground may be stirred on an annual basis. Biotic regulation of outputs is severely diminished. Inputs are usually drastically changed: nutrients in the form of fertilizers and irrigation water may be added. Insecticides and herbicides are utilized to control pests replacing natural controls. To effect and maintain these changes large amounts of fossil fuel are required.

Although these practices may be criticized today, it is important to recognize the accomplishments of modern agriculture. In fact, the astounding ability of agriculturists to keep pace with and even surpass the food demands of the growing human population is among the greatest human achievements. It is also important to recognize that still greater agricultural productivity will be needed in the coming decades since by the year 2100 some three to five billion additional people will be expected on the earth.

New Roots for Agriculture

Above: Jake Vail measures a plot in preparation for planting Leymus racemosus and intermediate wheatgrass sent by the Rodale Research Institute. On right: Jon Piper (l.) and Peter Kulakow (r.) show experiments to Don Duvick, Pioneer International, during a late summer visit.

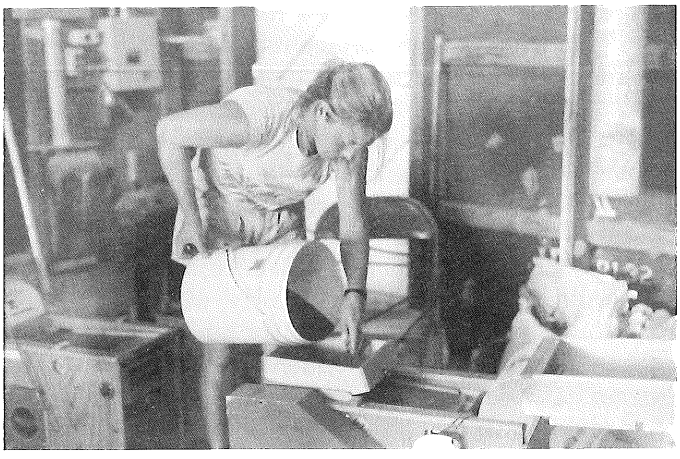


Fall Research Work

(left) Ray Epp and Colin Laird harvest what remains of the Illinois bundleflower germplasm experiment after measurements were made and specific plants hand-harvested.

(bottom left) Brooks Anderson measures variability of plant height in the perennial sorghum breeding project.

(bottom right) Berni Jilka uses the Clipper to clean Illinois bundleflower seed gathered from wild populations throughout southeast Kansas this summer.



Collecting Germplasm

Ed Orris

Fully equipped with the tools of the trade (#2 and #8 paper bags, thick black permanent markers, paper clips, clipboard with data sheets, burlap bags, a 35 mm camera, plus plenty of camping gear, baked goods, and a cooler of food), Land Institute interns traveled on two germplasm collecting trips this summer. The interns sought the germplasm of eastern gama grass *(Tripsacum dactyloides)* and Illinois bundleflower *(Desmanthus illinoensis)*, plants which are important in The Land Institute's perennial polyculture research.

The eastern gama grass (EGG) germplasm collecting trip took place July 11-14th. Pamela Cubbage, Berni Jilka, and I made the journey. On the first day, we drove south to Sumner County, (south of Wichita) our first collection spot. Traveling east from there, we gathered EGG germplasm (seeds) in Cowley, Chatauqua, Elk, Montgomery, Labette, and Cherokee counties.

By looking for EGG's distinctive reproductive tillers rising above the undergrowth, we spotted collectible plants fairly easily while cruising down highways and backroads. We harvested panicles (seed clusters) from thirty plants in each natural population (a group of genetically related plants in a given area). We placed all the panicles harvested from a single plant into a paper bag. The bags from each plant were paper-clipped and kept separate to insure that germplasm from different families (same mother plant) did not mix.

We filled a larger bag with the individual plant bags, marked the county and date on it, and wrote out a data sheet for the collection. These data sheets contained information on the geographic location of the natural population, size of the population, site characteristics (soil type, slopes, nearby vegetation, etc.), and general characteristics of the plant population (plant size, diseases, leaf and panicle features).

On the second day, we left behind the prairie, farm fields, gently rolling hills, and straight roads of Kansas for the winding roads of the steeper, hillier, and wooded southwest Missouri countryside.

The second, third, and fourth days of the trip proved to be very productive. We found EGG germplasm in Barton, Vernon, St Clair, Cedar, Polk, Hickory, Camden, LaClede, Wright, Douglas, Ozark, Taney, Christian, Lawrence, Newton, and Jasper Counties. We discovered EGG growing in a variety of places: roadside ditches, pastures, stream banks, railroad right-of-ways, vacant lots in towns, at the entrance of a pecan experiment station, and in a wildlife refuge, in our attempt to make at least one collection from each county.

Each night, after a long day's collecting work, we camped near a lake for swimming and relaxation. At sunset on the fourth day, when our bodies were covered with chigger bites and the car filled with bags of germplasm, we headed back to Salina, Kansas.

On September 7-8, I found myself lucky enough to go on another seed collecting spree. Berni Jilka and I gathered Illinois bundleflower seeds in the following counties in southern and eastern Kansas: Harvey, Marion, Chase, Greenwood, Woodson, Wilson, Allen, Bourbon, Crawford, Linn, Miami, Franklin, Anderson, Osage, and Shawnee.

Each county that we traveled through contained ample numbers of bundleflower plants growing along roadside ditches. As with EGG, spotting Illinois bundleflower presented no difficulties. The round dark brown seed pods stood out well against a predominately green and light brown background. Rather than keeping the seeds from individual plants separate, Berni and I "bulked" the germplasm collections, placing seeds from thirty different plants of a population in the same bag.

When we returned to Salina, we air dried the Illinois bundleflower seed pods (as we did the EGG panicles) to prevent decomposition, then threshed them for convenient seed storage. The Land Institute has two small scale electric threshers to accomplish this task. (See photo on opposite page.)

We store eastern gama grass with the stiff panicle casing intact, because at this phase in the research hand decupuling (seed casing removal) by patient interns is the only option for removing seeds. The seed room located in the Krehbiel house basement provides a cool storage space for the dried germplasm.

Depending upon the nature of the experiment, Peter Kulakow, who directs The Land's plant breeding work, and next year's interns will either plant the seeds directly into the soil at the outdoor research plots or into pots in the greenhouse to insure better germination. They will later transplant the greenhouse seedlings into the field.

Why does the Land Institute want these natural population germplasm collections? Basically, to have a wide genetic base from which to select desirable agronomic characteristics. We will carefully monitor the germplasm during storage and germination to insure that different accessions (collections from natural populations) are not mixed up. The accessions that are planted in breeding experiments will be analyzed for traits such as high seed yield, nonshattering (panicles that will not fall off the reproductive tillers or seed pods that will not break open and lose seed), synchronous ripening time, resistance to insect pests, weeds, and disease, and ease of harvest. The germplasm collected this past summer may contain important genetic material.

Ed Orris collecting Illinois bundleflower.

Graduate Opportunities in Sustainable Agriculture

Colin Laird

This article is, in part, the outcome of my search to find out what I would like to do after I leave The Land Institute. To learn what was happening at universities and colleges in the field of sustainable agriculture, I made some phone calls and talked to faculty and students at several of the institutions mentioned in the three source books listed at the end of this article. Although I focused my attention on scientific research in sustainable agriculture, I also learned about people doing work in other areas (policy, economics, health) within the collegiate system and outside of the collegiate system in alternative institutions.

Generally speaking, colleges and universities do not have organized research or curricula in sustainable agriculture. The notable exceptions are the University of California at Santa Cruz Agroecology Program and the University of Maine's Sustainable Agriculture Program. Otherwise, only a few individuals in the places I contacted actually are doing research in sustainable agriculture. And then, professors carry out the research more as a matter of their individual interests, rather than as a part of a university or departmental program.

As I talked to people at different schools, I became aware that the definition of sustainable agriculture varied at each place. Some have only institutionalized definitions based on farming techniques or methods. They are interested in lower purchased inputs and diversification as ways to increase profitability. In only a few cases did the ethics of sustainable agriculture or its political ramifications come up in our conversation.

Some researchers have merely altered the wording in their current experiments so that they sound like sustainable agriculture research, but are conventional experiments none-the-less. So, as in any discipline, the assumptions about what is important to study and research are different depending on the school, the department, the professors involved and their biases. It is up to the individual graduate student to find the right professor to work with, one who is interested in sustainable agriculture or, preferably, actively working in the area. Unfortunately, compared to the number of graduate students, the number of professors interested in and supportive of work in sustainable agriculture seems small. So, it is also important to carefully choose the department in which one would like to study. Some are more sympathetic and encouraging than others. Since funding is, in general, a severely limiting factor in sustainable agriculture research, departmental support in getting a grant can be extremely helpful.

Actually, it is hard to imagine programs in conventional agriculture and sustainable agriculture (ethics included) existing side by side in a college or university. They are antithetical views of how we are to sustain ourselves. Their time frames are different. It is therefore understandable why a school would be reluctant to start a sustainable agricultural program. There is already enough friction among departments.

One seems to find satisfactory programs only at schools that are committed to sustainable agriculture in its fullest sense, the ethical sense (Maine and Santa Cruz). Such an understanding eliminates most conventional research by default. Mainstream land grant universities often try to assimilate the idea of sustainable agriculture within their regular programs, or at least sprinkle in some of the jargon. They don't acknowledge that the political and social implications involved in sustainable agriculture challenge their basic research and education agenda. Such schools are usually those with only a few people doing some sustainable agricultural work within a conventional program. Or, they may be the schools that start a research center devoted to sustainable agriculture that is independent, physically as well as mentally, from the conventional agriculture work going on at the school.

My investigation revealed that the concept of sustainable agriculture, in its fullest sense, the ethical sense, is not widely accepted. Its importance is not acknowledged. Despite the National Academy of Science report on "Alternative Agriculture" and the ease with which many use the word "sustainable," the idea of "sustainable" and how it applies to agriculture and society is still peripheral to the research programs. A student in graduate school will encounter many more students and professors interested in conventional agriculture than sustainable agriculture. In many cases, students must make compromises in the type of research they do in order to receive funding.

This reality is not a cause for despair, however. Former Land interns are enrolled in graduate programs at land grant universities in traditional departments, yet they have not abandoned their interest in sustainable agriculture. Their values about land and food differ from many of their fellow students, and they take courses presented from the conventional perspective. But they usually discover a professor or two who lean towards sustainable agriculture, and they are working towards degrees.

I did receive the impression that interest is growing. Schools such as Iowa State and Wisconsin have recently started research centers (The Leopold Center and The Center for Integrated Agricultural Systems respectively) in sustainable agriculture, even though they currently do not have a graduate program in sustainable agriculture. In some schools, graduate students have organized sustainable agriculture seminars or discussion groups on their own initiative. They describe these as important additions to their class work and research.

What follows is a list of colleges and universities that offer classes or do research in sustainable agriculture. This is probably not a complete list, but it reflects what I learned in my own search for academic opportunities in sustainable agriculture.

The Univ.of Arizona
Dept. of Ecology
Tucson, AZ 85721
Contact: Dr. Robert Robichaux
(602) 621-3458

The Univ. of Calif.at Berkeley
Dept. of Biological Control
Berkeley, CA 94706
Contact: Dr. Miguel Atieri
(415) 642-9802

The Univ.of Calif. at Davis
Agronomy & Range Science Dept.
Davis, CA 95616
Contact: Bill Liebhart
or Mark Van Horn,
UCD Student Farm (916)752-7645

The Univ.of Calif. at Santa Cruz
Agroecology Program
Santa Cruz, CA 95406
Contact: Dr. Steve Gliessman
(408) 459-4051

Carleton University
Biology Dept.
Ottawa, CANADA K1S 5B6
Contact: John Lambert

Cornell University
Dept. of Ecology and Evolution
Ithaca, NY 14853
Contact: Dr. Alison Power
(607) 255-4703

The Evergreen State College
Ecological Agriculture Program
Olympia, WA 98505
Contact: Dr. Pat Labine
(206) 866-6000, x6195

The University of Florida
Farming Systems Program
Gainesville, FL 32611
Contact: Peter Hildebrand
(904) 392-1854

The University of Georgia
Institute of Ecology
Athens, GA 30602
Contact: Dr. Eugene Odum,
Dr. Paul Hendrix,
Dr. Ron Carroll (404) 542-3000

The University of Illinois
Urbana, IL
Contact: Dr. John Gerber
(217) 244-4232

Iowa State University
The Leopold Center for
Sustainable Agriculture
Ames, IA 50011
Contact: Dr. Dennis R. Keeney
(515) 294-3711

Kansas State University
Crop Breeding Unit
Throckmorton Hall
Manhattan, KS 66502
Contact: Dr. Paula Bramel-Cox
(913) 532-7238

The University of Maine
Sustainable Agriculture Program
Dept. of Plant and
Soil Sciences
115 Deering Hall
Orono, ME 04469
Contact: Matt Liebman
(207) 581-2926

Miami University
Dept. of Zoology
Oxford, OH 45056
Contact: Dr. Gary Barrett
(513) 529-6187

The University of Michigan
Dept. of Biological Sciences
Ann Arbor, MI 48109
Contact: Dr. John Vandermeer
(313) 764-1446

Michigan State University
Dept. of Crop & Soil Sciences
East Lansing, MI 48824-1325
Contact: Bernard Knezek
(517) 353-4569

McGill University
Dept. of Entomology
MacDonald Campus
St. Anne de Bellevue, Quebec
CANADA H9X 1CO
Contact: Stuart Hill

The University of Minnesota
Dept. of Agronomy
St. Paul, MN 55108
Contact: Dr. Kent Crookston
(612) 625-0220

The University of Nebraska
Dept. of Agronomy
Lincoln, NE 68583
Contact: Dr. Charles Francis
(402) 472-1581

North Carolina State Univ.
Dept. of Soil Science
Box 7619
Raleigh, NC 27695-7619
Contact: Dr. Larry King
(919) 737-2645

Ohio State University
Soil Ecology Program
Dept. of Entomology
Columbus, OH 43210-1220
Contact: Dr. Clive Edwards
(614) 292-3786

Oklahoma State University
Wes Watkins Ag. Research
and Extension Center
Box 128
Lane, OK 74555
Contact: J.V. Edelson
(405) 889-7343

Oregon State University
Dept. of Soil Science
Corvallis, OR 97331
Contact: Dr. Richard Dick
(503) 737-0123

Pennsylvania State University
Dept. of Ag. Economics
and Rural Sociology
University Park, PA 16802
Contact:Dr. Morteson
(814) 865-0469

Syracuse University
Syracuse, NY 13244
Contact: Dr. Katherine Clancy
(315) 423-4554

Tufts University
School of Nutrition
Medford, MA 02155
Contact: Dr. William Lockeretz
(617) 391-1033

University of Vermont
Dept. of Plant and Soil Science
Burlington, VT 05401-3596
Contact: Dr. Bill Murphy
(802) 656-2980

Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061
Contact: Dr. John Luna
(703) 231-4823

Washington State University
Dept. of Agronomy and Soils
Pullman, WA 99164
Contact: Dr. David Bezdichek
(509) 335-3644

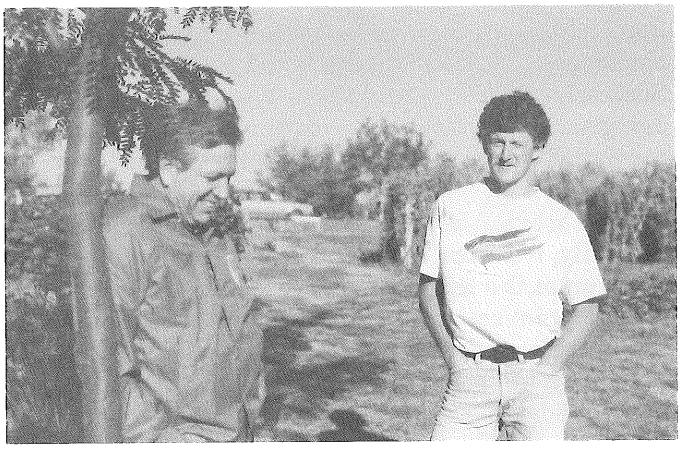
Western Michigan University
Dept. of Political Science
Kalamazoo, MI 49008
Contact: Dr. Kenneth Dahlberg
(616) 387-1000

The University of Wisconsin
Institute for Environmental Studies
Madison, WI 53706
Contact: Dr. Becky Brown
(608) 262-0090

SOURCES

1. *Universities and Colleges that teach Agroecology or Related Subjects*. University of California at Santa Cruz. October 5, 1988.
2. *Educational and Training Opportunities in Organic, Low Input or Sustainable Agriculture.* Jane Potter Gates and Kathryn Bielenburg. Alternative Farming Systems Information Center, National Agricultural Library. August 1989. (301) 344-3704
3. *Sustainable Agriculture Research Sourcebook*. Wisconsin Rural Development Center, Inc.. Black Earth, Wisconsin 53515-0504. 1986.

4. I would like to thank the faculty and students who took the time to talk with me about their programs, especially Michel Cavigelli and Jan Ryan, former Land interns who are now working on graduate degrees.



Wes Jackson and Colin Laird .

One Victory is not Enough

Wes Jackson

The following was written as an op-ed piece for the Los Angeles Times and appeared in the Sunday edition on October 1, 1989. Many other newspapers also carried it.

The National Academy of Sciences carries more prestige than any body of scientists in our country, maybe even the world. In early September the National Research Council (an arm organized by the National Academy in 1916) released a handsomely-done 450-page volume entitled *Alternative Agriculture* which, on my postal scales, weighed in at two and an eighth pounds. If my copy were wheat, it would be worth about fifteen cents. The study may well be worth billions in the short run, many times that in the long run, and might even be the first significant step toward saving our agricultural landscape first from the ravages of the chemical industry. Eventually it may prevent soil erosion and stem the tide of capital flow out of our rural communities. It is a small step, but the first step a baby takes—as halting as it may be—is always counted as important.

Upon release, nearly all major newspapers across our land carried a front page notice of the select panel's conclusions. It is a landmark book also in the sense that it is more radical than many conventional agriculturists appreciate, for it represents a possible turning point away from such a dependence on the extractive and polluting economy of which agriculture is only a part. The study confirms that we can farm without heavy chemical inputs, be they the fertilizer or pesticide varieties, that numerous farmers are already doing just that and cutting their costs besides. The group goes on to advocate removing the subsidy for such chemicals. In short, establishment scientists have finally validated one of the major tenets of the sustainable agriculture movement, a validation twenty years overdue. My gossip

(contd. pg 23)

Annual Report

July 1, 1988 - June 30, 1989

The Land Institute

Dear Friend of The Land:

There is a cynical view which holds that humans are too short-sighted, too uninterested in the long term and too greedy to do what needs to be done in order to "stem the tide" of our modern destructive habits. Our experience with fundraising for the long term work of The Land Institute does not support such a view at all.

The Land Institute has remained financially solvent during all of its thirteen years — and we intend to stay that way. We take some of the credit: we keep expenses down by cutting our salaries when we have to or waiting to buy something until we can afford it. Managing money in a prudent manner is not particularly heroic. Most successful households operate that way.

It's on the income side that you've shown the cynical view of human nature to be false. The record of our supporters clearly demonstrates that some humans are interested in more than the short run, the next quarterly report or the next election.

We've told all of our contributors that our work to help develop a more sustainable form of agriculture is a long term proposition — 25 to 50 years or more — and you've responded with vision and generosity.

Thank you for your participation and involvement. We couldn't do it without you.

Sincerely,

Wes Jackson

Wes Jackson
President

The Land Institute 2440 E. Water Well Road Salina, Kansas 67401 (913) 823-5376

Devoted to Sustainable Agriculture and Good Stewardship of the Earth.

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Highlights of 1988-1989

* Completed the third year and started the fourth year of an ongoing ecological study of the prairie as a model for sustainable agriculture

* Conducted 8 agronomic experiments in 1988 and started 12 in 1989 as part of the long-term effort to develop an agriculture based on mixtures of perennial seed crops

* Completed the first season of The Land's Harvest, a project devoted to the production and local marketing of organically-grown produce and field crops

* Completed the 1988 10-month program educating future leaders in sustainable agriculture with 9 interns and 1 research fellow; started the 1989 internship with 8 interns and 2 research fellows

* Hosted more than 400 guests at the 11th annual Prairie Festival in May, 1989, this year providing a unique prairie perspective on global environmental challenges

* Planned and initiated a three-year project to renovate the Herbary, a garden of some 300 species of prairie perennial plants

* The work of The Land Institute was highlighted in a front page article in The New York Times and a variety of other publications and settings

* Received financial support from more than 850 persons with contributions coming from 44 different states and 9 foreign countries

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Dear Friend of The Land:

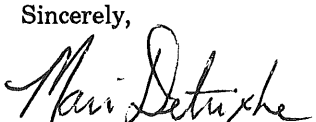
The Land Institute needs staying power to research perennial polycultures and support the move to a sustainable agriculture. The long-term health of The Land depends in part on stable funding and and environment which encourages good work and shared leadership.

To improve The Land's sustainability, the Board and staff made several changes this past year. With his new title of President, founder Wes Jackson will focus on communicating the vision and setting the direction for our work, while a staff management team will oversee day-to-day affairs.

In addition, the Board is diversifying and becoming more actively involved. Loyal, long-term Board members from the Salina area have voted in new Board members with wide-ranging backgrounds and homes, and an Executive Committee of the Board will work more closely with Wes and the staff between Board meetings.

It is our hope that these changes will make The Land itself more resilient and enable the people who work here to focus intently on nature's wisdom and our human respect for the earth.

Sincerely,



Mari Detrixhe
Chair, Board of Directors

THE LAND INSTITUTE

Summary of Revenues and Expenses

July 1, 1988 - June 30, 1989

		Total Operating Funds
Revenues		
Individual Grants	$	54,690
Foundation Grants		234,584
Corporation Grants		5,000
Friends of The Land Contributions		34,623
Earned Income/Other Income		33,587
Interest		24,089
Total Revenue	$	386,573
Expenses		
Research Program		191,450
Education Program		107,552
General Operations & Management		43,617
Development		30,151
Total Expenses	$	372,770
Net Income Before Depreciation	$	13,803

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("One Victory" contd. from pg. 18)
mill informs me that it was more or less finished two years ago, waiting for the right political moment for release. Though the report does not make me feel as though I have died and gone to heaven, I am happy that one important part of the argument about the evils of modern agriculture can now evaporate. The too-long held and silly notion that chemicals are necessary if we are to keep from starving has been addressed and dispensed with. We long-term proponents of sustainable agriculture can now refer a whole set of questions to the National Research Council. Highly respected scientists can field the accusations that this is an agriculture carried out by hippie farmers or a weird cult. What's more, all the land grant institutions will finally have to come forth and answer their critics. Countless extension agents can quit being traveling salesmen for the chemical companies.

As happy as people on my side of the argument can be about this blow to the chemical companies, countless pitfalls still await American agriculture. We still have the deeper social questions surrounding agriculture, questions that have to do with rural community, farm size, justice and the even deeper, pestering ecological questions—such as what to do about soil erosion and the fact that we need gasoline and diesel to run our equipment and natural gas to serve as the feedstock for nitrogen fertilizer. (About 1.8 times as many calories are used to sponsor the fertility in America's fields as are used for traction.)

Those committed to the long pull still have a huge agenda awaiting them. It is important to keep in mind that this push for alternatives in agriculture did not come out of the land grant universities or the U.S. Department of Agriculture, certainly not out of the chemical industry or the seed houses. The report acknowledges this fact, that it comes out of "the people," so to speak. "The people" should not slack off and assume that alternatives are now in the good hands of established agriculture. In other words, it is necessary to keep in mind what the report does not do, and in all fairness, what it was not meant to do.

The sustainable agriculture movement has a platform almost like a political party. One of the planks is the chemical plank. There is a soil erosion plank, a fossil fuel dependency plank, a family farm plank and an appropriate farm size plank. Let's consider farm size for a moment. Most of us proponents of sustainable agriculture have always considered scale as important as the chemical issue or any of the others just mentioned. But the report, by being scale neutral, creates a problem.

There are eleven case studies in the report, featuring fourteen farms. The Virginia farm studied is over 3,000 acres in an area where the average farm size is 200 acres. The two Coleman brothers who produce natural beef in Colorado own 13,000 acres, lease an additional 13,000 and have grazing permits on 250,000 acres of Forest Service and Bureau of Land Management land! That would accommodate over a million one hundred thousand L.A. homes on quarter acres lots. (And still the wife of one of the brothers has to work as a school nurse to help meet household expenses.) One Florida farmer owns and controls over 9000 acres consisting of 1500 acres of sweet corn, 120 acres of cabbage, 3,000 acres of radishes, 1600 acres of seed corn, 1300 acres of leafy vegetables, 120 acres of oranges, 1500 acres of sugar cane and has 500 acres devoted to pasture for cattle. This farm becomes part of a landmark report because inputs are low. A second Florida farmer has a total of 350 acres all growing peppers, a third a total of 1300 acres all in tomatoes. The report features other large-scale examples. I guess we are supposed to think that if the big boys can give us chemical-free food, so can everyone else.

I don't think it is overly cynical to suspect that this study focused on chemicals first because the urbanite is more worried about the chemical issue than the demise of the family farm or soil erosion. This is typical of the consumer's interest. His or her worry about hormones in beef or pesticides on fruit is simply an extension of concern about industrial pollution in general. Millions of Americans will send money to a consumer advocacy organization but would not think of taking out membership in the Soil Conservation Society.

It is crucial that "the people" who developed the terms and the understanding which surrounds them control the definition of sustainable or alternative agriculture, and the same people need to pay attention to why this one victory, if we can prematurely call it that, is not enough. Reducing chemical inputs will help, but farmers will still be in trouble ten years from now if this is as far as we go. We all need to remember that what is happening to the farmer, the farm and rural communities represents a faint foreshadow of what's bound to happen incrementally to the rest of the culture unless the institutional structures and policies which fuel our use-it-up-throw-it-away economy are greatly changed. It needs to be said again and again that this rural crisis is not like some isolated, malfunctioning satellite, "out there" away from the cities orbiting the industrial economy waiting for some simple fix. Rather, our rural areas might more accurately be regarded as the vulnerable soft underbelly of the culture at large. It would be nice if a simple reduction in fertilizer and pesticide use could fix agriculture. The simple reality is that rural people are a dispersed minority with no political clout, marginal isolates rapidly becoming like Third World people. And increasingly, the landscapes on which they live take on a Third World appearance.

If we are looking for what it all boils down to,

we had better think of the nature of power. Rural people are a dispersed minority. If they were a dispersed majority or a concentrated minority, they could have a voice with which all would have to reckon, but they don't. So, the rural economy is mostly an "exit" economy. Money capital leaves. People capital leaves. Ecological capital leaves in the form of soil or aquifer water. What has stayed are the alien chemicals the report makes as its principle subject, chemicals which will stay around to pollute what soils and water and people are left.

We can hope now that chemical application will mostly disappear, but with the validation of large scale farms in this report, rural schools and rural churches will continue to close. Rural baseball will continue to die out. It is a sorry state all of us face each day out here in the countryside. Outbuildings and abandoned houses go unpainted, roofs begin to leak, studs rot, walls lean; and when the inevitable storm comes through, one by one, they fall in a heap. One day, often years after a building has collapsed, an area bulldozer operator, hired to push out a hedgerow in order to expand the kingdom of wheat twenty more feet along a field's edge, spends a few minutes pushing the fallen building into a tighter pile. After dashing some diesel fuel over these jackstraws of two-by-fours, -sixes and -eights, siding and shingles, nails and hinges, he strikes a match and a portion of a 1920's Oregon forest, sacrificed for the common good, goes up in smoke. Paid-for buildings and decent people don't interest the extractive economy.

Meanwhile, the dominant culture, mostly well-heeled and wanting chemical-free food, remains content to keep only a few examples of the rural life around for nostalgic purposes —like keeping a well-polished Model T Ford, valuable as a quaint or interesting relic. But what our culture must face is the question of whether the Jeffersonian ideal which brought these farms and farm families and rural communities into existence is mere nostalgia or a practical necessity? This may be the most important national question for the rest of the century, for how we deal with these problems across our food-producing landscape will probably set the precedent for how we will deal with the other problems our culture is bound to face.

Alternative Agriculture thoroughly documents a small but important component of the rural crisis. Those responsible deserve our gratitude for exposing the farmers' chemical addiction and for helping farmers everywhere to have cropping arrangements that make it possible to just say "no" to the chemical cartels that blight our land. But as our culture is slowly learning, there is more we humans are addicted to than chemicals.

- Soil - Livestock - People -

Health Depends Upon Soil

Raymond Epp

"If you really stop to think about it", William Albrecht once said, "all I have done here is write down what we have learned . . . about how everything connects." [1]

William Albert Albrecht spent a lifetime studying the interconnectedness of healthy soil, good nutrition, and healthy animals including humans. His studies began on the family farm in central Illinois where he learned to love the soil and agriculture. As a young man he entertained thoughts of becoming a medical doctor, but after considering the economic plight of rural doctors, he rejected medicine as a career, although he maintained an interest in health. His undergraduate education focussed mostly on the humanities; he later turned his attention to agriculture, and eventually received a PhD. in soil microbiology. Albrecht's experience on the farm and an education rooted in the humanities and pure science, rather than the applied sciences and their related economics, helped develop his perspective of the interconnectedness of all things.

Albrecht was recognized for his contributions in soil microbiology. He was a member of several professional organizations, including the American Association for the Advancement of Science, the American Society of Agronomy, the Soil Science Society and the International Society of Soil Scientists. Albrecht chaired the Soil Science Department at the University of Missouri from 1938 until his retirement in 1959. He brought to his work a mindset which was not scientific; he did not consider humans to be objective observers of the soil. Instead, he saw human health ultimately depending upon the health of the soil. [2]

> Nature was the great teacher and agriculture was the art of working within her . Agriculture is still an art, which we study by deduction, that is, we look at it as a natural behavior. We take a fragment out of it and put a little science into that portion. But when we take complete control we must have the science so well organized that we can put all the parts together and run the whole process from creation to death. Nobody as yet has been able to do that with agriculture... Agriculture is biology first and foremost.[3]

It was at Sanborn Field that nature revealed many secrets to Albrecht and his students. Sanborn Field, begun in 1888 by Dr. J.W. Sanborn, Dean of the Missouri College of Agriculture, is the oldest agri-

In issue # 50 of *New Options*, editor Mark Satin suggests that society change the "guiding story" behind traditional politics and economics from "growth" (the value and necessity of endless economic growth) to "health." For the last two years, the World Health Organization (WHO) has been saying that "the measure of societal success should be, not the growth of the economy, but the inner and outer health of the people." Instead of public health policies, we need healthy public policies. Satin reported that at the 1985 annual conference of TOES (The Other Economic Summit), participants urged WHO "to promote healthier work, healthier food, healthier housing, a healthier built and natural environment, healthier transport policies, healthier technologies—and a healthier definition of wealth!"

This section is about health. Two writers have considered how healthy soil relates to healthy crops, healthy livestock and healthy people. Another examines an alternative to conventional medicine that connects the mental, spiritual and physical aspects of people and their environment in the healing process. The fourth writer, involved in a grassroots organization opposing the construction of a secondary lead smelter, describes an effort to convince people that health is a better "guiding story" for her community than economic growth.

D.J.

cultural research station west of the Mississippi River. Albrecht undertook long-term research, observing the land and learning its requirements from 1916 until his retirement in 1959. He recorded his findings in almost 800 technical and popular papers, including studies of the importance and limitations of legumes in improving soil, the importance of maintaining soil organic matter, and the nature of nutrient uptake by plants

Albrecht's early work focussed on the role of legumes in improving the soil. Legumes are important in crop rotations to put fertility and organic matter into the soil. What Albrecht found in some of the plots containing depleted soils at Sanborn Field was rather astounding.

> Legumes are not soil builders when grown on exhausted, 'tired' soils.... On exhausted soils, deficient in nitrogen, phosphorus, potash and calcium, legumes take little if any nitrogen from the air....Although good tonnage may be produced per acre, the growth consists largely of carbohydrates and consequently is not high protein feed.... Such legumes are not even efficient producers of organic matter which could be used to increase soil humus.... Under declining soil fertility the plant's protein manufacturing processes are evidently the first to decline.[5]

While Albrecht was carrying on his research at Sanborn Field during the 1930's, black clouds rolled across the American Midwest to the eastern seaboard dumping millions of tons of soils in their wake. This ecological disaster galvanized support for soil conservation in the mid 1930's. The roots of the disaster were not to be found solely in the deficiency of rainfall but also in the devastating impact of "the big plow-up."[6] The big plow-up ignited the biological fires and began the process of burning organic matter that had been accumulating in the prairie soils for 25,000 years.[7] This process, coupled with the cyclical return of the drought, produced the Great Dust Bowl.

Albrecht underscored the importance of organic matter in an article entitled, "The Loss of Organic Matter and its Restoration" in the 1938 United States Department of Agriculture *Yearbook of Agriculture* when he wrote:

> Soil organic matter is one of our most important national resources; its unwise exploitation has been devastating; and it must be given its proper rank in any conservation policy as one of the major factors affecting the levels of crop production in the future.

There was no doubt that soil organic matter was being depleted in the prairie soils. The long term research of Hans Jenny, a colleague of Albrecht's, served as evidence. He compared the organic matter content of an undisturbed virgin prairie to that of a field cropped to corn, wheat, and oats for sixty years without any additions of fertilizer or manure. He found that even though no erosion had occurred on the cultivated field (which is nearly inconceivable) 38% of the organic matter was lost. These results were a cause for concern. Loss of organic matter was altering soil structure, reducing water infiltration, and increasing soil compaction.[8] Fortunately, the rapid burning of organic matter tends to level off in young agricultural soils over time. Unfortunately, it is at a level far lower than its native state. Albrecht urged soil conservation policies to make up for the years of soil abuse and neglect.[9] Crop rotations are not enough, Albrecht discovered. Farmers must grow sod crops to boost the stock of organic matter and stored nutrients in soils. He recognized that soil restoration is a long and difficult process, but must be done.

William Albrecht also did important work in understanding how nutrients move from the soil to the plant. Building on the foundations of Richard Bradfield, Hans Jenny, and R. Overstreet, he contributed to our understanding of nutrient movement and its relationship to plant and animal nutrition. [10]

Albrecht understood soil organic matter and soil clay particles as the storehouse of organic and inorganic nutrients for plant growth in a fertile soil. Nutrients are attached to the clay particles by electrical charges, making them insoluble in water moving in the soil yet available for the plant.[11]

The process by which a plant is nourished by the soil begins when the plant root gives off carbon dioxide at the root's surface as a by-product of respiration, and in conjunction with soil water, forms carbonic acid. The root then exchanges this hydrogen atom for a nutrient held by the clay particles in the soil. As a consequence of plants exchanging hydrogen for soil nutrients over long periods of time, the nutrient supply in our soils is being depleted and replaced by hydrogen. We interpret this to mean that our soils are becoming more acidic and therefore in need of lime (increased acidity, increased hydrogen levels, and low pH are synonymous). We fail to recognize that the pH problem may really be a problem of depleted fertility.[12] One way to buffer the damage of soil mining, according to Albrecht, is to return organic matter and animal waste to the fields.[13]

The importance of organic matter as the "fuel" for the soil was overlooked when the munitions factories went looking for a peace time use for their nitrogen production after World War II and began manufacturing nitrogen fertilizer. Agriculture became the recipient of an industrial product, and with this shift to industrial fertility soil biology was ignored.

> Because we turned away from much of the art of agriculture, we have serious confusion....Let us try and comprehend the fact then that soil fertility properly coupled with plant nutrition is a form of creation— a form of outdoor biology— and is not a matter merely of scientific technology.... We seem to have lost sight of the fact that the creative business of agriculture has always started in the soil.

Water soluble, or salt fertilizers, were to Albrecht, "a damn fool idea," because the rationale for their use misrepresented the way nutrients moved from the soil to the plant.

> The use of the major amount of water by the plant is that of keeping the respiring leaf tissues moist for the exchange of gases, namely carbon dioxide and oxygen.... But yet we take to the concept that the transpiration by the plant has something to do with the movement of nutrients from the clay of the soil into the roots. The transpiration stream of water from the soil, through the plant and into the atmosphere is independent of the nutrient stream from the soil into the roots.[15]

Albrecht's unwillingness to accept research money from agrichemical companies eventually led to his stepping down from head of the soils department at the University of Missouri. Although accused at times by other researchers of drawing false conclusions from his data to support his views, he remained an active spokesman for biologically sound agriculture and good nutrition until his death in 1974.[16]

Louis Bromfield and Eugene Poirot were among the people influenced by Albrecht's life and work. Bromfield bought an old worn-out farm in Ohio and restored it to health. The story is recorded in his classic books, *Pleasant Valley* (1943) and *Malabar Farm* (1946). Bromfield served as an officer and board member for the Friends of the Land, an organization Albrecht also belonged to. Eugene Poirot was a student of Albrecht's. Similarly, he restored the soils of a farm in Missouri and recorded his inspiring story in a book entitled *Our Margin of Life.*

Albrecht was uncompromising in his view that "our health depends on soil." He also believed that our nation's health depends upon the soil.

> No national agricultural policy for survival under high standards of living can come forth unless we finally realize that our national strength lies in the fertility of the soil and our future survival in the wise management and utmost conservation of it.[17]

Soil conservation could only be accomplished within the context of the Jeffersonian ideal, according to Albrecht, with many people taking care of their own land.

> Soil conservation is still an individual responsibility. Soil conservation is still an individual opportunity. By multiplying the individual soil conservationists, we can meet the hunger needs ... yet for a while.
> Only in a struggle on such a democratic basis can a democracy survive. We shall survive only according as our needs are reduced to come into balance with the possible reconstruction of the soil. This view of the future for each of us, puts real meaning into the words, "Soil Conservation," and calls for more folks to become Friends of the Land in the fullest significance of that title.

References and Notes

1. William Albrecht, quoted in Charles Walters Jr., *A Life in the Day of an Editor*, 1986. Kansas City, MO: Halcyon House, Publishers, p. 46.
2. This can best be understood by a quote from "Diagnoses or Post-Mortems?" in *The Albrecht Papers*, Charles Walters Jr., Ed., Raytown, MO: Acres USA, 1975, p. 367. "For generations, the conquest of nature has been accepted as man's (sic) prerogative. But man is a part of nature, it being his essential environment, and unless he can find his rightful place in it he has poor hope of survival."
3. *The Albrecht Papers*, p. 50-51.
4. *A Life in*, p. 45-46.
5. *The Albrecht Papers*, p. 74.
6. Donald Worster, *Nature's Economy: A History of Ecological Ideas*, 1977. New York: Cambridge University Press, p. 229.
7. William Albrecht, "The Loss of Organic Matter and its Restoration", Soils and Men: *Yearbook of Agriculture 1938*, United States Department of Agriculture and United States Government Printing Office, p. 347.
8. "The Loss of", p. 349.
9. "The Loss of", p. 355.
10. William Albrecht, E.R. Graham and H.R. Shepard, "Surface Relationships of Roots and Colloidal Clay in Plant Nutrition", *American Journal of Botany*, Vol. 29:3, p. 210-214.
11. *The Albrecht Papers*, p. 118.
12. *The Albrecht Papers*, p. 240.
13. "The Loss of", p. 360.
14. & 15. *The Albrecht Papers*, p. 53.
16. Dr. Albrecht attempted to show in one instance how the protein content of wheat in Kansas declined from 1940 to 1949. He attributed this reduction to the loss of soil organic matter. An equally valid explanation of the reduced protein content in 1949 could be found in the higher rainfall of that year compared to the rainfall in 1940 (conversation with Dr. Orville Bidwell).
17. *The Albrecht Papers*, p. 63.
18. *The Albrecht Papers*, p. 496.

Thanks to Charles Walters Jr. for supplying me with books and tapes by William Albrecht. Thanks also to Dr. Orville Bidwell, Professor emeritus at Kansas State University, for taking the time to talk with me about his personal recollections of William Albrecht.

Farmers Talk about Livestock Health

Bernie Jilka

It was a beautiful September afternoon. The cool northerly wind insisted that we wear jackets, so we welcomed the warm sunshine. The cottonwoods were beginning to show shades of yellow, and the grasses, hues of red and brown. Abundant patches of big bluestem and indian grass nodded to us from the roadside as we sped by, on our way to visit Jim and Lisa French near Partridge, Kansas. The Frenches were conducting a tour of their fields and farm on this Saturday afternoon.

Jim and Lisa have a cow-calf operation and sell the calves as feeder stock. The cows are bred at two different times, in January, and in May, so that calving can be kept under control and the cows cared for as they prepare to calve. The Frenches sell the weaned calves when they have gained 550-600 pounds. They had been raising Simmentals, a European exotic breed, which are docile but quite large and rough on pastures. They are replacing the Simmentals with another European (German) breed, Gelbviehs, which are smaller and easier to handle.

The Frenches grow their own feed, with the exception of a few supplements. Austrian peas are planted in the fall rotation and serve as a winter cover crop, a possible nitrogen-fixer for the soil, a green manure when turned under in May, and also a source of protein for the cattle when they graze on the field in early spring. The Frenches also grow alfalfa in the crop rotation, along with wheat, sorghum, and soybeans. To eliminate the use of insecticides for alfalfa weevil, the Kansas State Board of Agriculture has released parasitic wasps into one of the fields for experimentation.

The cows can graze on the Austrian peas in early spring with few bloat problems. Alfalfa is often too rich for cows to graze on. Jim has found if he grazes the pregnant cows on wheat in early spring, the fetuses of the cows in the last trimester will grow too fast, and the cows may have trouble birthing.

The French livestock operation exemplifies a good system of animal nutrition, as described by Paul Johansen in his presentation at the Kansas Organic Producers meeting in March. Paul is an animal nutrition consultant, and he stressed the benefits of farmers growing feed for their own livestock. The farmer is familiar with the soil, and the condition of the crops grown for feed. Mr. Johansen warned that purchased feed should be examined for excessive amounts of vitamins or unnecessary additives. There can be impurities in feed such as sulfates and oxides, often packaged with vitamins. Thirty to sixty percent of vitamin A is lost if stored in feed bags that contain oxides. Vitamins and minerals are much more useful to an animal's nutrition as a natural constituent of its food, rather than an isolate added to the feed bag. Protein supplements are also common additives in feed, espe-

Jim French talks about raising livestock.

cially for young animals. However, Paul Johansen stressed that too much protein or nitrogen in an animal will cause an ammonia release in the digestive system, which raises the pH level of the blood, and creates an environment conducive for pathogens.

It is not only important to keep track of an animal's inside environment, but it is also advisable to be aware of outside environment conditions. Jim believes that animals must not be kept in confinement but be out on the fields, where they can return nutrition and organic matter to the soil. Windbreaks along the fields on the French farm not only protect soil, but provide cover for the livestock when needed, and create a living fence to keep the cattle on the fields.

The Frenches are aware of the importance of creating good soil tilth when growing crops. The sudan grass they plant for fall pasture not only provides feed for the cows, but also develops a good root system and therefore leaves the soil with better texture and porosity. Alfalfa with its deep roots is effective in bringing up nutrients and minerals to the topsoil. Because the soil near Partridge is quite sandy, it is necessary to increase the organic matter in the soil to create an increased water-holding capacity.

When I interviewed Paul Johansen, he emphasized the need for a balanced healthy soil in order to grow healthy crops to raise healthy livestock. The soil should be tested and examined routinely. He said that crop rotations are beneficial, especially when rotating between a nitrogen-fixing and a nitrogen-using plant to create a balance. The soil needs organic matter which must turn into humus to create tilth. To promote the aerobic organisms necessary to break down the organic matter to humus, shallow tillage is required. A soil with humus will retain moisture, and become less susceptible to wind and water erosion. Applications of pesticides, herbicides, and anhydrous ammonia destroy beneficial organisms in the soil, and damage soil tilth. Biological activity cannot be substituted mechanically.

I talked to another farmer, Howard Thome, who is a firm believer in biological activity. On his farm near Wichita he raises 100 bottle calves a year, marketing his finished product as hormone- and residue-free beef for the regular market. He grows most of the feed needed for his calves on 240 acres. Howard believes that a healthy life cycle begins with bacteria in the soil, which will in turn provide natural bacteria to the animal through food for proper digestion.

Thome starts his calves on a pelleted protein for a couple months and then gives them a combination of oats, barley, alfalfa, and straw. Straw is a good source of roughage and carbon to balance the proteins. Larger calves have gained as much as three pounds a day. Howard doesn't believe in precise, scientific balanced rations as taught in farm management courses. He says that as long as he can provide high quality feed, the calves will choose what they need to eat. Probiotics are used routinely to promote bacteria in the digestive tract.

I spoke with Gina and Glenn Huebert in a telephone conversation. These Nebraska hog farmers consult regularly with a veterinarian and nutritionist, who could also be considered a soil scientist. Dr. Dan Skow sees problems in diagnosing and treating animals without also examining and treating the soil. Glenn works with Dr. Skow in trying to achieve a healthy, balanced soil, so he can avoid putting additives in the feed. He mixes antiobiotics in the feed of newly weaned hogs for only two to three days, as this is a crucial time. Other inputs are minimal if needed, and instead Glenn relies on a healthy soil to create nutritious food. Glenn has also noticed that a healthly soil will make better use of rainfall, creating penetration and improved water-holding capacity, therefore he does not have to rely on irrigated water as much. He estimates that he irrigated only a third as much as his neighbors this summer.

Jim, Glenn, and Howard, all use antiobiotics for short periods of time as is recommended by nutritionists. Paul Johansen thinks that antibiotics can be helpful to control or reduce a pathogen infection if used for only two or three days. If used for a longer period of time, antiobiotics will create mutative pathogens, which become resistant to the antibiotics. Also, he says that the mutative pathogens caused by antibiotics may mutate to become part bacterial, part virus, and affect the natural balance of bacteria in the digestive system.

Probiotics are lactic acid-generating organisms, used as an alternative to antibiotics. Paul believes that probiotics are often misunderstood and oversold. Probiotics may not survive in a hostile environment such as the high acidity in the stomach; therefore, they often become nonviable before reaching the large intestines. Fermented milk products high in lactic acid are the best alternative. The lactic acid will prevent the colonization of bacteria and will metabolize to an energy source in the animal.

As a consultant, Paul urges livestock operators to be observant, suspecting anything that interferes with natural processes. When livestock become ill, common sense directs farmers to examine stress factors such as the food, storage of the food, or perhaps how the food crops were grown. Knowing the normal behavioral patterns of the livestock and using good judgements when a health problem does occur may eliminate unnecessary medical bills.

Johansen believes it is also important to acknowledge the auto-immune system functioning within an animal. This immune system must be properly nourished in order for it to function correctly. For example, he says that if a soil is deficient in trace elements, the crops grown in this soil will also be deficient, and the animal's blood cells will be malnourished, resulting in a poor immune system.

Driving home from Partridge, noticing the sorghum ripening, and patches of corn here and there being harvested, I couldn't help but wonder about the fields I was viewing, of the nutritional value of the grains in them. From a roadside view fields may look similar, but the true story is told in the soil.

Each of the people I interviewed for this article has his or her own opinions on how to farm and raise livestock. What they all have in common is an ethic that requires them to be responsible livestock caretakers and good stewards of the land. They believe that nurturing the soil, growing healthy crops and raising healthy livestock are all connected.

Homeopathy: an Ecology of Human Health

Danielle Carré

Two years ago I became ill and sought treatment from a general medical practitioner. The drug he gave me alleviated my symptoms but its side effects became intolerable. At the suggestion of friends, I visited a homeopathic doctor, although I was unfamiliar with homeopathic medicine and skeptical that this alternative doctor could help me. Following an extensive interview during which he asked me quite personal as well as medical questions, he prescribed for me the homeopathic "remedy," Lycopodium. Having studied a bit of botany, I knew that Lycopodium is a type of club moss, so I questioned further. He explained that the remedy contained Lycopodium as the only active ingredient, but in extremely dilute form (diluted one to a hundred, thirty times!). What good, I wondered, could be done by such a small dose of any substance? To my surprise the remedy worked very well.

This experience sparked my curiosity about the unique medical discipline called homeopathy. Homeopathy is based on a principle called "The Law of Similars," which states that "any substance which can cause symptoms when given to healthy people can help heal those who are experiencing similar symptoms."[1] The homeopathic perspective on health in general is also unique, since in addition to considering the symptoms of the individual, it also gives great relevance to how that individual interacts with his community and the surrounding environment.

THE HISTORY OF HOMEOPATHY

The founder of homeopathy, Samuel Hahnemann, was born in Saxony in 1755. He was a noted scholar and an esteemed physician and chemist. Hahnemann soon gave up his medical practice because he realized that the cures then used (bloodletting, leeches and poisonous doses of mercury and arsenic) were cruel and harmful.[2]

Since he was also a scholar of many languages, he started translating texts to support his family. While translating a work by William Cullen, Hahnemann came across a reference to Peruvian bark (quinine). Cullen claimed that the bark was effective in controlling malaria because of its bitter and astringent qualities. A skeptical Hahnemann proved Cullen incorrect by preparing an even more bitter and astringent mixture that was useless against malaria. He decided to test the physiological effects of Peruvian bark by taking a small dose himself. To his surprise he developed symptoms very similar to those of malaria. Hahnemann wondered if the curative property of Peruvian bark was its ability to produce symptoms in a healthy person similar to those suffered by a person ill with malaria. If the symptoms represent the body's attempt to rid itself of disease, then perhaps the Peruvian bark was helping the body.[3]

Hahnemann began a thorough study of this approach to healing. For the next six years he and other like-minded physicians ingested substances and carefully documented any symptoms produced. He also reviewed numerous medical records describing accidental poisonings.[4]

Through his detailed research, Hahnemann discovered a general principle: a substance could often cure a disease in a sick individual if it produced in a healthy person symptoms similar to those of the disease. This he called a law of similars -*Similia similibus curentur* (let likes be cured with likes).[5] Hahnemann did not claim to have originated this idea. In the tenth century B.C., Hindu sages mentioned the law, as did Hippocrates, the father of medicine, who wrote, " Through the like, disease is

produced and through the application of like, it is cured."[6]

Hahnemann began successfully treating his patients with these remedies. He discovered that results obtained were better from small doses, even those that were diluted to such a degree that possibly no molecule of the original substance was present in a typical dose of the remedy. He theorized that the curative property of the substance might reside in the energy it imparted to the diluted sample.[7]

Homeopathy quickly grew as a respected practice in both Europe and the U.S. It was first introduced in the U.S. following its success in treating victims of the 1832 cholera epidemic in Europe.[8] By the turn of the century, 20% of all physicians identified themselves as homeopathic doctors, and there were 22 homeopathic medical schools and over 100 homeopathic hospitals[9]. Homeopaths' effective and pleasant tasting remedies became popular with a public dissatisfied with the harsh practices of bloodletting and the use of arsenic and mercury.

Homeopathy then underwent a decline in the U.S for several reasons: first, the antagonism of conventional practitioners to the new and popular discipline; second, the rise of the drug industry; and finally, the new mobility of the American population.[10]

Conventional doctors felt threatened by the popularity of homeopathy, since many of their own patients were transferring to the care of homeopaths. In addition, they felt that homeopaths (licensed physicians like themselves) had rejected accepted methods of medical practice. Dr. Panos, reviewing the history of homeopathy in Homeopathic Medicine at Home, states that the American Medical Association (AMA) was formed in direct response to the founding of the American Institute of Homeopathy two years earlier in 1844.[11] The AMA code of ethics did not allow its members to consult with homeopathic doctors, and standard practitioners influenced legislation that limited homeopathic training and practice. Homeopathy received yet another blow when in 1910, the Flexner report, an evaluation of medical schools by the AMA, gave very low ratings to homeopathic schools, thereby denying them access to grant monies for research.

The rise of the drug industry after the Civil War dramatically changed the way medicine was practiced. By the twentieth century, antibiotics, pain-killing drugs and other new medicines were introduced. Homeopaths rejected these drugs since they felt that their mode of action was to suppress symptoms, thereby predisposing the patient to later problems. The pharmaceutical companies allied with the AMA early on, presumably because its membership provided a lucrative clientele.[12]

Finally, the new mobility of Americans was a major factor in the decline of homeopathy. The homeopathic doctor was the quintessential family doctor; before he could prescribe a remedy he had to spend a considerable amount of time getting to know and understand many aspects of the patient. With a shift to a mobile lifestyle, the doctor-patient relationship became less intimate.[13]

PHILOSOPHY OF HOMEOPATHY

Homeopaths consider the human as an integrated whole operating on three levels: spiritual/mental, emotional and physical. These compose the hierarchy of the individual. The spiritual/mental is the highest and most important level. On this level three qualities are defined: 1) clarity, 2) rationality, and 3) creative service for the good of others as well as oneself.[14] The third quality is usually considered the most important since it introduces the spiritual aspect of health. The emotional plane is second in importance. Standard medicine is now beginning to understand what a great influence the emotions have on the susceptibility to disease of an individual. Homeopaths consider the emotional state of a person of even greater influence on the inception and progress of a disease than the organism associated with the disease. On the emotional level is registered the range of emotional expressions: love, hatred, joy, sadness etc. Emotions that draw an individual to a state of happiness lead to health; negative feelings draw a person to a state of unhappiness and illness. George Vithoulkas in *The Science of Homeopathy* :

> Imbalances on the emotional plane manifest themselves as heightened sensitivity to the sense of ourselves as vulnerable beings separate from the rest of creation; emotionally disturbed states tend to revolve around issues of personal comfort, personal survival and personal expressions. On the other hand, the most evolved emotional states tend to involve feelings of the oneness of ourselves with all of creation - love, bliss, devotion etc....[15]

Homeopaths consider health on both spiritual and emotional levels essential not only for personal well being but also for the well being of society and the environment.

Finally, on the physical level homeopaths define the following subhierarchy of systems (in order of importance): nervous, circulatory, endocrine, digestive, respiratory, excretory, reproductive, skeletal and muscular. Although described separately, homeopaths view these three levels as an integrated whole in the individual with interactions occurring between levels.[16]

The body strives to keep itself healthy on all three levels when it encounters an stimulus that promotes disease. The defense mechanism responds

to the stimulus and initiates symptoms (runny nose, cough etc..) in an effort to restore the body's balance. The defense mechanism is not limited to the physical plane (the immune system), but acts on all three levels, protecting against the inception of disease. Homeopaths define the defense mechanism as an aspect of the vital force - the force that animates the human body[17]. The concept of a vital force originates from the philosophy of vitalism, defined in the *American Heritage Dictionary* as, "the philosophy that life processes possess a unique character radically different from physiochemical phenomena."

Homeopaths believe the vital force unifies the body, connecting spiritual, emotional and physical levels and maintains a balance. Treatment therefore should help the vital force regain its balance. Homeopaths do not attempt to suppress symptoms, which are viewed as positive adaptive responses to stresses on the body.[18] Since the medicine is given to aid the defense mechanism, the self-healing properties of the body are respected.

The medicines used in homeopathy are usually derived from plants, animals or minerals. Their toxic and therapeutic properties are tested in "provings" which involve giving healthy people small doses of a single substance until symptoms are elicited. These provings provide the experimental basis for determining what symptoms a substance elicits, and thus, according to the Law of Similars, what it cures. Each substance creates a pattern of physiological and psychological change in the healthy person.[19] The pattern produced by the substance must match those of the ill person to effect a cure.

The medicine is "potentized" before it is given to a patient. As described earlier, Hahnemann found extremely dilute solutions were more effective than stronger ones. The potentization process consists of a series of carefully controlled dilutions. If the medicine is soluble, it is diluted in either water or alcohol; if it is insoluble, it is ground and diluted with lactose, a process called trituration.

After each dilution the medicine is mixed vigorously by striking it against a firm surface. The medicine is diluted in either 1 part to 99, called centesimal potencies, or 1 part to 9, called decimal potencies. The common dilutions used are 3, 6, 30, 200, 1000, 10,000, 50,000 or 100,000 times. Homeopaths believe that both the dilution and vigorous shaking are necessary to develop an effective medicine, and that the more a medicine is potentized (diluted), the greater its effect.[20]

It seems difficult to believe that such minute doses of a substance could have any effect. It is, however, a common occurrence in the biological world. In the human body for example, free thyroid hormone in the blood with a concentration of just one part to 10,000 million parts of blood plasma is able to function as a regulator of the metabolic rate.[21]

The description of homeopathic philosophy gives an idea of the kind of information a homeopath must obtain from a patient before offering a prescription. Since homeopaths emphasize the interdependence of the body, they try to understand the total symptom picture on all three levels. Changes in energy levels, emotional outlook, or sensitivity to any environmental factor are considered.[22]

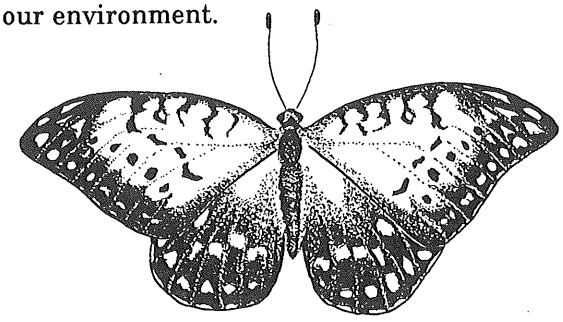
A close doctor-patient relationship is essential to homeopathy. The patient is also expected to be a greater participant in the healing process. The homeopath relies on the patient's detailed picture of what he is feeling on all the levels and how he is responding to the prescribed remedy.

CONCLUSIONS

Homeopathy is experiencing a resurgence in popularity. This popularity is not limited to the U.S. In France over 6,000 physicians practice homeopathy and over 18,000 pharmacies sell homeopathic medicines. Homeopathy is also strong in Britain, Germany and Austria. India has over 70,000 registered homeopathic practitioners and 124 homeopathic schools. Homeopaths are also busy in Latin America.[23]

Despite the popularity of homeopathy, most medical doctors and researchers remain skeptical of its effectiveness. They express disbelief that any medicine can effect a cure if it is diluted to such an extent. Some suspect that homeopaths are only witnessing the placebo effect.[24] Homeopaths admit that they do not understand the mechanism of the remedies' action on the body, but they maintain that the physiological activity of the medicines have been repeatedly demonstrated. Both infants and animals (neither responsive to the placebo effect) responded to homeopathic remedies.[25] Research to determine how these dilute preparations retain their biological activity should continue.

Perhaps the greatest immediate contribution of homeopathy to society is its perspective on health: the concept that health on all three levels is coupled to the way we interact in our communities and our environment. We can only guess what benefits would accrue if we no longer assumed that health is merely a matter of eating right and reducing stress, but that health is also a matter of how we treat our fellow human beings and what kind of perturbations we cause in our environment.



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Healthful foods (but not "High Falutin") at Chez Panisse

Bruce Colman

Since 1988, diners at the gourmet restaurant Chez Panisse, in Berkeley, California, have found unusual advisories printed on their menus.

"Most of our produce is organically grown," one reads. Another says, "Most of our meat is from animals raised in a wholesome way, without chemical additives."

Serving such healthful foods is all part of proprietress Alice Waters's life-long quest to awaken people and sharpen their senses, as she proclaimed in her *Chez Panisse Menu Cookbook* (1982). This means serving lettuces at lunch and dinner that were picked the same morning from hillside gardens a couple of miles from the restaurant. Most of the rest of Ms. Waters's herbs, vegetables, and fruits come from produce farms in the Sonoma Valley, a morning's drive north of Berkeley. The beef Chez Panisse serves was raised on a farm partly owned by Orville Schell, whose book *Modern Meat* (1984) blew the whistle on the chemicalization and industrialization of American cattle-raising. Chez Panisse's contracts with chicken growers require the birds to be fed organic grains, according to the The San Francisco Chronicle (April 26, 1989).

Once in the restaurant, the meats tend to be quickly roasted or grilled; complex, classic continental-cooking sauces that mask flavors and make a meal seem leaden, are out. Fish is handled in the same way.

Vegetables, served according to the seasons, may be roasted or grilled, too, or quickly steamed so that their flavors intensify. The cooking fat of choice is olive oil, rather than butter or butter-and-oil, generally less for its low cholesterol content than for its wonderful flavor.

Diners find almost nothing bland at Chez Panisse. Where preserved foods are used (for all the new American cooking's emphasis on fresh ingredients, there are great, great preserved foods in every important world cuisine, from kim chee to prosciutto to, obviously, any cheese you care to name), the foods are preserved in traditional ways: smoking (fish or meats); pickling (olives, onions and the like); salt packing for anchovies; cooking and preserving in their own fat for ducks, making *confit*; sun-drying for tomatoes.

Since its founding in 1971, Chez Panisse has been such a success (like a three-star restaurant in France, it's often the focus for people's visits to Northern California) that other restaurateurs have followed Ms. Waters' lead.

Chez Panisse is famous in food circles for the number of its former cooks who have started their own, highly successful eateries. A list of them wouldn't be necessarily appropriate to The Land Report. But a list of establishments with similar attitudes toward food is interesting. The New Booneville Hotel (in Booneville, California, about three hours north of San Francisco) made a splash in the mid-1980's, by planting produce gardens right around the restaurant itself. Patrons were encouraged to carry out glasses of wine and to wander amongst the eggplant and tomatoes and peppers and even corn, whose siblings they'd be eating later. (That incarnation of New Booneville went bankrupt in a couple of years, amid accusations that its proprietors had been buying their produce off trucks that passed through town, the same as other cooks in the area.) Cafe Beaujolais, in Mendocino, maintains its own organic garden, as does the Sundial Grill in Hopland (Hopland and Mendocino are also in Northern California), and the Union Square Cafe, in New York City, selects its produce from a nearby organic greenmarket, according to The New York Times Magazine, which cited Washington D.C.'s Restaurant Nora and City Cafe as other examples of this trend.

Ms. Waters's emphasis on freshness and organic production has spawned a whole cluster of other commercial enterprises around the Bay Area. Those Berkeley gardens and Sonoma truck farm are but three examples; there are also bakeries, wine importers, fish mongers, even a flower store in the Chez Panisse orbit. They sell to Chez Panisse, to other restaurants and retail outlets, and to the public directly.

A project started by a Chez Panisse alumna,

Alice Waters, new member of The Land Institute Board of Directors

Sibella Kraus, with Ms. Waters's backing five years ago, became an annual program called "Tasting of Summer Produce." California farmers bring their best products for food professionals and interested diners to sample.

Branching out from the Tastings, Ms. Waters will be a partner in a new venture called Central Market. This will enable farmers to sell directly to restaurants and home cooks in an old market building located in a neighborhood of Oakland (which borders Berkeley to the south), that was flattened by Urban Renewal twenty-odd years ago and never yet rebuilt.

All this has political and even spiritual dimensions, because eating fresh food and emphasizing organic principles in its production both opens markets for producers of organic produce and draws eaters closer to the earth from which food springs—such, at least, is Ms. Waters's faith. A friend of hers told a Chicago Tribune writer that Ms. Waters sees Chez Panisse as a political place (she was in Berkeley for the Free Speech Movement of 1964 and once ran the campaign office of an anti-Vietnam War candidate for Congress) because she believes that people who have eaten well and had their senses opened will think and speak to one another clearly about the events and issues of the day. The restaurant has hosted fundraising events for Central America.

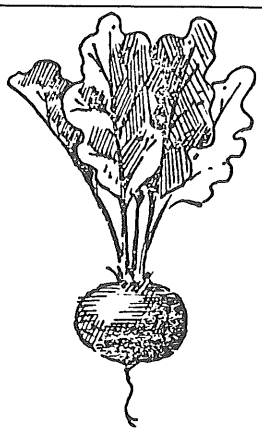
Ms. Waters personally became involved with the board of directors of the Natural Resources Defense Council around the time the organization released its report on Alar used on apples. She has also recently joined The Land Institute board and invited Wes Jackson to address the national convention of the American Institute of Wine and Food in Chicago. "They need to hear The Land's message," she told this writer.

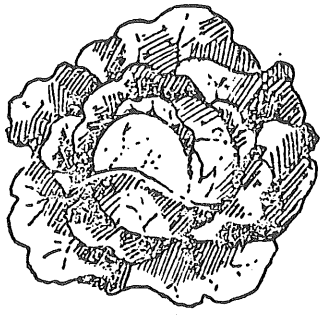
Meals at Chez Panisse aren't cheap—upwards of $50 per person without wine or beer for a five-course, fixed-price meal in the downstairs formal dining room. Prices easily reach that range in the a la carte cafe upstairs where one may order pizzas, pastas, salads, cold or hot dishes in a less formal setting. It's a restaurant for special occasions (just eating there can be a special occasion), and for being inspired in one's own gardening and cooking at home.

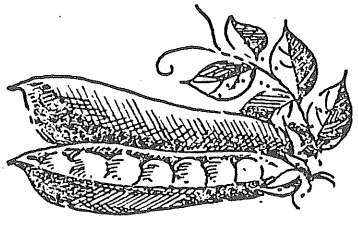
Still, Ms. Waters told an interviewer once, what she and her cooks do isn't that high falutin'. "It's the way peasants have eaten for centuries," according to a quote she gave Paradise magazine (and let us remember the root meaning of "peasant" as a person of the soil). "You grow things in the garden according to the seasons and you cook them, trying not to destroy the flavors."

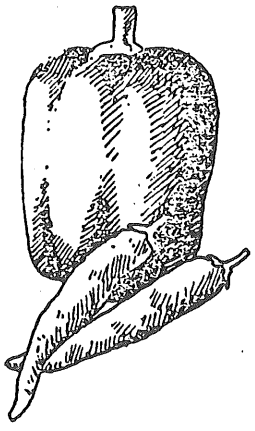
Bruce Colman, who wrote this article, is a freelance writer and editor from San Francisco. He also serves on The Land Institute Board of Directors.

The latest cookbook from Chez Panisse, is called *Chez Panisse Cooking* (Random House, 1988) and is by the current chef, Paul Bertolli, with Alice Waters.









The Sins of Emission

Ivy Marsh

Two memorable events occurred in my hometown of Salina, Kansas, in the summer of 1989. The good news: Salina was named an "All-America City"—official recognition that it is a caring community, a good place to live. The bad news: it was chosen to be the site of an 80,000 ton secondary lead smelter, where lead-acid batteries would be smashed and melted at high temperatures to recover lead. That announcement galvanized a handful of citizens to study and action. What hazards would this pose to health? Soil? Air? Water?

Exide Corporation, which operates a battery manufacturing plant in Salina, had tried earlier to locate the smelter at Hays, Kansas, 100 miles west of Salina; but citizens there effectively mobilized, and the city rejected the offer. Leaders of their Ellis County Environmental Awareness group kindly shared with us their advice, experience, expertise, and a large box of documents. We formed study groups to learn about the technology and track record of lead smelters, the legal process of rules and regulations, and the possible effects on human health and the environment. The reading materials we accumulated from Hays and elsewhere measured over two feet high, of very fine print. Reading all the documents and medical reports and understanding unfamiliar technical terms became an on-going challenge.

To emphasize the focus of our concern, we chose to call our group CITIZENS FOR A HEALTHY ENVIRONMENT. Towards the end of the summer, we produced a fact sheet, sponsored a public meeting and announced our opposition to the construction of a secondary lead smelter in Saline County. We had learned enough about the environmental and human health problems associated with secondary lead smelters to take a stand.

Conventional secondary lead smelters annually emit tons of lead and sulfur dioxide and other gases such as carbon monoxide and carbon dioxide into the ambient air, even with a control efficiency of 99.92%.[1] The company's environmental director says the lead emissions will be below five tons a year, in the area of 2.5 tons per year, and sulfur dioxide emissions will be a little less than 100 tons per year. This is built into the technology and cannot be avoided.

The proposed smelter in Saline County would produce 80,000 tons of lead a year. Lead is toxic. No other pollutant has such a narrow margin of exposure between safety and risk.[2] What would this mean to those whose homes, schools, parks, and workplaces are only a short distance from an operating secondary lead smelter? Health studies define "chronic" as three to four years' exposure, and state that chronic exposure to lead is much more dangerous than short-term exposure. The operating life of a smelter is twenty to thirty years (An Exide official predicted this one would operate for fifty years). There is no doubt that people within the four mile radius of a smelter would be exposed to chronic low levels of lead.

EFFECTS ON HEALTH

One of the most common ways to measure the body burden of lead is the blood lead level, which is expressed in micrograms per deciliter. John F. Rosen of Albert Einstein College of Medicine in New York City described rising doubts in the reliability of the measure.

> "Researchers from four collaborating institutions say they have data demonstrating for the first time that blood measurements may significantly underestimate the lead stored in a child's body. Moreover, these data suggest that blood lead concentrations currently deemed "acceptable" for young children by the Centers for Disease Control (CDC) offer little or no margin of safety.[3]

As more studies have been done, there has been a steady decline in the threshold or lowest exposure levels at which adverse health effects can be detected. In micrograms per deciliter, the critical index figure for lead toxicity currently set by EPA is 25. Recent reports indicate that EPA experts and their panel of outside advisers recommend reducing this figure drastically, by as much as 60% (to 10). An internal EPA staff report proposes that any blood lead levels above 10 be considered excessive, and EPA's Clean Air Science Advisory Committee of outside experts has recommended that the acceptable U.S. blood lead levels be reduced below 10.[4]

EPA emission levels and blood lead levels do not indicate that below that figure there is no harm; they indicate that above that level the amounts are so toxic they should not be permitted. This whole matter is complicated by the fact that most "safe or acceptable levels of lead are based on the assumption of temporary exposure, rather than the more dangerous chronic exposure that a lead smelter would pose. The average blood lead level in the U.S. population is believed to be about 10 micrograms per deciliter.[5]

Another criteria pollutant released in surprisingly large, and perfectly legal, amounts into the atmosphere from secondary lead smelter operations is sulfur dioxide, which is known to aggravate symptoms of heart and lung disease, obstruct breathing, and increase incidence of acute respiratory diseases, including coughs and colds, asthma, bronchitis, and emphysema.[6]

Members of the medical profession in Hays,

Kansas, took a stand against the construction of a lead smelter in their town. Every physician and dentist in Ellis County, except one, signed and paid for a full page open letter in their newspaper expressing opposition to the location of a secondary lead smelter in their community. The ad included the following:

> As concerned physicians and dentists of this community, we feel it is our ethical responsibility to voice our concern about the potential serious health hazard that a lead smelter would create. Many medical studies have shown that even low levels of lead exposure over a period of time can cause irreversible damage to the central nervous system. The hazard is most severe in children. Studies have demonstrated that chronic low level exposure to lead in young children can reduce their IQ's by five to ten points, and severe exposure will result in mental retardation...We realize that economic development is essential for Hays, but our clean air and healthful environment is also one of Hays' major attractions. If this is lost, we may find it increasingly difficult to attract future industry to locate here, and we may jeopardize our children's health as well.[7]

The Exide Corporation learned their lessons well in Hays. On October 25 they openly courted Salina doctors with a filet mignon dinner at the Salina Country Club, followed by two presentations downplaying the adverse health effects of lead. Dr. Eugene Shipman, Pittsburgh general practitioner who works one third of his time for Exide, told Salina physicians that all effects of lead were reversible. Dr. Claire Ernhart, developmental psychologist from Case Western Reserve University, well-known for her consulting work with the lead industry, debunked studies showing developmental deficits in children with higher blood lead levels. A few pediatricians and obstetricians questioned this testimony, but a number of older doctors seemed quite soothed and satisfied by the Exide story.

THE MYTH OF PROTECTION

Before the 1970s, there were few regulations governing lead smelters. In 1973, under the Clean Air Act, New Source Performance Standards (NSPS) were established which mandated that any secondary lead smelter under construction, modified, or reconstructed after June 11, 1973, would be subject to NSPS. They are to be reviewed every four years.[8]

A surprising number of people feel assured that EPA emission standards will protect them from harm. This is a false hope. The EPA's acceptable upper limit of lead particles in the ambient air is 1.5 micrograms per cubic meter, which was established in October of 1978 under the National Ambient Air Quality Standard. Proposals to lower this to 1 or to .5, in light of the increasing evidence of adverse effects of low levels of lead, probably will not be accepted because, as the Bureau of Mines states, the cost of new controls equipment would be prohibitively expensive for the lead industry.[9] Cost is one factor taken into account in setting the emission level. Public health is another factor in the complex five step formula that establishes that figure. However, step two is based on thirty micrograms per deciliter, a level of toxicity which the EPA now agrees is beyond acceptable limits, and step four is based on flawed information—the EPA based its determination of the contribution of non-air sources to children's blood lead on inference from empirical studies that involved adults. The EPA also concluded that to use a larger estimate of the non-air contribution would result in an exceptionally stringent air standard.[10]

In a November 29, 1988, letter to a Hays, Kansas, resident, Daniel Rodriguez and Charles Whitmore, Chief of the Air Compliance Section, Region VII, EPA, explained the standards very clearly.

EFFECTS OF CHRONIC LOW LEVEL LEAD EXPOSURE

—"An increasing body of data supports the view that lead, even at levels previously thought to be 'safe' is toxic to the developing central nervous system. Clearly the goal is to remove lead from the environment of children before it enters their bodies." ("Preventing Lead Poisoning in Young Children," Centers for Disease Control, Jan. 1985.)

—"The present literature shows biological effects as low as 6 micrograms per deciliter (for fetal effects and for IQ effects in some populations); ...the finding of biological effects at the lowest observed blood lead levels (4-6 micrograms per deciliter) potentially has important implications for public health, because such levels are common in the U.S. population...The studies summarized indicate that among the cognitive effects resulting from exposure to lead is a potential lowering of children's IQ's and a reduction in their ability to perform well in school." ("Reducing Lead in Drinking Water: A Benefit Analysis," Ronnie Levin, EPA, Dec. 1986.)

—"There are biochemical effects at very, very low levels of blood level of lead. Lead at 'low levels' has an adverse effect on the developing brains of children and a child does not develop with the same IQ as if there had not been lead exposure".
("Health and the Lead Phasedown," *EPA Journal*, Jan., 1985.)

> As required under the Clean Air act, emission limitations established under a standard of performance reflect the application of the best technological system of continuous emission reduction the Administrator determines has been adequately demonstrated, considering the cost of emission reductions, energy penalties, and nonair quality health and environmental impact. In other words, emission limits are set based on the best available controls, but don't necessarily ensure protection of human health.[11]

The EPA has delegated to the Kansas Department of Health and Environment (KDHE) the primary responsibility to issue all air-related permits and to follow up on all testing, monitoring, recordkeeping, and notification requirements under the new source performance standards. EPA retains concurrent enforcement authority but generally relies on the expertise of the state agency to carry out the programs.[12] While KDHE has dedicated and talented personnel, it is one of the most understaffed, underfunded, and overworked of state agencies. In December, 1988, a KDHE department head confirmed to the Wichita Eagle-Beacon that KDHE lacked the necessary personnel and funds to carry out their tasks of monitoring and enforcement properly, adding that the agency was receiving the same dollar amount from the state that it received in 1972, in spite of an increased workload and inflation.

Three other KDHE officials confirmed to Marge Streckfus and me in September, 1989, that the 1972 budget story was correct, and that if a permit is granted for a secondary lead smelter, KDHE will not have the funds (estimate: $60,000 to $80,000 a year) to monitor it to the extent they would like. They said that the company either would have to hire an outside firm or would have to monitor itself and send the emission readings to the state. A KDHE technical representative will perform an inspection at least once each year at the site, and more frequently if problems are identified.

To learn how dangerous self-monitoring can be, one has only to look at the Bergsoe secondary lead smelter in St. Helens, Oregon, built in 1980, under the EPA's new source performance standards (the same regulations that would guide the building of a smelter in Salina) in a state reputed to have the most strict environmental laws in the nation. The town was wooed and won with the prospect of seventy new jobs and a two million dollar annual payroll. Company officials promised the smelter would operate "the cleanest lead smelter in the nation." Today the state's Department of Environmental Quality says Bergsoe is one of the worst environmental disasters in Oregon, and the EPA says it is a "substantial hazard to human health."

Oregon's Department of Environmental Quality (DEQ) required the company to monitor itself. When the agency discovered that lead levels of air emissions were twice the allowable amount, that lead in the hazardous waste exceeded toxic levels, and that contaminated water containing extremely high levels of lead and acid had leaked into the ground, the DEQ issued a fine and warnings. But only after local citizens complained repeatedly did the DEQ/EPA act with authority. Bergsoe never paid the fines nor cleaned up the site. The company declared bankruptcy, leaving the state and town to ponder how to clean up the mess and who would pay the costs, once estimated to run as high as fifteen million, but now said to be twenty to forty million dollars. The permanent and irreversible damage done to the health of the citizens and to the environment is currently being assessed.[13]

Parallels to the Salina situation can be drawn—the lure of new jobs, a new industry, the complacency of citizens who believe that the EPA will protect them. KDHE also has a history of problems in getting companies to comply with state and federal regulations. After four years of having its repeated warnings ignored by companies in eastern Kansas that were polluting surface and groundwater, KDHE took strong action only after the Kansas Natural Resource Council threatened to file a lawsuit to force compliance. A 1987 KDHE internal memo states that cooperation with industry, not conflict, is its guiding principle.[14]

HOW COOPERATIVE IS THE LEAD INDUSTRY?

The fight to keep federal emission levels abreast and reflective of new medical discoveries and standards is difficult, given the slow movement of the regulatory process and the resistance of industry. Even though regulations are weak and poorly enforced, the lead industry appears to have a history of obstructing attempts to establish standards. In 1922, the lead industry successfully overruled health scientists who said alkyd lead in gasoline additives was a serious health hazard.[15] In 1978, when the government announced new regulations to protect an estimated one million workers from lead poisoning (citing cases of irreversible kidney disease, anemia, the risk of damage to the nervous system and possible sterility) the industry challenged the new rules as too costly and filed a court petition for a review of the standard. [16]

In 1980 the Lead Industries Association (LIA) fought acceptance of EPA's thirty micrograms per deciliter criteria index of toxicity because it considered that to be an "alarmist standard." A federal appeals court ruled in favor of the EPA. In 1985, the LIA stopped a scientific meeting called by the Centers for Disease Control to go over a draft paper entitled "Preventing Lead Poisoning in Young Children," by threatening "legal proceedings" if it were held.[17]

PROXIMITY TO SMELTERS

While airborne particles from smelters can be found nineteen or more miles from the stationary source, most pollution occurs within a four mile radius. Elevated levels of lead in soil, however, have been found as far as fifteen miles away.

—"Over the years, a lead-emitting operation will add a heavy ecological burden to nearby areas. Of particular concern is lead fallout from smelters transferring to nearby soil, dust, and forest cover. Results of numerous studies document that children sustain marked increases in blood lead and body lead burdens when they live near stationary lead emitters, particularly smelters." ("Nature and Extent of Lead Poisoning in Children in the U.S.—A Report to Congress," Agency for Toxic Substances and Disease Registry, pg.6-23, July 1988.)

—"Primary and secondary lead smelters and battery plants are the most significant sources of industrial lead emissions into the air, ultimately increasing soil and dust lead concentrations in the vicinity. Both adults and, especially, children have been shown to exhibit elevated blood lead levels when living close to these sources...Some of the more important additional lead exposures occur due to residence near stationary sources (e.g. smelters)." ("Toxicological Profile for Lead," Agency for Toxic Substances and Disease Registry, U.S. Public Health Service in collaboration with the EPA, Feb. 1988.)

—"In April, 1984, the EPA determined that an imminent and substantial endangerment to the public health or welfare may exist due to actual or threatened releases of a hazardous substance" from the lead smelter." ("Court Upholds 1990 Closing of Dallas Smelter," Dallas Times-Herald, June 25, 1987.)

threatening "legal proceedings" if it were held.[17]

Dr. Herbert Needleman, a pediatrician and psychiatrist formerly of Harvard University and now with the Children's Hospital of Pittsburgh, Pennsylvania, is well known for his research on the effects of chronic low level lead exposure on children. He expressed his frustration by society's inability to eliminate lead hazards from the environment.

> If lead at low dose is a neurotoxic hazard of the seriousness suggested by most of the recent studies, why then has progress toward control of environmental sources been less than aggressive? At least part of the reason for this halting response has been the obdurate resistance of the lead industry to every regulatory action proposed by government or by public health scientists.[18]

ENVIRONMENTAL THREATS

Sources of lead exposure are air, water, food, soil, dust, and occupational sources. Sources of possible contamination include air, water, soil, and hazardous wastes. Lead accumulates in soil as well as in the human body. Once it has been removed from its geologically bound forms, it poses a toxic threat for which there are no natural defense mechanisms, and it is almost impossible to remove from soil and water.[19] Airborne lead particles are deposited onto vegetation, soils and surface water. Leafy, above-ground vegetables tend to have the highest lead levels, but roots of below ground crops accumulate lead from the soil. Meat products may be affected by lead because of the deposition and accumulation of lead on forage eaten by livestock.[20] There have been cases of lead poisoning from consuming bone-meal tablets made from the bones of cattle that had grazed near smelters and highways. [21]

While EPA regulates air and water, it does not monitor soil. Dr. Philip Landrigan of the National Institute for Occupational Safety and Health in Cincinnati has said that children who regularly play in soil with lead levels of 300 parts per million (ppm) may suffer as much as a ten point drop in IQ.[22] The normal background level of lead in soil is estimated to be five to fifty parts per million. Levels in excess of 18,000 ppm were found in soil samples at Roosevelt High School in Dallas, Texas, in 1981, a site near two operating lead smelters. The city advised landowners in the area to "minimize their contact with the soil."[23]

Dr. Orville Bidwell, Emeritus Professor of soils at Kansas State University, points out that if a smelter is built near Salina, residents face potential health problems as a result of higher cadmium, lead and arsenic in the air, soil, and groundwater.[24] Lead tends to remain in the top centimeter of soil, but soils are contaminated to a much greater depth when turned under, which happens frequently in an agricultural state.[25]

Ingestion of lead contaminated dusts are a source of lead for the young child. Children absorb more lead following ingestion than adults (i.e., 40% as opposed to 5% and 8%) and so are most susceptible to poisoning. Between the ages of one and three, children crawl around, picking up dust and dirt on their fingers and toys, and because of the frequent hand-to-mouth contact, much of this is ingested. [26]

The potential for water pollution is another concern. Atmospheric deposits of lead can contaminate surface water. The Bureau of Mines reports that "Water standard attainment is one of the most difficult tasks for secondary lead smelters. Battery acid neutralization, contained soluble elements, and total suspended solids are the main problem areas."[27] At the Bergsoe plant, leaking tanks caused 25,000 gallons of waste water containing extremely high levels of lead and acid to be released into the ground. The company was permitted to dump uncontaminated water into a nearby creek where residents swam and fished; when the DEQ finally got around to testing the

drainage pipe that led to the creek, it showed high levels of lead and arsenic.[28] The Dixie Metals secondary lead smelter in Dallas, Texas, is currently under enforcement action by the Texas Water Commission for non-compliance with solid waste rules after chemical analysis indicated that groundwater beneath the company site is contaminated with various metals such as arsenic, cadmium, and lead.[29]

WHAT CAN BE DONE?

The most difficult question we have to deal with in talking to citizens has been, "But I don't want to give up driving my car, and it needs batteries. It's better to recycle lead-acid batteries than to have them dumped into landfills where they will pollute our soil and groundwater." That's true, and we can't just say, "Go build the lead smelter somewhere else."

But communities make choices about the kind of schools, parks, shopping areas and industries they want based on what is important to people who live there. While Salina might choose a healthy environment over jobs from polluting industries, another community might choose to welcome heavy industry, valuing jobs over their environment. If Salina rejects the lead smelter, that does not mean we will have to take batteries to the landfill. Another community might be happy to have a plant that recycles lead-acid batteries.

There are other alternatives, though they will be expensive. There is a process called electrowinning which has been developed by the U.S. Department of the Interior's Bureau of Mines which, while it poses risks for workers within the plant, does not appear to contaminate or endanger the community to the extent a traditional smelter does.[30] In October, 1988, one of the largest U.S. secondary lead smelter companies, RSR, announced that it is installing this process in three of its plants. "Our electrowinning process involves no baghouses, no slag, no dust, and no respirators," said Albert Lospinoso, chief operating officer of RSR. "It's a much cleaner and more cost-effective way of recycling batteries than refining is." Lospinoso says the process involves fewer people and more electricity and feels it will make the company competitive enough to handle the extra cost.[31] The company wanting to build a smelter in the Salina area has refused to consider this technology.

Another choice would be for the company to build away from populated areas and prime agricultural land. This would mean piping in water, running electric lines, building a treatment plant and perhaps busing workers to the plant. Costly? You bet. But what price tag does one put on the healthy minds and bodies of children, on the quality of air, soil and water? Those of us who drive cars will have to insist on better technologies (electrowinning) or more expensive, isolated sites, with the understanding that this means we will pay more for lead-acid batteries.

The Citizens for a Healthy Environment has set out to educate the public about the dangers of chronic, low level lead exposure. As long as the smelter is flawlessly constructed and operates with a 100% safety record, we aren't claiming that people will become actively sick or die. It's just that our children will not be quite as bright, quite as strong and tall, behave or feel quite as well—in other words, they will not be all that they could be. Adults won't be as much fun either. They may have slightly increased blood pressure and be more tired, anemic, irritable, constipated and apathetic.

If the promise of 100 jobs causes the All-America city to accept a lead smelter in our area, we may discover that the decision backfires in an economic sense. Property values will drop. Who will want to move to a community that has an operating lead smelter? New businesses may decide not to locate in an area where there is a smelter, because of the growing public awareness of the dangers of lead. Small manufacturing businesses requiring clean air and water for their operation might be hesitant to settle here.

Salina is a nice place to live. We can do without a lead smelter. Like Garrison Keillor, I want my hometown to be a place where all the women are strong, all the men are good-looking, and all the children are above average.

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Farm Operator Position Open

The Land Institute is seeking applicants for a three-fourths time position of farm operator. Responsibilities include all work related to field crops and hay making plus field work for the research plots, irrigation management, maintenance of equipment, operation and maintenance of the greenhouse (shared with other staff).
Qualifications: versatility, experience with farm equipment, mechanical skills, a sustainable agriculture perspective.
To Apply- Send resume and two references to The Land Institute, ATTN. Peter Kulakow. Applicants may also be interested in the lease opportunity mentioned below.

OPPORTUNITY AVAILABLE: The Land Institute wants to lease land that was planted to strawberries, asparagus and raspberries in 1989. Strawberries can be sold as a Pick-Your-Own operation in spring 1990. Several other acres for vegetables are also available. No chemicals have been used in the past two years and lessee must agree to use organic methods. Contact The Land Institute, ATTN. Peter Kulakow.

Planting in the Dust is a one-act, one woman drama in which Annie, a young farm woman, reveals her connection to the land and the satisfaction of farming it right. She reflects on generations past, on what the soil and its caretakers have weathered; and she wrestles with the present, with the emotionally charged issues of farming today. The Land Institute's actress, Dona Freeman, has played Annie 31 times across Kansas for soil and water district annual meetings, college convocations, church conferences and historical societies and is available for additional performances for a minimal fee plus travel expenses. The one-hour long program includes an introduction and a discussion following the play led by Dana Jackson. Contact Dana Jackson for information about scheduling and arrangements.

An "above average" Salina child playing on a tractor on a farm with "above average" soil.

Ian Carré Burritt at The Land 's 72 acre farm on Ohio Street.

East entrance to the classroom building.

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If you would like to visit The Land as an individual or with a group, please call (913) 823-5376 or write ahead of time and make arrangements. Office hours: 8 to 5 weekdays.

1990 Prairie Festival

Mark June 3-4 on your calendar for the 1990 Prairie Festival. Note that it is not on the last weekend in May as in the last few years.

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